

CONTROL OF LEAF CURL IN STONEFRUIT WITH DIFENOCONAZOLE

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Leaf curl (*Taphrina deformans* (Berk) Tul.) occurs in spring and early summer when leaves are infected as they burst from the buds. Infected leaves are puckered, curled and thicker than usual with a deep pink or purplish coloration. Leaves and small fruitlets that are infected usually fall before maturity. Stonefruit trees are seriously weakened by this disease. Control is obtained by using copper-based sprays or chlorothalonil early in the season from bud movement but growers have been having difficulty in maintaining effective control of leaf curl with these fungicides (Cheah and Tate 1986; Tate *et al.* 1987; Cheah *et al.* 1988). Alternative fungicides, including the EBIs, were investigated by Cheah *et al.* (1988).

Difenoconazole, an EBI fungicide, has been shown to control the blossom blight stage of brown rot in stonefruit (Tate and Gawith 1989; Follas and Beetz 1991). This research note reports on the effect of difenoconazole applied during the blossom period for the control of leaf curl.

Two trials in 1987 were situated in the Waikato (Redhaven peaches) and Canterbury (Early O'Henry peaches). The trials were randomised blocks with single tree plots and four replicates. Two applications of difenoconazole (Score 10 WP) were compared with two applications of captafol (Difolatan 50F) applied at 10 day intervals during the pink (late August) to full bloom (early September) period. The treatments were applied in the equivalent of 1000-1600 litres of water/ha at 450-500 kPa with the addition of a wetting agent (0.02% v/v). All treatments were preceded by an application of cupric hydroxide (Kocide 50 WP) at bud swell. Leaf curl was assessed on 100-150 shoots/tree, with shoots being rated as healthy or diseased.

In 1991 there was one trial in Hawkes Bay (Golden Queen peaches) and one in Canterbury (May Grand nectarines), and similarly in 1992. Four applications of difenoconazole or flusilazole (Nustar 20 DF) were made at 9-11 day intervals from pink (August) to early shuck fall (September). All treatments were in the equivalent of 1000 litres of water/ha at 400-600 kPa with the addition of a wetting agent (0.025% v/v). The trials were on blocks that had received two earlier applications of copper-based fungicides when dormant. Leaf curl was assessed on 10-30 lateral terminal shoots at periodic intervals after the last application by classifying them as either diseased or healthy. In addition in 1992 a disease infection score was used (0 = nil, 1 trace, 2 slight, 3 moderate and 4 severe) to indicate the severity of disease on each lateral shoot. The data after either angular or square root transformation where necessary, were subjected to ANOVA analyses. The separation of means was according to Duncan's multiple range test. All results are reported as untransformed means at specified days after treatment (dat).

The two trials in 1987 (Table 1) showed excellent efficacy against leaf curl from two applications of difenoconazole at 8 g/100 litres. Treatment with either difenoconazole or captafol reduced the level of leaf curl infection compared with the untreated, with no difference between the captafol or difenoconazole treatments.

In both trials in 1991 four applications of difenoconazole at 10 or 15 g/100 litres reduced the number of lateral terminal shoots infected with leaf curl compared with either the flusilazole or untreated treatments ($P < 0.01$) (Table 2). There was no difference between the two rates of difenoconazole. Flusilazole did not significantly reduce the level of leaf curl compared with the untreated.

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TABLE 1: Mean percentage of lateral terminal shoots infected with leaf curl in 1987.

Treatment	Rate g ai/100 litres	Waikato 25 dat	Canterbury 53 dat
difenoconazole	8	0 bA	0.3 bB
captafol	160	0.8 abA	0 bB
untreated	-	3.5 aA	2.4 aA

Any two means in a column followed by the same letter are not significantly different $P < 0.05$ (lower case), $P < 0.01$ (capitals).

TABLE 2: Mean percentage of lateral terminal shoots infected with leaf curl in 1991.

Treatment	Rate g ai/100 litres	Hawkes Bay 8 dat	Canterbury 28 dat
difenoconazole	10	0	0 bB
difenoconazole	15	0	0 bB
flusilazole	4	100	80 aA
untreated	-	100	87.5 aA

TABLE 3: Mean percentage of lateral terminal shoots infected with leaf curl and mean disease severity score in 1992.

Treatment	Rate g ai/ 100 litres	Hawkes Bay (35 dat)		Canterbury (29 dat)	
		% laterals infected	Mean sev. score	% laterals infected	Mean sev. score
difenoconazole	10	6.2 cB	0.04 cC	0.0 cC	0.0 cB
flusilazole	4	48.7 bAB	2.40 bAB	35.8 bB	0.8 bAB
untreated	-	91.2 aA	3.80 aA	65.8 aA	1.5 aA

In 1992 four applications of difenoconazole at 10 g/100 litres reduced the number of lateral terminal shoots infected and the severity compared with the untreated ($P < 0.01$) and the flusilazole treatment ($P < 0.05$) (Table 3). Flusilazole significantly reduced the number of lateral terminal shoots infected and the disease severity compared with the untreated ($P < 0.05$). No attempt was made in these trials to apply the fungicide treatments in relation to infection periods; therefore the difference in the efficacy of flusilazole between 1991 and 1992 seasons was probably due to coincidental timing of the fungicide applications in relation to infection periods. Difenoconazole activity against leaf curl may be less affected by application timing compared with flusilazole.

Applications of difenoconazole at 8, 10 and 15 g/100 litres applied at 10-14 day spray intervals over the blossom period primarily against blossom blight (*Monilinia fructicola* (Wint.) Honey) gave excellent control of leaf curl. Difenoconazole treatments were superior to flusilazole applications and equivalent to captafol treatments. Difenoconazole at 10 g/100 litres will give optimum control of leaf curl and blossom blight in stonefruit.

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