Landscape Management
The preferred resource for large contractors

Ornamentals

Fight tree killers

1 Aug, 2002
By: Terry Tattar, PH.D.
Landscape Management

Microinjection becoming weapon of choice against invaders threatening our shade and forest trees

The accidental introduction of China's Asian longhorned beetle (ALB) into New York City and Chicago poses a serious threat to both shade and forest trees of the United States. Government officials responded quickly by destroying thousands of infested and suspect shade trees in the two cities, but another strategy to eradicate and contain ALB was needed.

Feds get into the action

Scientists from government agencies such as the USDA Animal and Plant Health Service (APHIS) and the USDA Forest Service initiated an extensive research program. These studies indicated that microinjection of the systemic insecticide imidacloprid should be part of the ALB eradication program. The USDA-sponsored microinjection program was launched three years ago in Chicago. In 2001, it expanded to include the New York City area, and by spring 2002, over 120,000 trees were injected with the systemic insecticide Imicide in microinjection capsules. Under the USDA's direction, over 200,000 trees have been injected with Imicide to date.

The pests keep coming

The war against ALB is far from over. Also, there are other exotic pests that pose serious threats to trees, and microinjection is being used as part of the control efforts.

For example, infestations of the hemlock woolly adelgid in the Northeast and the red gum lerp psyllid on the West Coast are being controlled by microinjection of systemic insecticides. Other systemic chemicals can be microinjected into trees as well, such as antibiotics, fungicides, insecticides, mineral nutrients and plant growth regulators.

The idea of tree injection isn't new. The first reports of the introduction of materials into trees date to the 12th century. In the 15th century, Leonardo DaVinci reportedly injected poisons into fruit trees to discourage theft of the fruit.

Trunk injections and implants have become a popular alternative to spray applications.

Materials in liquids can be injected into the woody tissues, or xylem, of trees because the pressure within the xylem is below that of atmospheric pressure outside of the tree. Under this condition of negative pressure, liquids introduced into healthy xylem through a fresh injection wound will be taken into the xylem and distributed within the tree in the sap stream. It has been suggested that since the xylem of the tree accepts the liquids based on its porosity, the term infusion is more appropriate than injection when describing the movement of systemic liquids into trees.

Here's how it's done

Microinjection is a type of trunk injection where small amounts (approximately 0.1 oz.) of therapeutic chemicals, contained in sealed capsules, are introduced into shallow trunk wounds around a tree's base. The injected chemicals are then distributed systemically by sap movement within the tree to the branches, leaves and even roots within a few hours after injection.

High pressures to attempt to "force" liquids into the tree aren't needed with microinjection. High-pressure injection of any volume of liquid often damages tree tissues, especially in the bark/cambial zone, and doesn't place most of the injected materials into the outer xylem where most systemic transport occurs. Low pressures sufficient to empty the injection reservoir are most effective for transport and cause the least impact on the tree.

A breakthrough in injection technology occurred in the 1960s when the systemic insecticide Bidrin, in microinjection capsules, was injected into trees and shown to control a variety of chewing and sucking insect pests. It was then clear that it wasn't necessary for large volumes of materials to be injected into a tree to control a tree health problem. Research on Bidrin demonstrated that a small volume of a concentrated systemic chemical in a microinjection capsule could provide effective tree health care.

Combine treatments?

Since that time, the focus of microinjection research has been on developing systemic formulations of antibiotics, insecticides, fungicides and mineral nutrients that are effective in low volumes.

Considerable research has gone into studies of the most effective injection techniques to maximize uptake and distribution and to minimize injury to the tree. Recently, combinations of an insecticide and a fungicide in a single capsule have been developed to allow microinjection treatment of both insect and disease problems with a single injection. In the past year, plant growth regulators that can eliminate or reduce nuisance fruit production have been developed for microinjection application.

Today, microinjection is both an evolving, research-based technology and a clinical tool for the tree health care practitioner. Research on microinjection is continuing both at major research universities and at government research facilities. A key goal for microinjection's future is to determine the potential systemic uses for new tree health care chemicals which are being produced and registered each year.

Microinjection allows the introduction of systemic chemicals directly into a tree without any contact with the environment. Microinjections, together with macroinjections and implants, are one of the most commonly used methods to introduce systemic chemicals directly into the vascular system of trees.

<!--pagebreak-->

Forget spraying here

Trunk injections and implants have become an increasingly popular clinical alternative to spray applications in the control of urban tree health problems, in part because they're efficient delivery systems that can be performed under most weather conditions. Systemic materials placed into the tree are rapidly available, and there is no environmental contact with pesticides.

Spraying large shade trees in urban areas requires specialized, expensive equipment and has a negative public image. It also may not be a tree health care option if a hospital, nursing home, school, pond, stream or river is near your clients. In addition, if your clients or their neighbors have concerns about their pets or local wildlife, or they have chemical sensitivities to pesticides, spraying trees would also not be recommended.

Systemic chemicals may also be applied by soil injection. However, soil injections can damage roots and make injured roots susceptible to the invasion of root pathogens. Systemic chemicals injected into the soil may also impact beneficial soil microorganisms. In addition, increasing concerns about groundwater contamination have limited the use of soil injections in many areas. In Long Island, NY, for example, soil injection of pesticides is banned in many communities.

Microinjection is most effective if applied by trained applicators who have correctly diagnosed a tree health problem. An incorrect diagnosis will likely result in the use of an ineffective material, and improper application can be harmful to the tree.

Don't forget training

Companies that sell injection and implant products usually provide training prior to the use of their products, in part because microinjection has to be applied in strict adherence to the guidelines of the manufacturers. Attendance at a microinjection training workshop should be the first step for any potential user of microinjection technology. The J.J. Mauget Company, for example, regularly conducts one-day training workshops about the correct use of their microinjection products.

The landscape professional who maintains trees on clients' properties must be concerned with both the efficacy of and cost-effectiveness of any treatments that are used.
