EFFICACY OF TRUNK MICROINJECTION TO CONTROL ELM ANTHRACNOSE IN CHINESE ELM(Ulmus parvifolia)

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INTRODUCTION AND BACKGROUND

Anthracnose diseases affect a wide variety of trees and shrubs which include; ash, cottonwood, elm, oak, maple, sycamore, black walnut, other trees are susceptible as well.

Elm anthracnose also known as “Black Spot of Elms” is one of a group of foliage diseases of deciduous hardwood trees caused by fungi known as anthracnose diseases. These diseases often attack buds, shoot and twigs of host trees as well as the foliage. In some cases, the twig blight symptoms can involve cankers that girdle branches and even the main trunk. Anthracnose fungi produce spores in fruit bodies on host tissues. Fruit bodies on twigs and at canker margins remain on the host tree and are a source of re-infection. Infection levels are enhanced by wet conditions. Control of anthracnose diseases are difficult and infections can occur year-round on evergreen species, such as Chinese elm (Ulmus parvifolia).

Anthracnose fungi occur primarily on leaves and twigs . On deciduous trees the fungi over winter in infected twigs. In spring many microscopic spores are commonly produced and spread by splashing rain or sprinkler water along with other methods, to new growth where they germinate; the fungus enters the leaves and newly expanded twigs. If moist conditions prevail, a successive generation of spores is produced in the infected parts of new leaves.
On evergreen species such as Chinese elm, the fungus can occur year-round on leaves and twigs.
Susceptible elms include American, Chinese, Dutch, Scotch are susceptible to anthracnose wherever these trees grow.

The Causal agent associated with Elm anthracnose is Stegophora(syn. Gnomonia sp.) ulmea,.
Symptoms include; Leaves and twigs with black spot begin with small, white to gray to yellow irregular spots which later become “tar like” black spots. Leaves may turn yellow and exhibit premature defoliation
Fruit bodies on twigs and at canker margins remain on the host tree and are a source of re-infection. Infection levels are enhanced by wet conditions. Control of anthracnose diseases are difficult since infections can occur year-round on evergreen species, such as Chinese elm(U. parvifolia).

Chinese elm is also susceptible to anthracnose on the west coast of the U.S. and anyplace, where this tree species grows as an evergreen. Chinese elm anthracnose, caused by the fungus Stegophora(syn. Gnomonia sp.) ulmea,.
is especially severe in areas near the coastline or under influence of coastal weather. The value in a landscape plantings of Chinese elms, which are frequently planted, are compromised when they become severely infected with anthracnose fungi. The objective of this study was to determine if the use of injection of systemic fungicides could suppress disease development of the elm anthracnose disease in susceptible plantings of elm in southern California.

METHODOLOGY

1. Study Locations- The following two sites with plantings of Chinese elm trees were selected:
(1) a parking lot planting in Clairmont Mesa, CA and a roadside planting in a suburban community in Otay Mesa, CA. Chinese elms at Clairmont Mesa were chronically infected with the anthracnose disease and exhibited large elongate branch cankers, while trees at Otay Mesa had only been diagnosed to have elm anthracnose fungi and only exhibited foliar symptoms of this disease.
2. Plant Material – Chinese elm (U. paravifolia) trees transplanted from local nurseries were used in both study locations. The trees ranged from 10 to 20cm in diameter at 1.4m aboveground (dbh) and were 6 to 8 m tall.
3. Experimental Design –
   a. Clairmont Mesa Site – The following microinjection treatments were applied: tebuconizole 12%, tebuconizole 14%, tebuconizole 16%, Fungisol, ArborFos, Vigor 53 (AKA PhosGard, a fungicide product of J.H. Bioteck), and control-no injection. Each treatment was replicated on at least 3 trees.
   b. Otay Mesa Site – The following microinjection treatments were applied: tebuconizole 12%, tebuconizole 14%, tebuconizole 16%, Fungisol, ArborFos, Vigor 53 (AKA PhosGard, a fungicide product of J.H. Bioteck), and control-no injection. Each treatment was replicated on at least 6 trees.

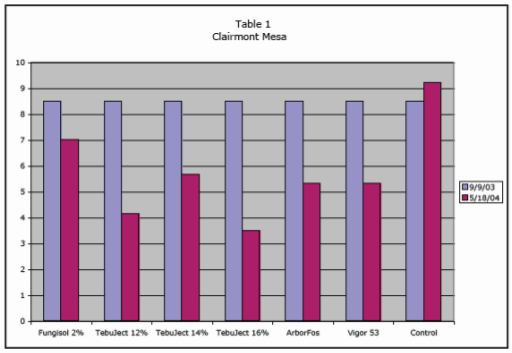
4. Trunk Injection Protocols – Micoinjection procedures were performed according to guidelines of the J. J. Mauget Company of Arcadia. CA, using a battery-powered drill with a 11/64 inch (4.3 mm) drill bit. Injection units were placed at the base of each tree on the root flare using diameter/2 to determine dosage in capsules. Injection were performed on 9/9/03 at Otay Mesa and at Clairmont Mesa.

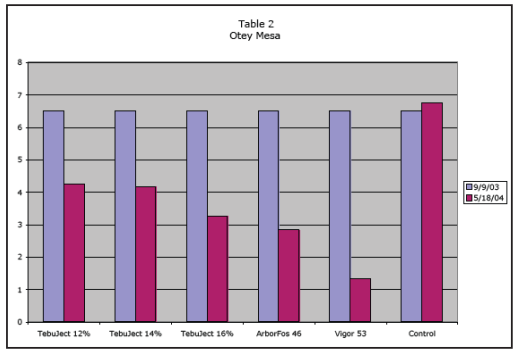
5. Anthracnose Disease Evaluation Ratings – A disease severity index rating as follows: 1- Healthy to 10 dead, was made on the crown of each tree at both sites at the beginning of the study, before treatments were applied on 9/9/03, and on 5/18/04. The change in disease rating for each tree during this period was then calculated.

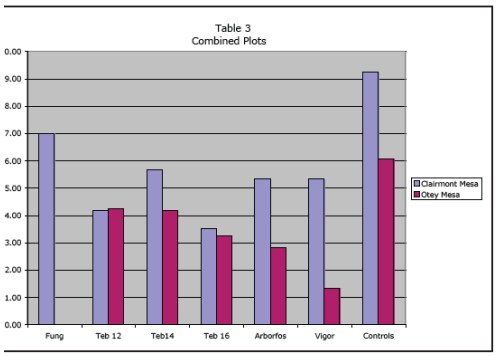
6 .Data Analysis – Disease rating changes from both sites were placed on an Excel spread sheet and analyzed for significance using a Studentized Range test.

RESULTS

At Clairmont Mesa, all of the injection treatments except Fungisol resulted in significantly improved health condition ratings compared to the uninjected control trees during the period of this study (Table 1). At Otay Mesa, the Vigor 53, Arborfos and Tebuconizole 16% treatments resulted in significantly improved health condition ratings than the control treatment(Table 2). The results of the two studies were combined in Table 3.







DISCUSSION

The results of these experiments indicate that trunk-injected tebuconizole at either 12, 14 or 16 % active ingredient, and the phosphorus formulations of Vigor 53 and Arborfos were able to significantly suppress development of the elm anthracnose disease symptoms in Chinese elm. One explanation for higher suppression in the Otay Mesa, CA location using Vigor 53 may be associated with the amount of irrigation received by those study trees. They were located in well irrigated lawn sidwalk medians and slopes with lawn irrigation the source of higher levels of soil moisture then the other study site. In locations where elm anthracnose is a serious health threat to evergreen Chinese elms, trunk injection of tebuconizole or a phosphorous formulation, such as Vigor 53, may be considered as a clinical measure to protect valuable landscape elms. The data suggests that 16% tebuconizole would be the most effective dose level for elm anthracnose control Results of these studies may also be applicable to other anthracnose diseases of hardwood trees, such as those on ash, oak and sycamore, since these anthracnose diseases have a similar etiology to elm anthracnose.

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