Green Ash Disorders

The following are common diseases and pests associated with green ash (*Fraxinus pennsylvanica*) in Mississippi. Contact your county MSU Extension agent for more information and assistance with diagnosis. Also contact your county Extension agent if you suspect you have found an exotic pest on your property.

Diseases

Leaf Spot

Leaf spot is a general term used to describe a variety of leaf diseases caused by fungi or bacteria. Some insects also can cause symptoms on leaves.

Symptoms and Signs

- Symptoms include spots that vary in size and color, generally ranging from brown to black.
- Concentric rings may be present.
- Clusters of spots may appear as a blotch.
- Leaf spot diseases tend to occur in the spring when young, succulent leaves are most vulnerable and moisture is abundant. Leaf spot pathogens survive in branches and fallen leaves, where spores can splash or travel by wind to an uninfected leaf. Leaf spot diseases are very common and may result in defoliation but do not usually require treatment on an established tree.

Life Cycle

Varies by organism.

Treatment

Organic

- Remove infected leaves and mulch.
- Keep foliage dry: drip irrigation, wide plant spacing, and pruning dense plantings to promote air circulation.
- Maintain plant vigor: proper planting depth, avoid wounding roots and trunk, maintain uniform soil moisture.

Chemical

Proper identification of the disease is necessary to determine which chemical products may be effective. Your county MSU Extension office can assist with disease identification. Fungicides have limited effectiveness once the disease is observed.

Ash leaf spot caused by the fungus *Mycosphaerella fraxinicola.* (Ward Upham, Kansas State University, Bugwood.org)

Powdery Mildew

Powdery mildew (*Phyllactinia sp.) is caused by a fungus that occurs* following warm days and cool nights, often in the fall and spring. This is a minor disease that does not warrant chemical treatment. Death of the plant is rare.

Symptoms and Signs

- Light-gray or white, powdery fungal growth (spores and hyphae) observable on the surface of leaves and young stems. In the fall, small, round, black, sexual, spore-producing structures may be visible on the powdery growth.
- Leaves will eventually yellow and drop off the plant.

Life Cycle

Winters in dormant buds or on stems and fallen leaves. The fungus spreads when new buds open in the spring. A new generation may be produced every 72 hours depending on conditions.

Treatment

Organic

- Space plants for good air circulation.
- Water plants early in the day.

Chemical

Fungicides are available but are rarely necessary in landscape settings. See **Table 1**.

Powdery mildew. (Andrej Kunca, National Forest Centre - Slovakia, Bugwood.org)

Ash Rust

Ash rust (*Puccinia fraxinata*) is a fungal disease that is rarely destructive enough to warrant treatment. The fungus completes its lifecycle only in salt marsh grasses. In Mississippi, the disease is rarely reported and is confined to the southern part of the state.

Symptoms and Signs

Yellow spots appear on the upper surface of leaves, stems, and petioles in the spring. After a few weeks, orange, cup-like fungal structures appear on the undersides of leaves. By summer, the leaf is deformed and brown.

Life Cycle

Spores from the ash infect cordgrass (*Spartina* sp.) and saltgrass (*Distichlis* sp.). The fungus overwinters on the grasses and produces spores that infect ash during cool, wet periods throughout the spring and summer.

Treatment

Chemical

Fungicides are available but rarely necessary and difficult to apply effectively due to timing and the need for repeated applications when conditions are favorable for disease development. See **Table 1**.

Ash rust. (Edward L. Barnard, Florida Department of Agriculture and Consumer Services, Bugwood.org)

Anthracnose

Anthracnose (*Plagiostoma fraxini*) is a fungal disease appearing as spots on leaves and new shoots. The spots on shoots are referred to as cankers. Anthracnose typically does not kill the host, but repeated infections can lead to decline.

Symptoms and Signs

Water-soaked spots on leaves and stems. Irregular, light brown to black spots along veins of leaves. Leaves can look somewhat burned. Cankers develop on twigs.

Life Cycle

The fungus overwinters in twig cankers and on leaves. Spores spread during cool, rainy weather and infect succulent new growth in the spring. Infection tends to be worse on the lower third of the tree where humidity is highest. Mature plant tissue is less susceptible to infection, and the disease stops during hot, dry weather.

Treatment

Organic

- Dispose of debris in the fall, including infected twigs and leaves.
- Prune out dead branches.
- Promote air circulation and tree vigor.

Chemical

Fungicides are available but are usually unnecessary from a plant-health perspective. Fungicide applications are most effective on young trees and should be applied preventively beginning at bud break and repeated weekly until environmental conditions become hot and dry. See **Table 1**.

Anthracnose. (Joseph OBrien, USDA Forest Service, Bugwood.org)

Table 1. Fungicide options.

Active ingredient	Anthracnose	Powdery mildew	Ash rust
azoxystrobin	X		X
Bacillus amyloliquefaciens	O	O	
chlorothalonil	X		
mancozeb + copper hydroxide	X		
myclobutanil			X
propiconazole	X	X	X
salts of phosphorus acid	X*		
thiophanate methyl		X	X

Fungicides registered for use in Mississippi against a specific disease on ash are marked with an X. OMRI-approved organic options are denoted with an O rather than an X.

X*: labeled for suppression only.

Pests

Emerald Ash Borer

Emerald ash borer (*Agrilus planipennus*; EAB) is an invasive Asian beetle that feeds on North American tree species in the olive family, such as green ash, and kills the host by destroying cambium cell tissue. EAB is present in surrounding states but has not yet been reported in Mississippi.

Symptoms and Signs

- Dying branches in the upper canopy are the first sign of infestation.
- D-shaped holes about one-eighth of an inch in diameter are visible where adult beetles have emerged. This usually occurs well after the tree has declined past revitalization.
- Frass-filled galleries from feeding larvae are present when bark is removed.
- Woodpeckers are attracted to infested trees, and heavy woodpecker damage may indicate infestation.

Life Cycle

EAB completes its life cycle in 1 to 2 years. Adults are one-half to five-eighths of an inch long, thin, with bright emerald-green wing coverings. They emerge from the tree in May or early June, with their peak in late June, and remain active for around 6 weeks. First emergence coincides with blooming of black locust (*Robinia pseudoacacia*). Growing degree days can be found online.

Adult females feed on ash leaves for 2 weeks before laying eggs on the bark of the tree. Most females lay eggs within 100 yards of the tree from which they emerged, but they are able to disperse 2 to 3 miles. Larvae hatch in 2 to 3 weeks and tunnel into the tree to the *cambium* where they feed until fall, reaching a length of about one-half inch. EAB overwinters as larvae, and pupation occurs in spring. When ash becomes unavailable, the EAB population decreases and moves to another area with vulnerable ash trees.

Treatment

Little can be done once an ash tree has exhibited more than 50 percent canopy decline. Governments quarantine areas once EAB has been identified, and no tree material may be removed from the area.

Organic

Replace the tree with non-ash native alternatives and Siberian elm (where it is not classified as invasive).

Chemical

For valuable trees, preventive insecticidal treatments can be costly but effective. Due to cost, insecticide treatments should begin if ash trees are within 10 miles of a known EAB infestation.

- *Systemic* insecticide applications must be applied in time to allow for uptake by the tree to ensure EAB encounters the toxin; this is usually spring through early June. A minimum of 1 to 2 weeks is necessary for systemic insecticides to move through the tree. Homeowners are restricted to making one soil application per year. Trunk injected systemic application products include the *active ingredients* imidacloprid, azadirachtin, and emamectin benzoate. Most injection applications provide 1 to 2 years of protection with a single application, although results vary based on time of year, *DBH*, weather conditions (i.e., drought), and pest pressure. Dinotefuran can be applied as a noninvasive basal trunk spray.

- *Non-systemic* sprays should target adults and newly hatched larvae in spring. Cover sprays labeled for EAB control include permethrin, bifenthrin, cyfluthrin, and carbaryl. Sprays have no effect on larvae that have already entered the tree and must completely cover the canopy and bark to impact adults. Two applications per season are recommended. Soil drench effectiveness is inconsistent.

Emerald ash borer. (Eric R. Day, Virginia Polytechnic Institute and State University, Bugwood.org)

Emerald ash borer damage. (David Cappaert, Bugwood.org)

Lilac Borer

Like emerald ash borer, **lilac borer** (*Podesesia syringae*) attacks plants in the olive family. Heavy infestations may kill the tree and provide entry sites for the wood-decay fungus *Trametes versicolor*.

Symptoms and Signs

- Exit holes are irregularly shaped at the bottom of the gallery and are associated with cankers on stems and branches. The top of the exit hole is round, and empty pupal skins often are present. Galleries are about 3 inches long and one-fourth of an inch in diameter.
- Sawdust accumulates at the exit hole and on the ground.
- Leaves wilt and turn brown, and dieback occurs.

Life Cycle

The insect is a moth that looks like a wasp and emerges in spring from tree bark (peak in late spring). The females lay eggs on the bark near wounds. Larvae chew through the bark, attacking and tunneling through the sapwood in the summer. Lilac borer overwinters as larvae in the sapwood and pupates in the bark. One generation is produced annually.

Treatment

Organic

- Avoid wounding plants.
- Prune infested branches to manage small infestations. Avoid pruning when moths are active in the spring. (It is always best to prune in winter, anyway.)

Chemical

Spray endosulfan or pyrethrin in late spring when moth flight begins. Spraying must be repeated during moth flight activity.

Lilac borer. (Eugene E. Nelson, Bugwood.org)

Lilac borer damage. (James Solomon, USDA Forest Service, Bugwood.org)

Carpenter Worm

Carpenter worm (*Prionoxystus robiniae*) is a moth that can cause significant damage to trees, especially those located near riparian zones.

Symptoms and Signs

- Early signs are sap spots on the trunk.
- Exit holes are small, rectangular openings on the trunk.
- Larvae expel *frass* from exit holes.
- Full-sized galleries are one-half inch in diameter and 6 to 10 inches long. Galleries tend to be vertical and found in crotch areas of trees or crevices of bark.
- Females lay eggs in already-infested areas of trees, leading to multiple galleries and extensive scarring on bark.
- Dieback occurs when branches are girdled.

Carpenter worm. (Pest and Diseases Image Library, Bugwood.org)

Life Cycle

After hatching, larvae burrow into sapwood. At maturity, they burrow into heartwood, which causes structural risk in the tree. Larvae take 2 to 4 years to complete their development. In spring, adults emerge from exit holes and mate.

Treatment

Organic

Beneficial nematodes have been used for small infestations; however, this is not a practical solution for most homeowners. Maintaining tree vigor and health is another approach.

Chemical

Insecticides are ineffective.

Oystershell Scale

Oystershell scale (*Lepidosaphes ulmi*) is an armored scale that is more common in northern states than southern states. The hard cover is about 2.5 mm long and gray-brown with a resemblance to an oyster shell. Like all armored scales, a tree can die from a severe oystershell scale infestation that stresses the tree and allows pathogen entry.

Symptoms and Signs

- Branches become encrusted from heavy infestations.
- Leaves yellow, bark gums, and branch dieback occurs.

Life Cycle

Oystershell scales overwinter as eggs beneath the hard covering of females. Eggs hatch in spring to become nymphs. Immature scales can move on the branch, but mature scales never move once they firmly attach themselves to the plant. They reach maturity in late summer to early fall. Males mate, then die in the summer. Only one generation is produced.

Treatment

Organic

- Maintain plant vigor.
- Prune out infected plant parts.
- Ladybugs and parasitic wasps feed on immature scales, noticeable by round exit holes in the scale covering. Before applying pesticides, check the plant for the presence of natural enemies that may be already reducing the scale population.

Chemical

Malathion, bifenthrin, imidacloprid, and pyrethrins are registered for use on scale. Horticultural sprays, oils, and insecticidal soaps have also been effective. Timing of the chemical application is important so that it coincides with the vulnerable stage (usually crawlers) of the scale insect.

Oyster shell scale (Whitney Cranshaw, Colorado State University, Bugwood.org)

Fall Webworm

The **fall webworm** (*Hyphantria cunea*) is a common caterpillar that appears from late summer to early fall. Unlike the eastern tent caterpillar, it constructs its web over the end of the branch rather than at tree crotches. The lacey web contains caterpillars, dead leaves, and fecal droppings. The pest can defoliate but will rarely kill a tree.

Symptoms and Signs

Young larvae are pale yellow with two rows of dark spots along their bodies. Fully grown larvae are green with a stripe along their backs and a yellow stripe on their sides; their backs are covered in white hairs emerging from orange warts.

Fall webworms. (Clemson University - USDA Cooperative Extension Slide Series, Bugwood.org)

Life Cycle

The pest overwinters in a cocoon concealed in ground litter or the soil. Adults appear in late spring or early summer and continue to emerge in small numbers throughout the summer. Eggs are deposited under leaves, and larvae hatch in a week. Larvae spin the web as they feed on foliage, skeletonizing leaves. Larvae mature in 6 weeks. There can be one or two generations each year.

Fall webworm web on a tree branch. (Steven Katovich, USDA Forest Service, Bugwood.org)

Treatment

Chemical

Pesticides are not recommended because they are expensive and because fall webworms do not threaten the health of the tree. However, if a pesticide is used, apply it only to the web when larvae are small. Spray initially with lime-sulfur or dormant oil, then apply acephate, malathion, or carbaryl, with two or three repetitions after 10 days.

Ash Leaf Curl Aphid

Ash leaf curl aphids (*Prociphilus fraxinifolii*) are small, light-green, woolly aphids that produce stringy white threads on their heads. They live on the undersides of leaves and deform the leaves as they feed on plant juices.

Symptoms and Signs

Clusters of tightly curled leaves at the end of summer. Could be confused with herbicide damage. Curling happens only on new leaves, not on already extended leaves. Damage has no long-term effect on tree health.

Life Cycle

Females lay eggs at the end of the growing season in bark or bud scales. Eggs hatch in spring with all female nymphs. These females give birth to females without mating. Toward the end of the growing season, males are produced to mate with the females; eggs are produced to overwinter in the bark or bud scales.

Ash leaf curl aphids. (Whitney Cranshaw, Colorado State University, Bugwood.org)

Ash leaf curl aphid damage. (Steven Katovich, USDA Forest Service, Bugwood.org)

Treatment

Organic

As with all aphids, insecticidal soap, horticultural oil, and neem insecticides can be applied.

Chemical

Insecticides are generally not recommended because they are expensive and will be ineffective by the time the damage is noticeable. Acephate can be used as a foliar insecticide and imidacloprid as a soil drench applied in the root zone, although this treatment is slow to work.

Further Reading

Dreistadt, S. H. (2004). Pests of landscape trees and shrubs, an integrated pest management guide (2nd Ed.). University of California Agriculture and Natural Resource Publication 3359. Oakland, CA: University of California Agriculture and Natural Resources.

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Glossary

Active ingredient: the ingredient that produces the chemical effect.

Frass: excrement of insect larvae; the fine wood waste produced by wood-boring insects.

Non-systemic: affecting a part of a tree. Compare with systemic.

Systemic: affecting the whole tree, from roots to shoots.

Cambium: the tree's living tissue that transports water and nutrients throughout the organism.

The information given here is for educational purposes only. References to commercial products, trade names, or suppliers are made with the understanding that no endorsement is implied and that no discrimination against other products or suppliers is intended. This publication is not intended to be an all-encompassing listing of treatment options. Consequently, only active ingredients are indicated. As with any application of pesticides, you should read the chemical label and consult a professional before using the information found in this publication if you are not familiar with the products detailed and their effects. Just because something is labeled for a problem does not mean it should be used. Pesticide labels are legally enforceable, and all of them carry the statement: "It is a violation of federal law to use this product in a manner inconsistent with its labeling" (www.epa.gov).

Publication 3297 (POD-12-18)

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MISSISSIPPI STATE UNIVERSITY EXTENSION

Produced by Agricultural Communications.

Extension Service of Mississippi State University, cooperating with U.S. Department of Agriculture. Published in furtherance of Acts of Congress, May 8 and June 30, 1914. GARY B. JACKSON, Director