

Efficacy of Alamo for prophylactic and therapeutic treatment of oak wilt in red oaks, 2004.

An experiment (prophylactic study) to determine the efficacy of Alamo in preventing spread of *C. fagacearum* through grafted roots of oak wilt-affected and of apparently healthy red oaks was initiated in eight locations in east-central and southeastern Minnesota in Jul 2002. Paired treatment plots were established in separate oak wilt centers within a larger forest stand of red oak species in each location. The soil types of the paired plots ranged from sand to sandy loam. In treated plots, all red oaks within root-grafting distance of any oak wilt-affected tree in the disease center were intravascularly injected below-grade on root flares with Alamo (20 ml per 2.5 cm stem diam breast height) using standard macroinfusion protocol. In control plots, all red oaks within root-grafting distance of oak wilt-affected trees were marked, but not treated. Evaluations of all study trees for wilt symptoms were made twice in 2003 (Jun or Jul and Aug or Sep), and once in 2004 (Aug). A second experiment (therapeutic study) to determine the therapeutic effects of Alamo on red oaks already exhibiting foliar wilt symptoms characteristic of infection by *C. fagacearum* was conducted in six locations in east-central Minnesota in Aug 2002, and in Jul and Aug 2003. The selected oak trees were infected by *C. fagacearum* presumably via root graft transmission from an adjacent, wilted red oak. Pairs of red oaks in one of three crown wilt categories were selected: 5 pr ($\leq 25\%$ wilt), 6 pr (26-50% wilt), and 5 pr (51-80% wilt). One oak tree in each pair was intravascularly injected with Alamo (20 ml per 2.5 cm stem diam breast height) using standard macroinfusion protocol. The other tree in each pair was marked, but not treated. Evaluations of study trees for extent of crown wilt after treatments were made one, two or three times during the treatment years and once in the year(s) following treatment. Disease severity data were analyzed using standard contingency table methods, with an accommodation for multiple comparisons. When the chi-squared statistic (likelihood ratio) was significant, subtables that excluded one treatment at a time were tested, until tables were found with entries that were not significantly different.

In the prophylactic study, a greater number of control trees (14 of 75) had wilted by August 2004 than the Alamo-treated trees (1 of 71) ($P < 0.01$) for all locations combined. In the therapeutic study, Alamo injection during the earliest wilt stage ($\leq 25\%$) was the only treatment that had a significant effect based on subsequent crown wilt ($P < 0.01$). Oak wilt progression was retarded during the treatment year for these trees, whereas the control trees died during the treatment year. Furthermore, none of the treated trees in the $\leq 25\%$ crown wilt category died before the end of the growing season in the year subsequent to treatment.

Treatment	Crown wilt Category (% wilt)	Trees (no.)	Trees (no.) exhibiting crown wilt level ^y			
			$\leq 25\%$	26 – 50%	51 – 95%	$> 95\%$
Alamo 20 ml ^z	≤ 25	5	1	2	2	0
Control.....	≤ 25	5	0	0	0	5
Alamo 20 ml.....	26 – 50	6	0	0	1	5
Control.....	26 – 50	6	0	0	0	6
Alamo 20 ml.....	51 – 80	5	0	0	0	5
Control.....	51 – 80	5	0	0	0	5

^zTreatment was significantly different from other treatments at $P < 0.005$ as determined by the likelihood ratio statistic.

^yFinal evaluations were made at the end of one or two growing seasons subsequent to treatment year.