Cooperative Extension University of California Ventura County

Landscape Notes

By James Downer, Farm Advisor

669 County Square DR., #100, Ventura, CA 93003-5401 – Phone (805) 645-1451
Vol. 20 No. 3 Now Available in Color at http://ceventura.ucdavis.edu October 2007

Let the wet begin

January brings its typical wet weather. Although we have been in a drought these last two years, it looks like despite the prediction of la Nina or dry conditions, this is shaping up to be a wet winter in Southern California. As I write this newsletter, it is predicted that we will receive up to 15 inches of rain along the foothills of parts of the central coast of California. This is more rain than in both of the last two rain years combined set to arrive in the space of five days. The ground is already soaked from the last few storms and so these rains will rapidly lead to flooding and saturated soil conditions. Similar rains occurred back in 1997. When soils become temporarily saturated, the effects can be devastating for woody plants. Anoxia or hypoxia is the condition of no or low soil oxygen content. Oxygen deprivation for periods of days can kill roots and lead to the evolution of symptoms in the leaves. In Ventura County, we observed the effects of this on citrus planted to low areas in heavy textured soils.

Roots require oxygen for respiration and the energy reactions that lead to water and nutrient uptake. Insufficient supplies or unavailable oxygen slows the functioning of roots. If low oxygen conditions (hypoxia) persist, root function and respiration is stopped, nutrient and water uptake decline or cease and photosynthesis is eventually slowed or stopped. Eventually, symptoms begin to show. Wilt, yellowing, chlorosis or other nutritional symptoms occur on older leaves. Often remaining foliage will color up or reddening even though cold weather is not present. The effects can worsen to leaf drop, complete defoliation and death.

Yellowing is a common Symptom of hypoxia and poor root functioning

Soils that are flooded with excess water may drive plants into acute oxygen deficit and depending on their own susceptibility; they may develop some or all of the above symptoms. For a list of plants sensitive and resistant to hypoxia see Costello and others, 2003. If flooding conditions continue for weeks or months, chronic hypoxia or anoxia/anaerobic soil conditions may result. This very low oxygen content in the soil leads to 'reducing' chemical conditions where metals, sulfur and nitrogen change their oxidation states. This results in a change in soil color (to blue-black) and the smell of rotten eggs. Roots cannot survive in this environment and all but the most adapted plants will start to show symptoms. Although oxygen is able to dissolve in water, its diffusion through water is about 10,000 times slower than through air. Thus, most plants will languish in flooded soils.

Oxygen deprived soils are common in most landscapes from both natural and man made processes such as compaction, over irrigation or over application of water. This may in part explain the common occurrence of root rotting pathogens in landscapes because they are stimulated by these

conditions. Roots that are in mild hypoxic conditions become "leaky" and provide the chemical attractant to root rot pathogens that produce swimming spores (zoospores). The flooded conditions are also favorable for the life histories of these organisms which tend to propagate rapidly. Once plants become infected with root rot organisms, biotic disease can continue the symptoms even after the flooding conditions disappear. .

Flooding conditions lead to hypoxia and disease predisposition

What can be done to alleviate the symptoms of hypoxia from plants? Well, draining the swamp would help, although it is difficult to put in drainage systems in flooded soils. Like many problems, prevention is the best cure. Designing landscapes with drainage is the first step. A realization that aeration deficits are predisposing to Oomycete root rots are important because the detection and treatment of root rot pathogens is quite feasible and recommended after flooding events. Since most *Phytophthora* spp. are common in landscapes, it is important to diagnose their occurrence. Once detected, fungicides can be applied to limit their progression in landscapes.

The stormy weather we are having now reminds me that aeration deficits may be a problem for landscape plants in the near future. However, it is important to remember that it does not take a storm to cause these conditions. The same situation can be created with irrigation water and a poorly adjusted valve controller. Unfortunately, this is all too common in Southern California despite the increasing cost of water. So, its time to turn off the irrigation systems or alter the valve controllers to reflect the fact that it is raining now. We don't need to add to the flooding by applying more water

Reference

Costello, L.R., E.J. Perry, N.P. Matheny, J. M. Henry, and P.M. Geisel. 2003. Abioti Disorders of landscape Plants: A diagnostic guide. ANR publication 3420.

CONTROLLING LANDSCAPE DISEASES

(Reprinted from Southwest Trees and Turf 15:1,14)

Have you ever tried to control a teenager? I have teenage children right now and I think they have the control and I don't. I suppose I could cut off the food and that would slow them down. Surprisingly there is an analogy here with diseases of plants. If you understand the energy dynamics of pathogens you can understand how to control diseases. More on that point in another article. Much of my work is to help arborists, landscape industry people and others recognize disease. Diagnose the pathogen, discern between biotic and abiotic diseases. However, once the diagnosis is made, then comes the question "What do I do to control it?" Controlling diseases is often frustratingly difficult or impossible. Still, there are several approaches which I will cover in this article

From a sales aspect, diagnosis is a loss. It is hard to sell pest identification, even if it is the first step in a health management plan. It is much easier to sell a control method, especially one where the person being paid does something dramatic like apply, spray, prune or replant. Of course our clients expect the entire package rolled into one company, although needs may exceed reality here. Actions can be billed but advice or knowledge is often not paid for. So, hiring that consultant for his or her diagnostic prowess is not often feasible. I cannot stress enough however, the importance of first correctly diagnosing any disease before trying to control it. So much pesticide is sprayed on the basis of assumption or even wrong diagnoses. This may pollute the environment, but does not control the intended problem. Also, action without accurate

diagnosis prolongs the disease and gives the pathogens more time to harm the plant.

As many readers know, I work for University of California Cooperative Extension. Technically, that means I am from the government and I am here to help! Others have made that claim (perhaps jokingly) but there is one way that Big Brother helps us control diseases. This is the concept of Exclusion. We can control disease before it even gets to our plants. We prevent it from coming to us. County Agricultural Commissioners conduct monitoring, exclusion, and quarantine programs to prevent pests from establishing in a new location. For the Western states, this is a big job with all of our international airports and seaports. Keeping the bad guys from coming to a new landscape or jobsite also involves selecting healthy plants, knowing suppliers and monitoring disease spreading practices such as pruning. Quarantines are useful to prevent spread of known pests. We can also do this locally by recognizing where the diseases are and not moving soil, or plant materials from there to other landscapes. The best way to exclude diseases is not to plant a susceptible host.

Do the plants in your landscape have good "protection"? Protection is another plant disease control word. We can protect plants from disease by applying a prophylactic covering of fungicide that inhibits the germination, growth, or penetration of fungi thus stopping disease. This works for fungi and some bacterial diseases where spores or inoculum are air borne and fall on plant surfaces, but is impractical for many soil borne diseases such as root rot. Fungicides often have to be "timed" so applications are in place to protect the desired stage of growth on the plant. They also need to occur when spores of the pathogen are present, so knowledge of the pathogen biology is also required. Diseases commonly protected from plants are the powdery mildews, leaf spots, anthracnose, blights, and some canker diseases.

"I just want it gone! Can't we just kill the pathogen, please"? Eradication is the elimination of the disease agent. We can do this in a number ways, chemical, heat, drying out, removing the infected plant and disposing of it, or pruning off the diseased part(s). Since most diseases of landscapes are fungal, we would love to just spray a fungicide and kill everything pathogenic. Unfortunately, this often does not work because most fungal diseases cannot be eradicated by fungicides once they have entered the plant. This is because most fungicides are not very systemic within plants and only have localized activity. With biotrophic diseases such as powdery mildews, the fungus sets up a "relationship" with host cells. Although we have eradicative fungicides for powdery mildew, the host cells associated with the disease will also die leading to phytotoxicity when the job is all done. So the disease may be killed, but so is the plant where the disease was. As plant health specialists, our charge to "do no harm" is violated and so we are back to "protection" strategies for mildews.

For some pathogens, "Resistance is futile!" They are too virulent for the host to survive. However, in many diseases, the host has some measure of resistance to the pathogen. Rusts, mildews, leaf spots and even root rots are diseases that may have resistant hosts. Using host resistance to fight disease is great when you understand the relationships between host resistance and pathogen virulence. This works best in cropping systems where the resistance may be included in a breeding line. Unfortunately, ornamental plants are often not bred for resistance. Notable exceptions are roses, vegetables and some bedding plants where resistance to various diseases has been bred into new varieties.

"Could you please just pick up your room!" Again, if you have teenagers you know this phrase. Sanitation is an important aspect of disease control as well. Picking up the landscape "room" involves removing disease inoculum that might initiate or continue a disease in the landscape at a later time. A great example of this is Camellia petal blight. The fungus survives in old dead flowers that drop to the ground. Sanitation involves raking and carefully removing the dead flowers to break the disease cycle. Any disease that kills plant parts which later accumulate under the plant would probably be partially controlled by sanitation measures. Sanitation also means surface sterilizing seed to kill organisms before the seed germinates or cleaning/sanitizing pruning equipment between cuts

when a pruning-borne disease is present.

Biological warfare has its proponents but in the end, it seems that battles are often fought hand to hand. Disease control has biological control options. There are diseases that are controlled by organisms, usually bacteria or fungi. Many soil borne fungi are regulated by other organism in soil. Same for nematodes and some leaf infecting pathogens. The most dramatic success with BC has been in the control of insects. Often we get a new insect that has no natural enemies here and so it causes an epidemic. Entomologists import a parasite, make a single (usually multiple) inoculative release and the epidemic pest comes into regulation. This was done with many psyllid pests and also recently with the Eucalyptus long horned borers and many other insects over the years. There are a few cases of inoculative control of plant diseases, but searching out the Holy Grail pathogen killer has rarely led to success for any landscape diseases. However, an understanding of soil biology and how the soil biota can reduce soil borne diseases is helpful if not omnipotent (but this is fodder for another article).

Cynthia Westcott, the great plant doctor of the last decade, wrote in her autobiography "I would not waste time where the expected control would not be worth the cost of treatment". Sometimes no one approach will really be worth the effort. However, the combined effects of doing everything you can, sanitation, resistance, eradication, protection and biological control can lead to satisfactory results that are "worth the effort". These integrated approaches are the basis of Integrated Pest Management strategies that have been used very successfully on insects, weeds and some diseases. The integrated approach has one drawback; it requires extensive information and knowledge about the environment, the pathogen and the host. The learning curve for integrated controls is steep, and agreement of the client to undertake the necessary efforts is required, but the rewards are a healthier landscape.

Reference
Westcott, C. 1957. Plant Doctoring is Fun. D. Van Nostrand Company Inc. Princeton , NJ

THE 54TH ANNUAL SOIL FUNGUS CONFERENCE
March 26-28, 2008
The Hansen Agriculture Center
Santa Paula, California

This meeting addresses the interests and needs of a diverse group of pathologists, practitioners, instructors, and advisor personnel such as extension faculty and agri-business personnel, in all aspects of soilborne fungi and root diseases. We have a very informal format to maximize interactions and exchanges among participants. Topics include research and development discoveries, new or increasing disease problems, products and equipment, chemical control, biological and cultural control, new methods of detection and quantification, applied aspects of molecular biology, epidemiology, and ecology.

We will have a field trip on the first day, Wednesday March 26, to look at the horticultural and ornamental industry in Ventura County, an area with a large production of avocados, lemons, vegetable and nursery crops. The trip will be led by Jim Downer, University of California Cooperative Extension Farm Advisor from Ventura County.

The meeting registration form, hotel information, and program information can be found at http://soilfungus.ars.usda.gov

Please contact the session chairs listed on the web site to schedule your talk.

For more information about local arrangements, contact James Downer ajdowner@ucdavis.edu

Program Chair: Timothy Paulitz paulitz@wsu.edu

Landscape Notes

FROM THE UNIVERSITY OF CALIFORNIA COOPERATIVE EXTENSION
VENTURA COUNTY
A. JAMES DOWNER, ENVIRONMENTAL HORTICULTURE ADVISOR