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PRELIMINARY INVESTIGATIONS WITH DPX 3674 FOR WEED CONTROL IN FORESTRY

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Summary

A new herbicide, DPX 3674 was evaluated for weed control in radiata pine (*Pinus radiata*) plantations. A wide range of weeds was controlled, the most important from the aspect of forest establishment being bracken (*Pteridium aquilinum* var. *esculentum*) and toetoe (*Cortaderia fulvida*). Certain woody species were also controlled. Radiata pine appeared tolerant to rates of up to 4 kg/ha applied as a foliar spray and to residues of up to 12 kg/ha when planted after spraying.

INTRODUCTION

Techniques have been established for the use of chemicals in many aspects of forest establishment. The use of desiccants prior to burning and the control of grass and many woody weeds in young plantations are standard operations. A major problem which still confronts the forester is site preparation in areas of bracken (*Pteridium aquilinum* var. *esculentum*) and toetoe (*Cortaderia fulvida*). Some chemicals show control of these species in the Kinleith forests, although generally a waiting period of up to 12 months is required prior to planting.

DPX 3674 is a new herbicide, formulated as a 90% water soluble powder. It is a foliar- and root-absorbed herbicide developed for non selective vegetation control (Du Pont 1974).

EXPERIMENTAL

Small plot trials were laid down on bracken and toetoe in February 1974 at rates of 8 and 12 kg/ha of DPX 3674. Initial assessments of these two trials led to further testing on various weed species and observations on radiata pine (*Pinus radiata*) present led to the establishment of two tree tolerance trials.

In all small plot trials, the chemical was applied using a modified Oxford precision sprayer operated at a pressure of 200 kPa applying a total volume of 340 litres/ha. In the aerial trial the application was made with standard boom and nozzle equipment in two half-overlapping passes of 170 litres/ha from a height of 7 to 10 m. Radiata pine 1/0 seedlings were planted in May, July and September following treatment, to determine residual effects of the chemical.

Weed control ratings were assessed on a 1 to 10 scale where 1 = no effect and 10 = complete control. In the tree tolerance trial heights and diameters of trees were measured in May 1975.

A trial was laid down in October 1974 to test the tolerance of radiata pine to DPX 3674. Rates of 2, 4 and 8 kg/ha, with and without surfactant, replicated three times, were applied over 20-tree plots. The trees had been planted in June 1974 in pasture, which was very dense at time of spraying. Weed species in the plots were perennial ryegrass (*Lolium perenne*), Yorkshire fog, browntop and cocksfoot, with sheep's

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sorrel (*Rumex acetosella*) and little or no clover. Heights and diameters were measured 31 weeks after spraying and grass control was assessed 7, 12 and 32 weeks after spraying.

Another trial was established in August 1974 to test weed control on a site that had been burnt, disced, harrowed, oversown and planted with radiata pine and *Eucalyptus regnans* seedlings.

DPX 3674 was applied as both pre- and post-emergent herbicide to autumn sown radiata pine. Sowing took place on 7th March 1975. Two replications of 0.75 and 1.5 kg/ha were applied pre-emergent on the same day and a further two replications were sprayed on 17th April 1975, after germination of the radiata pine.

RESULTS ON INDIVIDUAL SPECIES

Bracken

Initial knockdown of fronds sprayed in February 1974 was good, rates of 8 kg and 12 kg/ha having given complete top kill of bracken. Spring regrowth 38 weeks after spraying showed slight dieback soon after emergence and at 43 weeks control was 60 to 65%, with fronds stunted and most showing dieback. Control at 64 weeks was 85% at 8 kg/ha and 95% at 12 kg/ha. Fronds were 30 to 50 cm high, compared with the surrounding area where the bracken was 1 to 1.5 m high.

Plots sprayed in November 1974 have shown complete control of fronds at 4, 6 and 8 kg/ha with no autumn regrowth.

An aerial application of 8 kg/ha in late December 1974 gave complete control of existing fronds. New fronds appearing during January died within two months and, although a few weak fronds up to 30 cm had appeared in early April, they were chlorotic and showed tip dieback.

Toetoe

Applications of DPX 3674 in February 1974 gave 98% control at 8 kg/ha and 100% control at 12 kg/ha in eight weeks. No regrowth had occurred up to 64 weeks after spraying. Rates of 4, 8 and 12 kg/ha applied in September 1974 have given complete control except where plants have grown from under logs. An aerial application of 8 kg/ha to plants measuring 20 cm to 2 m in height gave 100% control of all exposed plants at 15 weeks. No regrowth had occurred in any of the trials at time of writing.

Himalaya honeysuckle (*Leycesteria formosa*)

Rates of 4, 6 and 8 kg/ha were applied to plants 1 m high in November 1974. At eight weeks control of existing canes was 80% at 4 kg/ha, 90% at 6 kg/ha and 95% at 8 kg/ha. New shoots had already appeared from the base and were growing strongly though chlorotic. At 20 weeks the regrowth was 1 m high and apparently healthy, though some tip dieback of canes had occurred at the 6 and 8 kg/ha rates. Untreated plants then form a dense thicket up to 2 m high.

Wineberry (*Aristotelia serrata*)

Plants sprayed in November 1974 at 6 and 8 kg/ha were mostly killed by 15 weeks. At the 4 kg/ha rate some larger plants (1.5 m to 2 m) were 80 to 90% controlled.

Patete (*Schefflera digitata*)

Rates of 4 and 8 kg/ha were applied in November 1974 to coppice regrowth of patete in pine cutover. Plants were up to 1 m high. After eight weeks the lower rate had given 50% control but vigorous regrowth was present. At the high rate control was 75% and regrowth was chlorotic and less vigorous. At twenty weeks control was only 20 and 50% respectively.

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Blechnum (*Blechnum capense*)

Rates of 4 and 9 kg/ha were applied in November 1974 to dense blechnum up to 1 m high. Brown-off was rapid, most existing fronds being completely brown at eight weeks. Some regrowth appeared and has since died off. Occasional small chlorotic shoots were visible in the 4 kg/ha treatment at twenty weeks but none in the 8 kg/ha treatment.

Buddleia (*Buddleia davidii*)

After initial dieback regrowth appeared from the base of the plant. These new shoots have since shown tip die-back, with the upper leaves chlorotic. At 8 kg/ha dieback was almost complete and further new shoots were chlorotic with small leaves and tip dieback.

Broom (*Cytisus scoparius*)

Applications of 4, 8, 12 and 16 kg/ha were applied to broom from 0.5 to 1.5 m high in September 1974. At 4 kg/ha regrowth was evident from all except the smallest plants. Eight kg/ha had given adequate control of most plants and 12 and 16 kg/ha had given complete control.

TABLE 1: EFFECT OF DPX 3674 ON SOME WEED SPECIES

Weed Species and Date of Treatment	Rates of DPX 3674 kg/ha	
	8	12
21.2.74 (plot trials assessed May 1975)		
blackberry (<i>Rubus fruticosus</i> agg.)	5.0	9.0
browntop (<i>Agrostis tenuis</i>)	10.0	10.0
Californian thistle (<i>Cirsium arvense</i>)	10.0	10.0
cocksfoot (<i>Dactylis glomerata</i>)	10.0	10.0
Spanish heath (<i>Erica lusitanica</i>)	10.0	10.0
Yorkshire fog (<i>Holcus lanatus</i>)	10.0	10.0
30.9.74		
lotus major (<i>Lotus pedunculatus</i>)†	1.0	1.0
Scotch thistle (<i>Cirsium vulgare</i>)†	10.0	10.0
27.11.74		
<i>Clematis</i> sp.†	1.0	—
fleabane (<i>Erigeron canadensis</i>)†	10.0	—
fireweed (<i>Erechtites</i> sp.)†	10.0	—
supplejack (<i>Rhipogonum scandens</i>)†	1.0	—
29.12.74 (aerial trial assessed April 1975)		
piripiri (<i>Acaena novae-zelandiae</i>)	10.0	—
bush lawyer (<i>Rubus parvus</i>)	8.0	—
hooked sedge (<i>Uncinia</i> sp.)	10.0	—
<i>Phymatodes diversifolium</i>	10.0	—
karamu (<i>Coprosma robusta</i>)	5.0	—
matipo (<i>Pittosporum tenuifolium</i>)*	6.0	—
koromiko (<i>Hebe stricta</i>)	10.0	—
burdock (<i>Arctium minus</i>)*	1.0	—
mahoe (<i>Melicytus ramiflorus</i>)	1.0	—
red matipo (<i>Mrysiene australis</i>)*	1.0	—
mingimingi (<i>Cyathodes fasciculata</i>)*	10.0	—
narrow-leaved plantain (<i>Plantago lanceolata</i>)	10.0	—
rangiora (<i>Brachyglottis repanda</i>)	10.0	—
rewarewa (<i>Knightia excelsa</i>)*	7.0	—
ring fern (<i>Paesia scaberula</i>)	10.0	—

* Less than 10 plants examined.

† Also tested at 4 kg/ha rate of DPX 3674 with similar results.
Weed rating 0 = no effect, 10 = complete control.

EFFECTS ON OTHER SPECIES

Observations of herbicide effects on other species have shown DPX 3674 to control many other grasses and broadleaf weeds at rates of from 4 to 12 kg/ha. Germinating seedlings of broad leaved annuals were visible in many plots six months after treatment. Grasses were generally well controlled with browntop and cocksfoot showing slight resistance. Yorkshire fog was killed at 4 kg/ha but seedlings appeared six months after spraying in plots sprayed at up to 12 kg/ha. Top growth of Californian thistle was killed at 4 kg/ha, regrowth being weak and browning off from the base. Many woody species died back but showed regrowth. Tree tutu (*Coriaria arborea*) up to 1 m high was fully controlled at 8 kg/ha. Blackberry was killed to ground level; regrowth was chlorotic and showed stem dieback up to 12 months after spraying. A list of weed species is given in Table 1, with indications of susceptibility to various rates of DPX 3674.

TREE TOLERANCE

The effect of DPX 3674 on radiata pine and degree of grass control is shown in Table 2. Radiata pine seedlings were tolerant of DPX 3674 up to 4 kg/ha but *Eucalyptus regnans* was killed by 1 kg/ha. The effect of pre- and post-emergence application to radiata pine seedlings is shown in Table 3.

TABLE 2: TREE TOLERANCE AND GRASS CONTROL

Rate of DPX 3674 (kg/ha)	Rate of Surfactant	19 wks Height (cm)	31 wks Height (cm)	31 wks Diam (cm)	Survival %	Mean visual ratings for grass control		
						7 wks	12 wks	32 wks*
2	0.1%	67.4	87.8	1.74	97	6.3	7.3	6.5
4	0.1%	59.4	80.3	1.86	98	8.6	9.5	8.7
8	0.1%	48.4	72.3	1.59	87	9.6	9.8	9.1
2	—	65.1	82.0	1.59	98	6.3	6.7	5.9
4	—	61.8	85.4	1.80	100	9.0	9.3	8.9
8	—	57.0	82.4	1.86	87	9.5	9.8	8.1
untreated	control	38.6	49.9	0.61	85	—	—	—

* These assessments ignore Yorkshire fog seedlings.

TABLE 3: EFFECT OF DPX 3674 APPLIED PRE- AND POST-EMERGENT TO AUTUMN SOWN RADIATA PINE

Time of application (days after sowing)*	Rate of DPX 3674 (kg/ha)	63 days after sowing	
		Effect on trees (1-10 scale)	Weed control
0	0.75	1.5	7.5
0	1.50	1.5	8.0
41	0.75	3.0	8.0
41	1.50	4.0	8.0

* Germination of radiata pine normally occurs at 20 to 30 days after sowing.

DISCUSSION AND CONCLUSIONS

DPX 3674 gave good control of bracken when applied in the summer and indications are that 15 to 20 months control may be expected from a February application in the Kinleith area, thus obviating up to two

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release cuttings during the first year after planting radiata pine. Rates as low as 4 kg/ha gave a good kill of existing fronds and have also controlled autumn regrowth.

Control of toetoe was excellent at rates as low as 4 kg/ha, with no regrowth. This rate also controlled Yorkshire fog and tall fescue (*Festuca arundinacea*) both these grasses normally growing in association with toetoe.

An important advantage of DPX 3674 in forest management is that trees can apparently be planted almost immediately after the chemical has been applied.

In treatments of individual weed species no tree measurements have been taken, as under field conditions there are too many variables. However, visual assessments of trees planted in these plots have shown no phytotoxic effects, while trees of 2 and 3 years which were present in the plots at time of spraying were affected by foliar application, with the leaves on the lower branches browning off. The trees have recovered and were growing well.

Radiata pine appears to be reasonably tolerant to DPX 3674, though there was a reduction in growth with increasing rates at nineteen weeks. At 31 weeks 4 kg/ha gave larger height and diameter than 2 kg/ha without surfactant, probably due to better grass control. The addition of surfactant appeared to increase damage to radiata pine. There is a possibility that a rate of 4 kg/ha could be used as a release treatment in newly established radiata pine plantations for control of bracken, toetoe, tall fescue and many other broadleaf weeds and grasses. The use of low rates of DPX 3674 for weed prevention on cultivated sites shows promise.

Blechnum is a serious weed of South-facing slopes in pine cutover, reducing the stocking and vigour of young trees. DPX 3674 offers a viable method of control.

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REFERENCE

- E. I. du Pont de Nemours & Company (Inc.), 1974. Product information bulletin on DPX 3674.