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The Rutgers Turfgrass Proceedings is published yearly by the Rutgers Center for Turfgrass Science, Rutgers Cooperative Extension, and the New Jersey Agricultural Experiment Station, Cook College, Rutgers University in cooperation with the New Jersey Turfgrass Association. The purpose of this document is to provide a forum for the dissemination of information and the exchange of ideas and knowledge. The proceedings provide turfgrass managers, research scientists, extension specialists, and industry personnel with opportunities to communicate with co-workers. It also allows these professionals to reach a more general audience, which includes the public. Articles appearing in these proceedings are divided into two sections.

The first section includes lecture notes of papers presented at the 1995 New Jersey Turfgrass Expo. Publication of the New Jersey Turfgrass Expo Notes provides a readily available source of information covering a wide range of topics. The Expo Notes include technical and popular presentations of importance to the turfgrass industry.

The second section includes technical research papers containing original research findings and reviews covering selected subjects in turfgrass science. The primary objective of these papers is to facilitate the timely dissemination of original turfgrass research for use by the turfgrass industry.

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IDENTIFICATION AND MANAGEMENT OF OAK LEAF SCORCH

Dr. Ann B. Gould[1]

Leaf scorching in plants is usually attributed to both biotic and abiotic agents. Abiotic (or environmental) agents that can cause scorching in leaves include drought, dehydrating winds, salt, flooding, pesticides, air pollutants, toxic metals, and nutrient extremes. In most cases, this type of scorching is fairly uniform around leaf edges, affects newer leaves as well as older leaves, and will appear on vast expanses of the canopy. In addition, scorch symptoms due to abiotic agents may also develop soon after a known stress (such as drought or a salt application) occurs.

Plant infection by living or biotic agents can also result in leaf scorching. Organisms that can cause this symptom include fungi, bacteria, nematodes, viruses, and insects. Leaf scorching due to biotic agents is not clearly defined. The scorch symptoms on leaves are often irregular in shape, and frequently a yellow or red "band" will appear between healthy and scorched tissues. In addition, symptoms may appear first on the older leaves of one or more branches, and then spread to other parts of the tree.

Bacterial leaf scorch of shade trees, caused by the bacterium *Xylella fastidiosa*, affects American elm, red and black oaks, sycamore, London plane, red mulberry, and red maple trees in regions throughout the east and midwestern United States. *X. fastidiosa* also causes diseases in grapes, peaches, plums, almonds, periwinkle, and ragweed. In addition, the bacterium infects a wide variety of other plants (alternate hosts) without causing visible symptoms of disease.

Of all the diseases caused by *X. fastidiosa*, the disease most commonly found in New Jersey is **oak leaf scorch**. Both pin and red oaks are affected. Although **oak leaf scorch** is most prevalent in certain sections of Burlington, Camden, Gloucester, and Salem Counties, it has been reported in Mercer, Middlesex, Monmouth, and Somerset Counties as well.

Symptoms of Oak Leaf Scorch:

The most obvious symptom of **oak leaf scorch** is scorching around the margins of infected leaves. Frequently, a dull red band appears between healthy and brown (or necrotic) tissues. These symptoms usually occur in mid-to late-summer on leaves of one or more branches in the canopy. Affected leaves may curl and drop prematurely. As the infection progresses over several years, branches die and the tree declines. Affected trees eventually decline to the point where they must be removed.

Disease Development

X. fastidiosa lives and multiplies within the xylem (or water conducting) vessels of infected plants. The bacterium induces moisture stress in the tree by producing gums that block xylem vessels.

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The bacterium is carried from tree to tree by sharpshooter leafhoppers, treehoppers, and spittle bugs. These insects subsist on the fluid within xylem vessels and pick up bacteria when feeding on infected trees. When an insect carrying the bacterium subsequently feeds on a healthy tree, the new tree becomes infected. Once an adult insect acquires the bacterium, it can continue to infect trees throughout the remainder of its life. The particular species of insects that spread *X. fastidiosa* to oaks and other shade trees is currently unknown.

Diagnosis

X. fastidiosa was not recognized as a pathogen of landscape tress until the early 1980's, and its symptoms are very similar to those caused by other agents. It is not surprising, therefore, that the disease is frequently misdiagnosed. When trees are suspected of being infected with the bacterium, it is best to submit a specimen to a competent diagnostic laboratory (e.g., the Rutgers Plant Diagnostic Laboratory) for analysis. Diagnosticians identify this disease by looking for the bacterium in xylem fluid or through the use of selective antibody techniques.

Possible Strategies for Disease Management

Maintain plant vigor. The best management tool for this disease is to maintain tree vigor for as long as possible. The development of oak leaf scorch is enhanced by other diseases, insects, and environmental stresses such as drought. Bacterial leaf scorch may also predispose infected plants to other disease and insect problems.

Sanitation. Branches that have died due to oak leaf scorch may be routinely removed. Infected trees that are in a severe state of decline should also be removed.

Use of tolerant plants. In areas known to be affected by this disease, plant trees that are not known to harbor the bacterium.

Removal of alternate hosts. There are a number of weeds and shrubs (i.e., American elder, blackberry, black cherry, bermudagrass, Boston ivy, chicasaw plum, golden rod, johnsongrass, Ladino clover, poison hemlock, sumac, and Virginia creeper) that harbor *X. fastidiosa* without exhibiting symptoms of disease. In commercial grape production, known hosts of the bacterium are routinely removed to prevent disease spread. However, little is currently know about the effectiveness of reducing disease spread by removing these alternate host near landscape plantings.

Control of insect vector. Insect control is not practical due to the great number of insects that feed on oaks and other shade trees during the summer.

Injection of antibiotics. Trees infected with *X. fastidiosa* have been known to temporarily recover when injected with antibiotics on an experimental basis. Unfortunately, symptoms return once the injections stop, and the injections are expensive. This control measure may only be feasible on extremely valuable trees. Further research, however, will be needed to confirm the effectiveness of this technique.