# Fertilizing woody landscape plants

**Proper technique and fertilizer selection are parts of PHC over which arborists have more control than any other service except tree pruning and surgery.**

by Trevor F. Vidic
The Davey Tree Expert Co.

■ Maintaining woody plants in artificial ecosystems such as landscapes is a manipulative science.

Landscape soil usually does not contain the natural nutrients that are found in most wild plant communities. Arborists can use fertilizers to replace these essential elements, which plants need for optimum growth.

Providing nutrients for plants' roots and surrounding soil is probably the most important Plant Health Care (PHC) treatment arborists provide. The Davey Tree Expert Co. and the International Society of Arboriculture are among the industry organizations that endorse and employ PHC. Its strategy focuses on maintaining healthy, vital plants to enhance plants' natural defense systems, minimizing pesticide use.

The best way to promote plant health is proper site and plant selection, planting techniques and cultural maintenance. The right tree in the right soil with a good mulch, watering and fertilization program will function and grow with minimum pest problems.

The ISA notes that woody plant fertilization can increase growth, reduce pest susceptibility, and sometimes help reverse declining health. Fertilizer misuse, however, may not benefit woody plants at all, and in some cases it actually damages them.

Large, over-mature trees may not need fertilization, for example, and over-application of soluble nitrogen may trigger unnecessary growth that is susceptible to insect and disease attack. Over-fertilized trees often need more pruning at shorter intervals to control or direct vigorous growth that the plant's root system may not be able to sustain. High salt, high nitrogen tree fertilizers also can induce plasmolysis (water loss from root cells) and decrease mycorrhizal populations, the association between roots and certain fungi that improves absorption.

**Why nutrients?**—Good fertilizers and application technique, while promoting the growth plants need to survive, should also provide nutrients that are necessary for the plant to maintain its structure and function.

All organisms require at least 16 essential elements. Of the 16, bonded carbon, hydrogen and oxygen are the energy-yielding carbohydrates or "tree food" derived from photosynthesis. The other 13 elements are absorbed from the soil as cations and anions.

A fertilizer itself in the soil is not a nutrient. Instead, it is a group of essential elements that will be used as nutrients through the interaction of the plant and soil. Fertilizing a tree is not the same as "energizing" a tree; fertilization simply provides some of the essential elements to the soil that the tree takes in for its own energy system.

An important aspect of woody plant fertilization is the method used to deliver essential elements to the root system. According to Dr. Roger Funk of the Davey Institute, the most limiting factor in fertilizer uptake is water availability. The ISA has studies on mature trees that demonstrate optimal response to fertilization in areas with relatively high soil moisture levels.

**The entire area within, to several feet beyond, the drip line should be fertilized.** *(Photo courtesy Davey Tree Expert Co.)*

In addition to water, application frequency depends on type of material used, the soil profile, plant species and periods of root growth. With these variables taken into account—balanced by the economic realities of arborists being able to apply an appropriate material in a wide range of soil environments and climates during growing and dormant seasons—Dr. Funk developed a complete, slow-release, low-salt fertilizer that is applied with the liquid injection method.

**Liquid injection**—Of the five general

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application methods (broadcast, drill hole, liquid soil inject, foliar, implants), liquid injection with slow-release fertilizer provides good distribution of material to the rootzone with adequate water included. The fertilizer, suspended in water, is injected using a soil needle or lance attached to a hydraulic sprayer unit.

You should keep several measurements in mind when using liquid injection to ensure uniform and consistent distribution:

**1)** the release rate of the fertilizer material;

**2)** spacing of the injection holes in the soil;

**3)** the amount of liquid injected per hole; and

**4)** the depth of the needle tip in the hole.

Most contemporary arboriculture texts say that the ideal root system of an "average" tree runs anywhere from 3 to 12 inches below the soil surface out to two or three times the canopy radius beyond the trunk on well-established trees.

The entire area within, to several feet beyond, the drip line should be fertilized. Injection holes should be spaced at about 3-foot intervals in a grid pattern.

Davey uses Arbor-Green 30-10-7 at a rate of 6 lbs./1000 sq. ft. of rootzone (in accordance with 1988 National Arborist Association standards) with one application. The hydraulic sprayer is maintained at 150 to 200 psi to force fertilizer elements laterally through the soil. Hole depth is generally 8 to 12 inches, and material is injected just as the tip enters the ground, down to maximum depth and as the tip is withdrawn, shutting the flow off before the tip clears the hole.

Davey's needle tip is a replaceable four-holed point that ejects the pressure fluid in an X pattern that further ensures consistent, even distribution per injection hole through almost the entire absorbing root profile in the soil.

These steps help ensure that landscape woody plants receive the nutrients they need to remain healthy.

*—The author is technical advisor for the Davey Institute, the research and development arm of the Davey Tree Expert Co., Kent, Ohio.*

# Subsurface applications grow in SE

**Contractors developing market for 'slit' and 'injection' mole cricket control in Dixie; efficacy against white grubs still uncertain in the North.**

■ For a turf insecticide to be effective, it must contact the insect. Often only a small amount ever does—particularly products aimed at soil-inhabiting pests. This is true even after irrigation moves enough insecticide to the target area to solve an insect problem.

That's why researchers continue to investigate putting pesticides just below the soil surface, primarily for mole crickets in the South and white grubs in the North.

Equipment that either slices the soil and drops granules into the slits, or that injects liquids under high pressure through the turfgrass canopy, is receiving the most attention.

The concept isn't entirely new. But it's been within the last 10 years that entomologists like Auburn's Dr. Pat Cobb have been testing subsurface application against turfgrass insect pests in the United States. Dr. Pat Vittum at Massachusetts and Dr. Rick Brandenburg at North Carolina State (and probably others) continue subsurface work on turf plots in 1993. They're evaluating both equipment and insecticides.

Research so far strongly suggests that the target placement of pesticides:

- reduces the amount of pesticide needed to control the insect pest, with obvious savings in time and money.
- reduces the exposure of insecticides to applicator, bystander and wildlife since the material is being placed below the turfgrass canopy.
- reduces the potential for chemical drift or runoff.

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*—Bob Wicker*

**Misleading term**—Robert Wicker is one of a growing number of contract applicators in the Southeast who use "slit application" for mole cricket control, mostly on bermudagrass golf course fairways, but also on athletic fields.

"To describe what we do as subsurface placement or incorporation is probably misleading. We don't actually till the soil or incorporate the pesticide into the soil," says Wicker, Environmental Turf Control, Inc., Jacksonville, Fla.

Wicker started experimenting with slit applications about four years ago. He is now working with Canaan Industries, Inc., Dothan, Ala., on its granular applicator/overseeder.

"It was apparent from the outset that the concept was solid, that if you incorporated these pesticides on close centers, you could reduce the rate because you are slicing them in," says Wicker. His company treated 3,500 to 4,000 acres of turf last year, most of it using Mocap 10G insecticide. The slit applications provide excellent mole cricket control using 50 to 75 percent of the label rate, he says.

Best results occur when the material is deposited in slits 1/2 to 1 inch deep. "In essence, we wedge the soil open and it closes right behind us," says Wicker.

The unit his company uses is pulled by a tractor. It's sizable. It treats a swath 84 inches wide, much too large for home lawns.

In fact, designing a subsurface unit small and maneuverable enough for home lawns is a tall order. "The lawn care industry wants to treat 1,000 square feet a minute and the subsurface equipment can't do that. A lot of the industry would have to change its thinking," says one industry insider.

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**The market for custom chemical applications will grow, but only if the equipment and chemical manufacturers cooperate to match specific equipment designs with specific pesticides and formulations.**

**New technology**—Several equipment companies, however, are testing walk-behind subsurface prototypes. They know the units they bring to market will have to be easy to transport, simple to operate and cover lots of ground fast.

"I think we get a call a month from equipment manufacturers about subsurface applications," says Mike Shaw, pesticide product development manager at DowElanco. That company's Dursban insecticide now includes label directions for sub-surface mole crickets. Shaw believes the market for custom chemical applications will grow, but only to the extent that equipment and chemical manufacturers cooperate to match specific equipment designs with specific pesticides and formulations. So far, industry has focused on retrofitting equipment that was orginally designed for other purposes.

But, that has an up side too. Ken Lewis of the Rhone Poulenc Ag Company says equipment that can be used for several different tasks such as for slit applications *and* overseeding is more versatile and, therefore, may be more afforable for turfgrass managers.

**More work needed**—"The dispensing and metering mechanisms of this equipment are undergoing the greatest amount of development," says Lewis, who is a senior field research and development representative and does subsurface research for RP.

Another area where industry might have some work to do before subsurface applications become more commonplace is regulatory.

For example, this spring Ciba's Triumph insecticide label was finally amended to allow it to be applied with non-conventional equipment under the 24C state "local need" exemptions.

"In other words, there's nothing on our federal label that would keep us from going to the various states and asking for a 24C if we choose to re-open that door," says Dr. Douglas Houseworth, Ciba's manager of technical support. Injecting the insecticide on test plots several years ago gave excellent white grub control at less than label rates, he points out.

**Bob Wicker says the colter/spring arrangement won't damage sprinkler heads during application.**

**While some insecticides are already labeled for slit applications for mole crickets, others apparently still need label revisions to allow subsurface applications. Turfgrass managers, of course, must follow label directions.**

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**The future**—The continuing spread of mole crickets throughout the Southeast—from coastal North Carolina to Texas—will likely drive interest in slit or injection applications, believe many Sunbelt turfgrass managers. Many golf courses there have the budget to contract for this service, or to buy their own units.

"My concern is that it's so easy with this technology to treat areas that don't need treating, making applications wall to wall rather than mapping," says Dr. Pat Cobb.

The use of slit or injector technology for grub control in the North is still being evaluated with cautious enthusiasm.

"We're making progress, but there are still some questions that must be addressed," says Massachusett's Vittum, who is putting out several test plots for grubs again in 1993.

*—Ron Hall*

## *For more information:*

- Canaan Industries, Inc., P.O. Box 8097, Dothan, AL 36304. (800) 633-7560.
- Cross Equipment Company, 1401 Radium Springs Road, Albany, GA 31705. (912) 435-1781.
- Dol Brothers Ltd., R.R. 4, Cookstown, Ontario LOL 1LO. (705) 458-4353.
- Gandy Company, 528 Gandrud Rd., Owatonna, MN 55060. (507) 451-2857.
- Cushman Inc., A Ransomes Co., 7027 Cushman, P.O. Box 82409, Lincoln, NE 68501. (402) 475-9581