The Plant Doctor's LANDSCAPE TIPS

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PHYTOPHTHORA: THE PLANT DESTROYER

INTRODUCTION

Trees may be affected by many different types of issues, ranging from diseases to pests to environmental and cultural problems. Infectious plant diseases are caused by fungi, bacteria, viruses, phytoplasmas, nematodes and so forth. Of the causes of infectious plant diseases, fungi represent the largest and most common class of incitants.

Among the many thousands of fungi that are capable of causing plant diseases, many of us associated with arboriculture/landscape recognize some of the more common ones: *Cytospora* (canker), *Nectria* (canker), *Ophiostoma* (Dutch Elm Disease), *Phomopsis* (canker and blights) and the various rust fungi that cause "rust diseases" . . . for example, Trellis Rust.

There is a group of "fungi" that are considered "primitive" compared to most of the other fungi (such as those listed above), which are considered more "advanced"… at least on an evolutionary scale. Three of the more common primitive fungi we encounter in the plant world are *Phytophthora*, *Pythium* and a group of "downy mildews", not to be confused with the "advanced" powdery mildews. In fact, most scientists today would prefer to not refer to certain of these entities, *Phytophthora* for example, as a "fungus"; rather, it has been concluded that they are more closely related to algae. Even if this group is more primitive, it should not be concluded that they are less important in regards to plant health. In fact, *Phytophthora* (pronounced fi-top-thor-a) is a very destructive organism in the plant world (Photos 1-4).

PHYTOPHTHORA - A BRIEF HISTORY

In the long history of human endeavors, science has been rather slow to develop… that is until the 19th and 20th centuries. Prior to the 1800s and 1900s, our knowledge of the natural world developed at a snail's pace. Religion probably played an important role in restricting the advancement of human understanding of the natural world. It wasn't that many years ago that people thought the world was flat. The Church prescribed edicts that stipulated, for example, that the Earth was the center of the Universe and that the Sun and the Universe revolved around the Earth. If you disagreed with this and other edits, it could be considered blasphemy and you might be regarded a revolutionary who could be imprisoned or even killed as a threat to The Church's and, hence, God's authority. Ironically, perhaps due to some extra time on their hands compared to the hard working, busy peasant class of the day, a few religious individuals challenged these edits through their own inquisitive nature. While religion sometimes restricted the advancement of science, some monks and clergy through curiosity, contemplation and the experimental design also advanced our knowledge about the natural world. Enter *Phytophthora*.

During the mid-1800s, essentially before and around the time of the American Civil War (1860-1865), the Irish were encountering a series of yearly crop failures. Having largely depended on the potato as a main staple, the people of Ireland realized that something was killing their plants in the field before the plants could mature and produce the swollen stem (tuber) known as the potato (French Fries would come later as a French invention). Due to the strong presence of religious influence in European society during that period, the Irish presumed that the crop failure was due to God's punishment of the people for their sins. While some Irish were undoubtedly sinners, we now know that the incitant for what was to become

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Photo 1A: Maple trees are highly susceptible to Phytophthora infections, which are sometimes responsible for contributing to "Maple Decline." Frequent irrigation striking the trunk along with wounding from lawn mowers and weed trimmers provide a perfect storm for disease development.

Photo 1B: A "treeopsy" of the tree in Photo 1A disclosed reddish water-soaked areas beneath the bark . . . typical of Phytophthora infections. Phytophthora destroys the cambium tissues, which subsequently contributes to decline.

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known as the Irish Potato Famine was caused by *Phytophthora*. Due to crop failures over a number of years and the resultant famine, one million people of the eight million population total died of starvation. Another million immigrated to other countries such as "America". It wasn't until the invention of a crude microscope a number of years later that a microbe was discovered and shown to be the cause of the disease that destroyed so much of the Irish potato crop. That microbe was named Phytophthora, which is Greek and appropriately named, "The Plant Destroyer". And due to the Irish Potato Famine, we can better understand the importance of plant diseases, especially *Phytophthora*, in the history of human culture. Today, farmers and growers, including those in Michigan, still battle this destructive disease on their potato crops.

Photo 2A: Other than Beech Bark Disease, Phytophthora may be beech trees' number one killer. In this photo, excessive irrigation not only caused the demise of the ground cover (pachysandra) but also promoted Phytophthora infections of the lower trunk of this large old beech tree.

Photo 2B: A close-up of the beech tree is Photo 2A shows the typical water-soaked, dark "cankers" developing beneath the bark. These cankers will often "ooze" secretions . . . typical of a Phytophthora "bleeding canker". Regrettably, this beech tree died.

Photo 3: Rhododendrons are also highly susceptible to Phytophthora. It is not unusual to witness wilting or dead plants such as the plant in the right center of this photo. Excising the bark from the lower stems of affected Rhododendrons with a pocket knife (Inset) often reveals the tell-tale signs of Phytophthora infection . . . here the discoloration is clearly visible.

Photo 4: Sudden Oak Death, caused by Phytophthora ramorum, often causes an exudate of a tar-like substance from infected trunk areas.

PHYTOPHTHORA DISEASES IN THE LANDSCAPE

As related previously, we in the plant health care industry may encounter a variety of diseases. Phytophthora-incited diseases are among the most destructive (Photos 1-4). Various species of *Phytophthora* cause blights, root rots, trunk decay, collar rots and bleeding cankers. *Phytophthora* has been called a "water mold" because it tends to appreciate an abundance of moisture to enact its destructive nature. The "fungus" generally grows by producing hyphae, which are tubes (fungus body), perhaps analogous to roots in plants (Photo 5). When reproduction is necessary, it may produce several types of spores. A dense thick walled spore (oospore) is notable for overwintering. During the growing season, *Phytophthora* produces

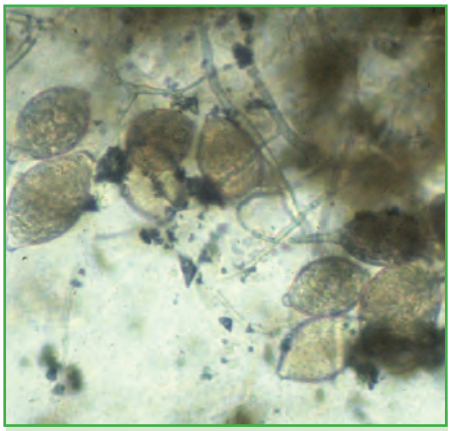

Photo 5: In this microscopic photo taken through the apertures of a microscope, the lemon-shaped sporangia (spores) can be seen. These sporangia may be carried by wind currents for miles to infect other susceptible plants. Also note the fungal "tubes", which are the fungus body known as hyphae or mycelium.

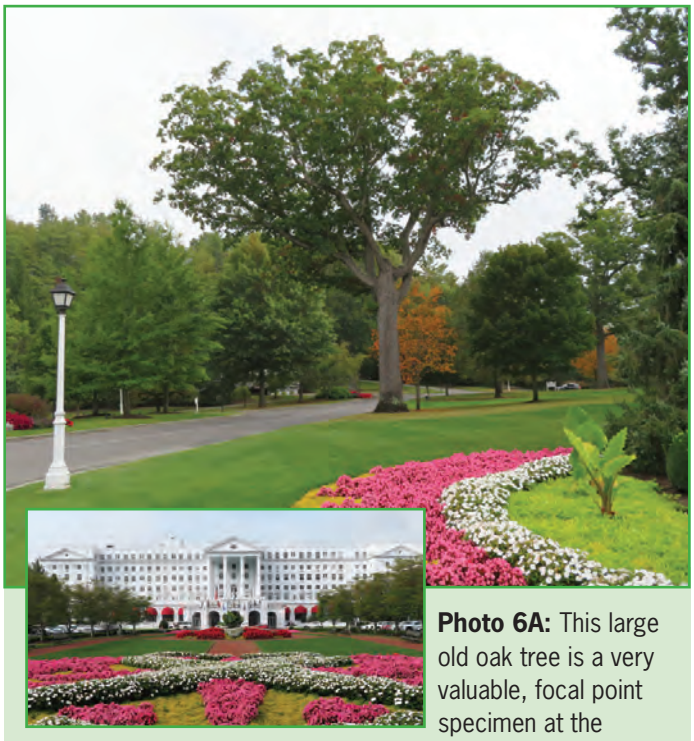

Photo 6A: This large old oak tree is a very valuable, focal point specimen at the entrance to The Greenbrier, an upscale resort (Inset) located in White Sulfur Springs, West Virginia. Although healthy at the time this photo was taken, its existence might be challenged by human activities such as human maintenance practices.

Photo 6B: Another angle of the large old oak tree in Photo 6A shows frequent irrigation activity on the lower trunk of this tree. As the old adage proclaims, "If you build it, they will come," consistent with the popularity of The Greenbrier for more than 100 years, when it was built as a Chesapeake and Ohio railway stop for the affluent. A variation on this theme is, "If you provide the proper conditions, the diseases will come." Oaks are very susceptible to Phytophthora.

sporangia, which are specialized spores that may be carried from plant to plant or for many miles by wind currents (Photo 5). Upon contact with a susceptible host plant, the sporangia may germinate and infect the plants. Under certain conditions, depending on temperature and moisture, the sporangium may instead produce zoospores, which are tiny mobile spores (with tails) that swim in water . . . analogous to the tadpole of a frog . . . except that all spores and hyphae of *Phytophthora* are microscopic (Photo 5). It is this microscopic nature that prevented humans from discovering *Phytophthora* and other disease agents before the development of certain technological advances such as the microscope.

MANAGING PHYTOPHTHORA DISEASES

Phytophthora diseases may be managed by a variety of methods. Often a combination of the following procedures are most effective.

Avoidance: When purchasing new plants, be sure to examine them closely for any signs of disease that may indicate *Phytophthora* or other pathogen infections. Such symptoms as sunken bark areas, weeping wet spots on the bark, cankers, root rots and so forth may indicate a disease already infecting the plant. Once disease agents are transferred to landscapes, it is difficult to eradicate them.

Moisture: Because the "water mold" *Phytophthora* is favored by abundant moisture, ensure proper drainage and avoid excess irrigation. Frequent irrigation that strikes the bark of woody plants is a predisposing factor that promotes *Phytophthora* (Photo 6A and 6B).

Alternative Plants: Some plants are more susceptible to *Phytophthora* infections than other plants. For example, many species of rhododendron are highly susceptible. Use of less susceptible or alternative plants may help prevent continuous loss of plants in replanting situations.

Fungicides: Occasional fungicide application may thwart the activities of Phytophthora in both the nursery and landscape. In fact, it is not uncommon for nurseries to make fungicide applications to susceptible plants such as rhododendrons in order to prevent disease development while the plants are in the nursery; once the plants are transplanted to the landscape, the fungicides may wear off, allowing *Phytophthora* to resume its dastardly deeds. Some of the elemental-based fungicides such as Copper (Cu) and Phosphorus (Ph) may help protect plants from infection by *Phytophthora*. Mefenoxam (sold as Subdue Maxx, Quali-Pro Mefenoxam, Mefenoxam, etc.) is one of the more potent fungicides for managing *Phytophthora* diseases. Other natural biological control products that stimulate beneficial microbial activity may also have some impact on *Phytophthora*.

The author, MSU and MGIA do not endorse any particular products. If using pesticides, be sure to read and follow label directions.