AN AERIAL SPRAY TRIAL TO CONTROL *CYCLANEUSMA* NEEDLECAST ON *RADIATA* PINE

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Cyclaneusma minus (Butin) DiCosmo, Peredo and Minter (formerly known as *Naemacyclus*) causes a premature needle-cast of *Pinus radiata* D. Don (Gadgil 1984). Infection of the current foliage usually occurs in autumn or winter when conditions are suitable, with leaf wetness periods longer than 5 hours and temperatures higher than 10°C. The infected needles are cast in the following spring when they are just over a year old. Trees of different clones show a variation in susceptibility to the disease (Forest Research Institute 1977), and the severity of the disease is low in trees younger than six years and older than 25 years (van der Pas *et al* 1984a). Diseased trees exhibit a significant reduction in annual volume increment (van der Pas *et al* 1984b).

A number of fungicides have been screened for their effectiveness in controlling the disease in a small scale trial (Hood and Vanner 1984) and of those tested, dodine was the most effective. Kistler and Merrill (1978) showed that three applications of mancozeb fungicide gave good control of *Cyclaneusma* needle-cast in Scots pine Christmas tree plantations.

An aerial spray trial was carried out to evaluate the three fungicides dodine, mancozeb and copper oxychloride, for control of *Cyclaneusma* needle-cast disease in *P. radiata*.

Four adjacent treatment plots, each 12.5 ha in size, were established in a 17-year-old stand of *P. radiata* in Whakarewarewa State Forest. In 1984 the stand had been rated as having a disease incidence of 40% and a disease severity of 50%. The disease incidence is a measure of the percentage of trees in a stand affected by the disease. The disease severity is a measure of the average percentage of the unsuppressed green crown of the diseased trees showing the yellow mottling of the needles characteristic of the disease (van der Pas *et al* 1984a). The treatments are listed in Table 1. One treatment was assigned to each plot.

The fungicides were applied from a helicopter fitted with six Micronair AU 5000 rotary atomisers, and flying at a speed of 60 knots. The spray flow rate was set using a flow meter. An intermediate spray oil was added to the fungicide mix to assist in slowing evaporation of the small spray droplets produced. Six applications of each fungicide were made at monthly intervals, the first on 1 April 1985 and the sixth on 28 August 1985. For the first application a total spray volume of 5 litres/ha was used but due to difficulties experienced in mixing the mancozeb and oil and also its poor atomisation, the second and subsequent applications of all treatments were made in a total volume of 10 litres/ha.

Treatment plots were assessed for incidence and severity of visible disease symptoms by the same two experienced observers working from a helicopter on 2 October and again on 29 October 1985. The results of the four assessments of disease incidence and disease severity (two assessments and two observers) were subjected to analysis of variance. Duncan's multiple range test was used to detect any differences in treatment effectiveness.

The average expression of disease severity and disease incidence recorded in each treatment is shown in Table 1.

The assessments show that only the application of dodine resulted in a reduction of disease incidence and disease severity compared with the unsprayed plot. There was no significant difference between the two assessments or between the results recorded by each observer.

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TABLE 1: Mean percentages of disease severity and disease incidence for each treatment.

Treatment	Fungicide	Application rate ai/ha	Disease incidence (%)	Disease severity (%)
dodine	Syllit 40S*	0.8 kg	14 a	35 a
mancozeb	Mancozeb 80W*	1.6 kg	19 ab	41 ab
copper	Copper	0.8 kg	28 b	60 c
oxychloride	oxychloride 50W*			
unsprayed			25 b	50 bc

*Mobil Superior 663 spray oil added at a rate of 2 litres per hectare.
Treatments joined by a common letter do not differ significantly ($P=0.05$) using Duncan's multiple range test.

A relationship was derived to relate tree growth loss to disease severity at one particular site (van der Pas *et al* 1984a). If this relationship were to hold true for the trial area, spraying with dodine in 1985 would have resulted in only a 6% increase in stand volume increment.

The cost of spraying the dodine treatment by helicopter, exclusive of any ground control costs, amounted to \$250 per hectare for all six applications in 1985. It could be expected that to maintain any reduction in disease levels, repeated spraying would be necessary particularly in those years where climatic conditions favoured the disease.

It is concluded that the high cost of spraying is not justified by the small reduction in disease levels.

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