

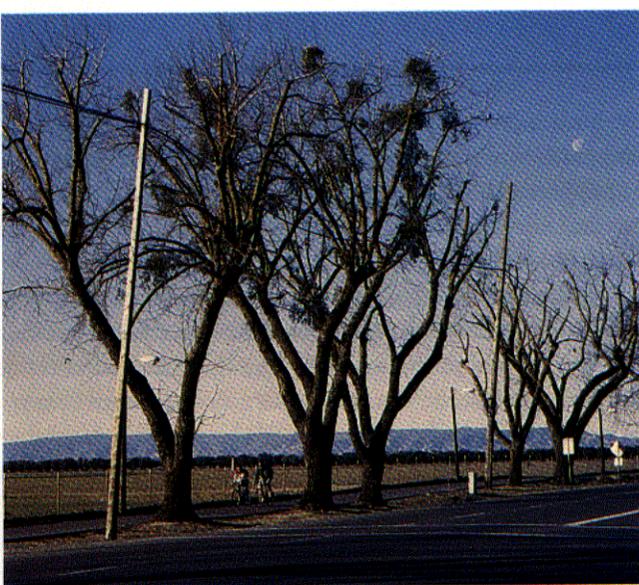
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## New Methods for Mistletoe Control

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Infestation of landscape trees with any of a variety of mistletoe species is a worldwide problem in ornamental horticulture. These destructive plant parasites are serious pests of mature landscape, fruit and forest tree species, and may lead to the death of the host tree. Leafy mistletoes in the genus *Phoradendron* are hemiparasitic plants that infect many species of landscape trees in large portions of the United States where mild winters permit their survival. In California, a broad range of native and planted landscape trees are susceptible hosts, including oak, ash, walnut, birch, poplar, alder, and honeylocust. Damage caused by mistletoe includes branch dieback and reduction in tree vigor, which may be contributing factors in tree decline.

Current control measures include removing infected host branches, or pruning mistletoe clusters off host branches and wrapping those branches with black plastic, tar paper or aluminum foil. Until recently, application of



**Pruning host branches as a control measure for leafy mistletoe often leads to unsightly appearance and potentially hazardous branch growth, as in this black walnut near a parking lot. Despite repeated pruning, the mistletoe has regrown.**

2,4-D to the cut stubs of mistletoe was also recommended for mistletoe control. While these methods are effective, they are time-consuming, expensive, unsightly, and potentially damaging to host trees. If control measures are incomplete, extensive regrowth of the mistletoe parasite can occur within only a few years. The city of Sacramento spent \$1.4 million for mistletoe control and some remedial treatment in 1978-79, and now Sacramento spends approximately \$350,000 annually.

A low-cost, non-toxic means of eradicating mistletoe from deciduous landscape trees would be of considerable value to public agencies and other horticultural professionals. Ethephon, an ethylene-generating compound, is a relatively non-toxic plant-growth regulator that has shown promise for mistletoe control. We learned from preliminary experiments done on Moraine ash by Joyce, et al. in 1987, that spray application of ethephon (2 percent) caused complete abscission of mistletoe plant parts without damage to the host. The mistletoe showed no evidence of regrowth after one year.

The first objective of our research program was to carry out a thorough evaluation of ethephon treatment methods to achieve effective control of mistletoe infestation after it has become established in the host tree. From 1988 to 1990, we assessed the effectiveness of different methods of application, timing of application, concentration of active ingredient, and incorporation of surfactants into the ethephon solution, and in those studies we com-

pared results on different host trees. In addition, we tested alternative control methods, including glyphosate application, and pruning paint spray.

Our second objective addressed the possibility of preventing infestation at the stage of parasite seedling germination and establishment on the host. Mistletoe control measures developed to prevent initial infection may ultimately prove the most useful. In 1991, we devised a convenient, easily manipulated host/mistletoe experimental system which has enabled us to carry out replicated experiments to study interactions between parasite and host.

### **Mistletoe Control With Ethephon**

To determine the optimal method of applying ethephon, we tested spray application to mistletoe clusters, spray application to cut mistletoe stubs, and several branch injection techniques, using both high and low pressure injection. Dormant spray application to clusters at 2-percent active ingredient gave excellent control, provided the treatment was done within the seasonal window of application. Pruning to a stub and treating with 10-percent ethephon gave consistently excellent control of mistletoe regrowth over a range of treatment dates. None of the branch or trunk injection treatments, however, consistently resulted in mistletoe abscission.

### **Ethephon Treatment of Mistletoe Stubs**

Mistletoe clusters of two species (*Phoradendron macrophyllum* and *P. villosum*) on three host trees (Modesto ash, honeylocust, and blue oak) were selected for treatment. Mistletoe clusters were pruned to stubs and sprayed to runoff with various concentrations of ethephon. Other control clusters were pruned and left unsprayed, while in one experiment some stubs and the surrounding area were either wrapped with black plastic or sprayed with an aerosol black pruning paint. Ethephon (at 10-percent active ingredient) gave nearly complete control of mistletoe. After one year, none of the ethephon-treated clusters had regrown, while 40-to-100 percent of untreated stubs had regrown. Observations of two experiments during the second growing season following treatment revealed that 6-to-8 percent of the treated clusters had regrown compared to 20-to-73 percent of untreated clusters.

Additional experiments were carried out on pruned mistletoe stubs to test other types of treatment. Black plastic wrapping (a method currently in use) and black pruning paint spray (a method we devised using the as-



