29. Wetwood (Slime Flux) of Elm, Cottonwood, and Mulberry

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Bacterial wetwood is a common disease affecting the xylem of many softwood and hardwood trees. In some species wetwood is lethal, while in others little damage occurs.

Hosts and Distribution

Wetwood affects trees throughout the United States. It is common in elm, mulberry, and cottonwood in the Great Plains. Trees growing on wet sites and poorly drained soils are more likely to develop wetwood than those on upland sites or on well-drained soils. Wetwood has been reported in 86 percent of cottonwood over 6 inches in diameter sampled along the Mississippi River.

Symptoms and Signs

Wetwood can be found in the trunk, branches, and roots (figs. 29–1, 29–2), and has a dark color, high moisture content, elevated pH, decreased electrical resistance, abnormally high gas pressure, and an increase in mobile cations.

Western cottonwoods are often infected early in their life. Dark streaks or bands may appear in the annual rings. Discoloration is most extensive in heartwood or older sapwood, but can occur in current wood. Foliage of affected limbs is often prematurely yellow, scorched, and wilted. Wilting may cause dieback of scattered branches; the entire crown may decline over several years. Premature defoliation may occur, but causes little growth loss.

"Bleeding" or slime-fluxing from trunk wounds, cracks, or other injuries is the most conspicuous symptom. Air-borne bacteria, yeasts, and other fungi contaminate the sap, resulting in a frothy, slimy, foul-smelling liquid, and upon drying it leaves a light gray to white crust (figs. 29–1, 29–2).

Abundant gas is produced in wetwood-affected tissues by the fermenting action of bacteria on carbohydrates and other materials in the sap. The gas is composed primarily of methane, nitrogen, carbon dioxide, and oxygen. When the gas is confined in the trunk, abnormally high pressures of up to 60 psi develop; 5 to 10 psi are common. The accumulation of liquid under pressure results in a water-soaked condition that gives rise to the name "wetwood." The pressure forces the accumulated liquid and gas out of the trunk through cracks in crotches, through pruning and other wounds, and through other natural openings. This liquid can cause localized cambial mortality and prevent callus formation.

Foliage wilts when sufficient quantities of the toxic liquid accumulated in the trunk wood are carried into the branches. Leaves first curl upward along their margins, then the petioles become flaccid, and finally the leaves droop and wilt.

Figure 29–1. Light gray discoloration of bark of Siberian elm affected with wetwood.

Disease Cycle

The bacteria associated with wetwood disease are common soil and water inhabitants. Wetwood is primarily associated with the facultatively anaerobic bacterium *Enterobacter cloacae (=Erwinia nimipressuralis)*. The bacterium is a small, motile, rod-shaped, single-celled, gram-negative organism with up to six peritrichous flagella. Several other bacteria, including species of *Xanthomonas, Agrobacterium, Bacillus, Clostridia, Acinetobacter,* and *Pseudomonas,* are commonly isolated from diseased tissue and probably play a role in the production of the complex symptoms associated with wetwood.

Roots may become infected through wounds. Bleeding trees harbor large populations of bacteria that may be transmitted by bark beetles to infect other stem or branch wounds.

Figure 29-2. Light ash gray discoloration of bark of American elm affected with wetwood.

Damage

Wetwood is a chronic disease that may contribute to general decline, especially of old trees and trees of low vigor. It causes an unsightly and often foul-smelling bleeding from tree wounds. It retards or prevents callus formation over wounds, and therefore lengthens susceptibility to decay fungi. Dripping wetwood flux may kill turf beneath infected trees.

Wetwood is responsible for substantial losses of wood in the forest products industry. Loss occurs through shake and frost cracks in living trees, checking and collapse in lumber and veneer during drying, and increased drying time in the kiln. The stained wood is also a serious defect in lumber and veneer graded on appearance. Strength properties of wetwood-infected tissues do not differ significantly from those of healthy tissues. In fact, wetwood tissue in living trees is rarely decayed, and appears to be resistant to wood-inhabiting fungi.

Control

No completely satisfactory chemical control measures are available. Installation of metal or plastic drain tubes to lower stem pressures and remove excess liquid has prevented additional damage and spread in infected trees, but may allow entrance of decay fungi. Fertilization of affected trees may be helpful in lessening the effects of the disease. Severely affected trees and limbs should be removed in the spring. Care should be taken to sterilize tools after each cut to prevent spread from diseased to healthy trees.

Selected References

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