Cooperative Extension University of California Ventura County

Landscape Notes

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Volume 14 No. 4 October 1999

Landscape Entomology/Disease Symposia

This year we are serving up two symposia in the time frame of one. Due to scheduling difficulties we were not able to offer the Entomology symposium in June. Since that time, the lerp psyllid has devastated eucalyptus plantings all over Southern California. There has been a concentrated effort by various UC scientists to address the lerp psyllid problem and we hope to showcase these and other entomological problems November 23. The lerp psyllid problem is a perfect model for biological control and indeed U.C. scientists are proceeding ahead with plans for release of biological control agents. A lot of time and work goes into the process of finding natural enemies or predators to pest insects, importing and rearing them and then releasing them here in California. This year, we will spotlight the process with a keynote lecture by Dr. Don Dahlsten from U.C. Berkeley.

The following day (November 24) we will have our regularly scheduled Landscape Disease Symposium. Each year, we try to have a theme as well as a thorough treatment of a single disease group. Our overall theme is alternative methods of control. Non-chemical control is not the intent of the theme. We are interested in new and different ways of controlling plant diseases—alternatives to what we are used to. If you come away from this meeting with one new weapon in your fight against plant disease I feel we will have been successful. This year, Steve Koike will give an in-depth presentation on wilt diseases of ornamental trees; Mike Stanghellini will update us on soil-borne pathogens; Jerry Turney will cover diseases of azaleas and camelias, and Heather Scheck will give an update on local diseases of ornamental plants.

We will also be offering the usual continuing education credits for pest control operators, advisors and applicators (12 hours) as well as arborist credits (10 hours). There will be clinic sessions shortly after lunch so you can speak with the entomologists/pathologists. We encourage you to bring unknown samples, **but please do not bring unknowns from other counties—we do not want to promote the spread of pest insects or pathogens.** We feel these symposia give you a great value for the time and money and look forward to seeing you again this year.

Phytophthora: an unseen menace in the landscape.

The name *Phytophthora* is derived from the Greek and means (phyto) plant (phthora) destroyer. The name is apt, for *Phytophthora cinnamomi* and other species of this "plant destroyer" are responsible for considerable losses in ornamental plantings. For professionals trying to diagnose a problem plant, *Phytophthora* is often an excuse; "Oh, that plant probably died of *Phytophthora*". Since the signs of *Phytophthora*

infection are microsopic, field diagnosis is almost always presumptive. The symptoms of *Phytophthora* damage can often be mistaken for damage from other pathogens or even abiotic agents. Isolation and identification of the pathogen is the only way to accurately identify the cause of water-mold infections. Even mono-clonal antibody test kits that promise accurate identification can cross-react with other fungi giving false positive results. Thus, most of us without laboratory facilities cannot positively identify *Phytophthora* diseases. However, it does help to know your enemy—the more we know about *Phytophthora* diseases, the better we can be at recognition of damage symptoms and prevention through cultural and other control methods.

Phytophthora is a genus of fungi that are almost entirely parasitic on various plant hosts. In 1876 de Bary identified *Phytophthora infestans* as the causal agent of late blight, a fungus which totally destroyed Ireland's potato crop plummeting thousands into hunger, starvation and eventually emigration to the United States. Since de Bary identified *P. infestans* as the type species for the *Phytophthora* genus, at least 50 more species of *Phytophthora* have been discovered around the world. Some species such as the type species have a narrow host range (Solanaceae) while others such as *P. cinnamomi* and *P. parasitica* have wide host ranges attacking many desirable ornamentals. Although Zentmeyer (1980) claims a host range of 900 species of plants for *P. cinnamomi*, most pathologists recognize that this list must be considerably larger.

Phytophthora cinnamomi

Phytophthora cinnamomi has had a notable history both here in California and around the world. This fungus is responsible for perhaps one of the largest epiphytotics ever. The Jarrah (*Eucalyptus marginata*) dieback of Australian forests has resulted in loss of millions of hectares since the fungus was introduced there. *P. cinnamomi* is also the worst fungal threat to the production of avocados in California and is a pathogen of many woody landscape plant materials.

Phytophthora cactorum

This water mold was first reported in rotting cacti (as ornamental plantings) in Czechoslovakia. The fungus has a worldwide distribution, but most often reported in temperate climates. It parasitizes over 200 plants causing root and collar rots, fruit rots, cankers, leaf blights, wilts and seedling blights. Both woody and non woody hosts are affected. Crown, collar and root rot of apple and pear trees are often associated with *P. cactorum.* The fungus also occurs on ginseng, strawberry, English walnut, dogwood, pine, azalea and maple causing serious cankers or crown rot diseases.

Phytophthora citricola

P. citricola was first isolated in Taiwan and is the cause of trunk and root rots of many important crop and ornamental plants. Hibiscus, California pepper, coast live oak, Monterey pine, bottle tree (*Brachychiton populneus*) and gold dust plant are all susceptible to root rots or cankers. *P. citricola* also causes a fruit rot and canker disease of avocado.

Phytophthora citrophthora

This fungus was first isolated from rotted lemons and soon recognized as an important pathogen of citrus causing gummosis and fruit rots. *P. citrophthora* is also known to cause a stem canker of eucalyptus, foliar blight of giant redwood, and root rot of orchid trees, maples and Japanese holly.

Phytophthora cryptogea

P. cryptogea was first described as a foot rot of tomato in Ireland. It is now recognized as an important pathogen of ornamental plants, particularly greenhouse grown container plants. The host range is large, many of which are in the Asteraceae or sunflower family. The fungus is easily recovered from irrigation water where it can survive in absence of a suitable host. Root rot diseases and crown rots commonly occur on gerbera, Iris, *Dianthus*, *Eucalyptus*, *Contoneaster, Cineraria, Ceanothus, Calendula, Brassica*, African violet, Monterey pine, marigold, lupine and many other ornamental plants. This pathogen can spread with amazing speed in humid greenhouses devastating a crop like gerbera.

Phytophthora dreshsleri

Originally isolated from rotting potatoes, *P. drechsleri* has a host range that includes as many as 40 plant families. It is primarily a root pathogen; however, some isolates may attack fruit of melons. or cucumber. This fungus is very difficult to discern from *P. cryptogea*, but mycologists believe it to be a distinct species. The fungus causes root rot of several *Banksia* spp. as well as many other Australian plants used as ornamentals (*Callistemon, Greveillea, Melaleuca, Hakea,* etc.).

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***Phytophthora nicotianae (P. parasitica*)**
This *Phytophthora* spp. is responsible for many different diseases of numerous crops and ornamental plants. Although root and crown rots are perhaps the most frequent diseases, the fungus also causes brown rot of fruit, gummosis, as well as flower, fruit and foliar diseases. Although perhaps most commonly studied on citrus and tobacco, *P. nicotianae* causes leaf spot on Philodendron, damping-off of Phlox, collar rot of primula, crown and root rot of orchids, and root rot of many Australian plants.

These short descriptions of various *Phytophthora* spp. are certainly not inclusive of all the plant species that they parasitize. There are many more hosts for each fungus mentioned, and there are other species of *Phytophthora* not mentioned that are very important. Most of the diseases I mentioned do occur in the United states even though the plant material may have originated from Africa, Australia or Asia. The important thing to realize is that there are many kinds of *Phytophthora* and that a single species can cause different kinds of disease on the same or different hosts. Another important point is that *Phytophthora* can cause disease on any plant part, not just roots.

Despite the many species of *Phytophthora* and the wide variety of diseases caused, these fungi share many similar characteristics. *Phytophthora* is a genus in the class Oomycetes; fungi commonly called the water-molds. Their standing in the fungal kingdom is somewhat precarious. Although we think of them as fungi, many scientists now consider them a part of the Chromista, a newly erected kingdom. The biochemical differences that make *Phytophthora* unique also help us understand how to control it. Specific fungicides that affect oomycetes have been developed. In many cases however, these fungicides have little effect on other fungi. This is why a fungicide like Subdue (metalaxyl) has little effect on common blights, foliar leaf spots, seedling damping diseases, or rots caused by other fungi. Still we see metalaxyl used for control of ascomycete fungi—a futile effort. To best understand control of water mold diseases we need to understand something of their life history.

Phytophthora produces both sexual and asexual spores. Some of these are used to infect susceptible plant roots or other plant parts and some are long term resting spores. Resting spores can be asexual (chlamydospores) or sexual (oospores). Chlamydospores are the most commonly produced resting spore. Chlamydospores can germinate to form hyphae which develop into mycelium (the body of the fungus) or directly into zoosporangia which produce the most important asexual spore, the zoospore. Zoospores are swimming spores that can chemically detect and swim to susceptible plants, attach, penetrate and infect roots. Most infections by water molds are caused by zoospores, not the hyphae or mycelium of the fungus. Also, *Phytophthora* does not persist in the soil as mycelium (like *Armillaria mellea* does). It is very much dependant upon its various spore stages to survive the adverse microbio-logical environment in soil. Spore germination and development is carefully tied to soil moisture levels. When conditions are wet and free water abounds, *Phytophthora* will produce zoospor-angia that produce zoospores which infect roots and again produce more zoosporangia.

This repeating cycle can increase the number of spores rapidly in a soil so that epidemics and rapid loss of plants is very possible. When conditions are unfavorable for zoospore production (drying or lack of host roots) the fungus makes resting spores which will germinate when the time is right (you plant a susceptible plant and continuously over-water it).

To produce oospores (the sexual resting spore), most *Phytophthora* spp.require two different fungal types or mating types (called A_1 and A_2). If both kinds of fungus are present in the soil, A_1 and A_2 hypae will join together and form reproductive structures which result in sexual recombination of genes and development of a spore (oospore) that can persist in soil for long periods of time. In some cases we do not have both mating types of *Phytophthora* in our soils, thus long term persistence and genetic durability are not as great. Unfortunately both mating types of *P. cinnamomi* and other *Phytohpthora* spp. occur in California soils.

Phytophthora spp. are unique “fungi” that parasitize a wide variety of ornamental plants. Their biology gives us clues to control methods for the diseases they can cause. In a future issue of Landscape Notes, we will cover methods for controlling the diseases caused by *Phytophthora* spp.

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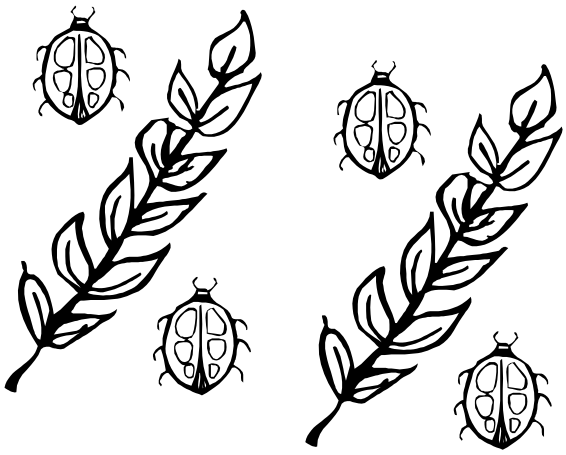

Landscape Entomology & Disease Symposia

November 23 & 24, 1999
Rancho Del Rey, Oak View

Featured in this issue of Landscape Notes
Phytophthora: **An Unseen Menace in the Landscape**

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