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The Myth of Vitamin Shots

"Fertilizer injection is the most effective way to correct tree nutrient deficiencies"

The Myth

One of the more interesting members of the landscape management community is the medical professional. Advertisements show white-coated technicians with the latest injection equipment for delivering doses of fertilizers and fungicides to ailing plant patients. The memory of the family doctor who would make house calls is embodied in these plant health care professionals and we feel we are providing the best possible care for our shrubs and trees.

A great deal of scientific literature has been dedicated to this practice as well. Leaf chlorosis (yellowing) tends to be the primary signal to landscape managers that fertilizer application is required. Trunk- and soil-injection of fertilizer has been performed on a number of tree species, generally those with landscape amenity or fruit and nut production value. In addition to injection of complete fertilizers, specific nutrients such as iron, zinc, and magnesium are also delivered in this way. Proponents of injection fertilization, especially trunk injection, point to the immediate improvement in leaf color and the relatively low cost of application.

The Reality

This is another practice that falls into the "immediate results" category of landscape management. Indeed, trunk injection of nutrients can have an immediate impact on leaf color, but what is routinely missing in published reports and papers is the long-term effect of the practice on leaf color and tree health. Indeed, when studies are carried through for a number of seasons, invariably the authors will report that leaf color of the injected trees is no different from that of the control trees. This is not a practice with sustainable benefits.

Injecting plants with various substances has fascinated humans for many centuries. Both fertilization practices of tree injection and soil injection have been studied for decades and have been recently reviewed in the scientific literature. It is apparent in these reviews that there are no long-term benefits to trunk injection of fertilizer. Though it can have immediate effects in terms of leaf color change, this practice breaches the tree's bark barrier and leads to numerous health problems. Injection sites are portals for pathogens and pests; they can cause trunk splitting, decay, cankers, and structural defects; and they are especially dangerous to trees already in poor condition. Furthermore, trees injected with fertilizer have been found to become more susceptible to insect pests, presumably because their leaf nitrogen content increases.

Oddly enough, this practice has been repudiated several times throughout the 20th century by agricultural and silvicultural researchers. Unfortunately, it continues to be widely recommended and practiced since it "makes sense" to people who assume that medical and veterinary models extend to the care of plants. Though the value of vaccines and other medical injection procedures for animals (including humans) are clear and documented, it is not a practice that translates to plant species, whose normal physiological functions and biochemical resistance strategies are still poorly understood.

What about soil injection? There are several papers and a few scientific reviews on soil injection of fertilizers, though not nearly as many as on trunk injection. Briefly, researchers have studied application

of nutrients such as nitrogen, potassium, and iron to various landscape and crop trees. Though not an invasive technique like trunk injection, this procedure does not significantly improve delivery of fertilizer to tree roots. In fact, a review in 2002 concluded that "surface applications were as effective as soil injection or drilling". This appears to be a practice that generally is not warranted and adds excessive costs to a landscape.

Finally, we landscape managers need to be more aware of mitigating factors that affect leaf color and overall tree health. Poor soil conditions, including compaction and waterlogging, lack of adequate irrigation and mulch, opportunistic pests and pathogens, weeds, and urban stresses can all contribute to tree decline. Yellowing leaves do not necessarily mean that fertilizer is necessary; they are often a sign of other plant stresses that no amount of fertilizer will correct. A proactive approach to mineral nutrition of trees, especially in obtaining soil and leaf tissue analyses, is more economically and environmentally sustainable than the "quick fix."

The Bottom Line

- Leaf yellowing and other foliage symptoms are not direct indicators of soil nutrient levels
- Before any fertilizer program is initiated, a complete soil analysis should be performed
- Leaf tissue analysis should be performed before initiating any specialized fertilization program
- Fertilizer will not cure nutritional deficiencies caused by disease, pests, air pollution, mineral toxicity, drought, poor root health, or poor soil health
- Trunk injection is harmful to the long-term health of the tree and should not be used for delivering fertilizers
- Soil injection is no more effective at delivering fertilizer than broadcast application and is not cost-effective
- Woody plants growing in competition with turf will always suffer more nutrient stress than those trees and shrubs partially protected by mulch
- Any fertilizer program that does not include weed management is ineffective and costly

For more information, please visit Dr. Chalker-Scott's web page at http://www.theinformedgardener.com.