LIVE OAK (*Quercus virginiana*)
Oak Wilt: *Ceratocystis fagacearum*

(332)

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EVALUATION OF PROPICONAZOLE APPLICATION METHODS FOR CONTROL OF OAK WILT IN TEXAS LIVE OAKS, 1995: Four fungicide application methods using the microencapsulated (blue) 14.3% EC formulation of propiconazole (Alamo), including a low-concentration high volume method, two high-concentration low volume microinjection methods, and a low-concentration intermediate volume soil drench method, were tested for effectiveness in controlling oak wilt in a mature natural stand of live oaks near Austin, Texas. Test trees were growing on a residential development site with a predominantly rocky, sandy clay-loam soil type. The field plots, established 27 Jul 93 along the expanding edge of a large oak wilt infection center, consisted of 18 subplots of 12-18 trees that received the fungicide treatments as well as nontreated and inoculated control treatments. Treatments were applied in a completely randomized design within each subplot, each containing 2-3 replications per treatment. Fungicide treatments were applied 23-27 Aug 1993, and included bole injections by: (1) High volume injection at 3 ml/l $H_2O$/6.4 cm dbh using a Turfco model 490 Injector pressurized with $CO_2$ and connected with tygon tubing to injection ports, (2) ARBORx microinjection at 6 ml/12 ml $H_2O$/5.1 cm dbh using experimental ARBORx microinjectors, and (3) Mauget microinjection at 6 ml/0 ml $H_2O$/5.1 cm dbh using Mauget microinjectors, all pressurized at 15 psi and applied through one injection port per 15.4 cm of tree circumference. The soil drench treatments with Alamo were applied at 3 ml/ 6.4 cm dbh in 2 L aliquots of $H_2O$ divided and distributed evenly around the dripline of each tree in small holes dug 5-10 cm deep at 3-5 m intervals, depending on crown size, and covered with soil. Inoculated control trees were cut with an axe into the sapwood on one side of the tree. The wound was filled with a 1-2 ml aliquot of a mixed mycelial-conidial inoculum suspension prepared from colonies of *Ceratocystis fagacearum* growing for one week on 0.5% Neopeptone-glucose broth. All other treatments were challenged by natural inoculum through root transmission from the adjacent expanding infection center. Crown ratings, branch mortality, canopy density, and defoliation were recorded 23 Jun 1995 as indications of disease severity and disease progress, two-years after fungicide treatments and one-year following control inoculations on 5 May 1994.

Symptoms of oak wilt began developing in nontreated controls 22 months following installation of treatments. Nontreated controls continued declining as inoculum from infected trees in the adjacent infection center began moving through root grafts and common root systems. Treatment effects on disease severity were highly significant ($P<0.0001$). Inoculated controls developed oak wilt symptoms much more rapidly with higher disease incidence and severity within a year after inoculation, indicating more effective disease development compared with natural inoculation through root transmission. Many inoculated trees appeared dead and had higher branch mortality and defoliation, although some trees still had small amounts of living foliage. Since branch mortality followed defoliation, this indicator of disease severity developed more slowly, requiring several years for branch death following defoliation. No phytotoxicity was observed with any treatment. All four Alamo application methods provided significant protection to live oaks against the oak wilt pathogen at 2 years post-treatment. However, a longer observation period will be required to determine the long-term protection provided by these control methods.

| Treatment, formulation, application rate and method[2] | n | Disease Severity[1] | | | |
|---|---|---|---|---|---|
| | | Crown Symptom Rating[3] | Branch Mortality (%) | Canopy Density (% light transm.) | Defoliation (%) |
| Alamo 14%EC, 3 ml/L $H_2O$/6.4 cm dbh, . . High volume | 37 | 4.00 a | 0.89 b | 13.22 c | 1.30 c |
| Alamo 14%EC, 6 ml/12 ml $H_2O$/5.1 cm dbh, ARBORx microinjection | 37 | 4.00 a | 0.92 b | 14.53 bc | 0.41 c |
| Alamo 14%EC, 6 ml/ 0 ml $H_2O$/5.1 cm dbh, Mauget microinjection | 35 | 4.00 a | 0.94 b | 10.81 c | 0.43 c |
| Alamo 14%EC, 3 ml/6.4 cm dbh in 2L $H_2O$, Soil drench at dripline | 37 | 4.00 a | 2.46 b | 12.18 c | 2.70 bc |
| Nontreated Control . . . . . | 64 | 3.63 b | 3.50 b | 21.36 b | 12.73 b |
| Inoculated Control . . . . . | 58 | 2.36 c | 29.99 a | 37.99 a | 49.72 a |

[1] Percentage values were arcsin transformed prior to analysis, although values represent actual percentages. Means in each column followed by the same letter were not significantly different according to protected LSD tests ($P=0.05$).

[2] Injections of fungicide were done through polyethylene ports inserted into holes drilled into root flares at 15.4 cm intervals around the circumference of each tree.

[3] Crown symptom rating scale: 1 = crown dead, totally defoliated, or with only necrotic attached leaves, 2 = thinning crown with leaves having diagnostic oak wilt symptoms, including veinal chlorosis or veinal necrosis, 3 = crowns containing foliage with chlorosis or reduced leaf size, but lacking diagnostic symptoms of oak wilt, and 4 = full, healthy crown with no apparent foliar symptoms.