UK COOPERATIVE EXTENSION SERVICE
UNIVERSITY OF KENTUCKY — COLLEGE OF AGRICULTURE

PPFS-OR-W-17

Leaf Scorch and Winter Drying of Woody Plants

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Leaf Scorch

Leaf scorch symptoms can develop whenever water needed for growth and health of plant foliage is insufficient. While symptoms are often due to unfavorable environmental conditions, leaf scorch can also result from an infectious disease. Symptoms, possible causes, and management of leaf scorch are discussed below.

Symptoms

Leaf scorch may occur on one branch (Figure 1), on one side of a plant, or over an entire plant. Often symptoms are most prominent on upper branches. Premature defoliation (leaf drop) may occur, and small twigs and branches in the upper canopy may die back during periods of prolonged water stress or drought. In severe cases, larger branches may also die.

Foliar symptoms differ for deciduous woody plants (drop their leaves during autumn, e.g. maple) and needled evergreens (retain their foliage during winter, e.g. pine). Symptoms on broadleaf evergreens (e.g. southern magnolia, Figure 8), are similar to those due to winter drying and are described later in this fact sheet.

Figure 1. Leaf scorch symptoms may appear on individual branches or over the entire plant.

Deciduous plants

When periods of drought or insufficient water uptake occur, areas between leaf veins (interveinal scorch, Figure 2) and/or along leaf margins (marginal scorch, Figure 3) may initially turn yellow. However, as the condition becomes increasingly severe, leaf tissue dies, dries out, and turns brown. Frequently, browning may occur without any previous yellowing symptom.

Needled evergreens

Needles turn brown at needle tips (Figure 4). As the problem continues, brown coloration progresses toward bases of needles.

Figure 2. Interveinal leaf scorch on maple. **Figure 3**. Marginal leaf scorch of maple. **Figure 4**. Leaf scorch appears as a browning (necrosis) of needle tips on evergreens such as white pine.

Causes

Leaf scorch occurs when water is lost from leaves faster than it can be replaced from soil. Any factor that interferes with either uptake of water by roots or movement of water throughout plants can cause water deficiency in leaves. The underlying causes of leaf scorch may be fungal or bacterial diseases (biotic) or environmental/cultural problems (abiotic). Some conditions which may lead to leaf scorch are:

Diseases due to fungi/bacteria (biotic)

- **Cankers—**large fungal or bacterial cankers on branches and/or trunks restrict flow of water to foliage. (Figure 5)
- **Root diseases—**root rots caused by fungi and fungus-like organisms (water molds) result in root loss. (Figure 6)
- **Vascular diseases—**wilt diseases, such as Verticillium wilt and Dutch elm disease, disrupt water conduction through the vascular system. Initial wilt symptoms associated with these diseases may be followed by scorch.
- **Bacterial leaf scorch—**the bacterium *Xylella fastidiosa* has been widely associated with scorch on a number of woody ornamentals. However, symptoms of bacterial leaf scorch differ from non-infectious scorch and many other scorch-related problems in a number of ways. Refer to the publication entitled 'Bacterial Leaf Scorch' (PPFS-OR-W-02) for specific information on this disease.

Environmental/cultural problems (abiotic)

- **Drought—**insufficient water available in the soil.
- **Hot sunny weather; hot drying winds—**results in excessive water loss through evaporation, even when adequate soil moisture is present, A sudden spell of hot, windy weather immediately after a long wet, cloudy period can lead to scorch.
- **Heat build-up—**parts of plants directly exposed to heat reflection from buildings and paved surfaces may suffer from water loss or direct scorching.
- **Soil-related problems—**such as:
  - Shallow soils that overlie rock or a hard pan fail to hold sufficient moisture.
  - Soils that are heavy, poorly drained, or compacted, thus lack enough oxygen to maintain a healthy root system.
  - Soils that drain rapidly (light, sandy soils) and do not retain moisture.
- **Physical injury**
  - **To trunk—**injury from lawn mowers, string trimmers, and construction equipment can result in partial or complete girdling of trunks, which interferes with water uptake in plants. (Figure 7)
  - **To roots—**digging in root zones (e.g. construction and trenching for utility lines) damages root systems.

Figure 5. Canker diseases restrict water flow to foliage, resulting in leaf scorch symptoms. **Figure 6**. Early symptoms of Phytophthora root rot (in this case, on oak) may appear as leaf scorch. **Figure 7.** Trunk injuries due to construction, mowers, and other causes interfere with water movement to branches and foliage.

- **Transplant shock—**improper transplant techniques and/or poor follow-up maintenance can result in root damage.
- **Girdling roots—**roots twist around and either partially or fully girdle (encircle) trunks, so water movement to the leaves is restricted. This condition often originates while plants are growing in nursery pots.
- **Surface roots—**roots that develop near soil surfaces as a result of heavy soils, frequent light watering, or excessive mulch. Surface roots dry out quickly, making these plants less adapted to drought conditions.
- **Changes in grade—**soil added to or removed from root zones of established trees or shrubs can result in root injury.
- **Impermeable materials over roots—**asphalt, concrete, or plastic mulch covering established root systems not only reduces water penetration into soil, but also reduces oxygen availability, making water uptake impossible.
- **Excess deicing salts or fertilizer—**salts applied to sidewalks and streets during winter can injure roots when products wash into soil/root zones. Symptoms are usually more evident on sides of the plants nearest to salt applications. Excess fertilizer applied to the root zone can have the same result.
- **Gas leaks—**oxygen is forced out of soil when underground gas leaks occur, causing roots to suffocate from lack of oxygen.

Management

Brown foliage and dead branches cannot be cured. However, with proper care, plants may recover and produce new growth.

- Determine the underlying problems and, if possible, correct them.
- If disease, such as Verticillium wilt or canker, is suspected, contact your county Extension agent for diagnosis and treatment options.
- If improvements to the growing site should be made but are not possible, consider relocating valuable plants to a more suitable growing site. Success rate will be affected by plant size, plant age, and size of root ball. Follow proper transplant procedures.
- Apply mulch around bases of young trees and shrubs to help conserve soil moisture. Mulch should not exceed 2 to 3 inches in depth and should be pulled back from the base of plants (i.e., do not pile mulch around the trunk of the tree or shrub).
- Water thoroughly, especially during dry periods. Woody plants should receive at least 1 inch of rainfall per week; supplemental water may be required. Newly planted trees and shrubs almost always require supplemental water during their first 3 years after transplanting. Many established trees may be able to withstand mild to moderate drought conditions, but plants should not be allowed to become excessively moisture-stressed (wilting foliage). Mature,

moisture-stressed plants may also require supplemental watering. Water over several hours using a soaker hose to direct water into root zones to a depth of 12 inches or at least the depth of the root zone. Do not overwater.

- Do not fertilize moisture-stressed plants. When plants recover, apply a complete fertilizer in late winter to promote new root growth and foliage.

Winter Drying

Broadleaf evergreens and needled evergreens, which retain their foliage during the winter, are subject to winter drying, a condition similar to leaf scorch. In Kentucky, rhododendron, magnolia, and pine are most commonly affected.

Symptoms

Symptoms may not become apparent until late winter or early spring. Affected leaves dry out and turn brown along margins and at tips (Figure 8). Often foliage droops and the plant has an overall wilted appearance. Winter drying may also lead to dieback of twigs.

Figure 8. Typical winter drying symptoms on magnolia leaves.

Cause

Evergreens lose moisture from their leaves throughout the winter, with greater losses on windy, sunny days. When the ground is frozen, plants cannot take up the moisture they need to replace lost water and leaf scorch results. Winter drying is more likely to occur on sensitive plant species exposed to direct sun and drying winds.

Management

- Place cold-sensitive plant species in protected locations in the landscape.
- Continue to water plants, as needed, during dry periods in late autumn and when soil is not frozen during winter.
- Apply mulch around the base of the plants to help conserve soil moisture. A layer of mulch can also help prevent soil in the root zone from completely freezing. Mulch depth should not exceed 2 to 3 inches. Pull much back from the base of trees, so it is not piled around the trunk of the tree or shrub.
- Wrap tree trunks with tender bark with burlap to protect them from drying winds.

Additional Resources

- Bacterial Leaf Scorch, PPFS-OR-W-12
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-12.pdf
- Dutch Elm Disease, PPFS-OR-W-2
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-2.pdf
- How Dry Seasons Affect Landscape Plants, ID-89
http://www.ca.uky.edu/agc/pubs/id/id89/id89.pdf
- Shade Tree Decline and Related Problems, ID-50
http://www.ca.uky.edu/agc/pubs/id/id50/id50.htm
- Transplanting Trees and Shrubs, ID-80
http://www.ca.uky.edu/agc/pubs/id/id80/id80.pdf
- Verticillium Wilt of Woody Plants, PPFS-OR-W-18
http://www.ca.uky.edu/agcollege/plantpathology/ext_files/PPFShtml/PPFS-OR-W-18.pdf
- Woody Plant Disease Management Guide for Nurseries and Landscapes, ID-88
http://www.ca.uky.edu/agc/pubs/id/id88/id88.pdf
- Woody Plants under Stress, ID-71
http://www.ca.uky.edu/agc/pubs/id/id71/id71.htm

Revised from the original fact sheet (ID-51) authored by CA Kaiser, JR Hartman, and ML Witt

Photos: Cheryl Kaiser (Fig 1, 2, 8), Nicole Ward (Fig. 3, 5), John Hartman (Fig. 7), University of Kentucky; University of Illinois Cooperative Extension (Fig. 4); and Edward Barnard, Florida Department of Agriculture and Consumer Services, Bugwood.org

June 2013