

a guide to protecting
WOODY ORNAMENTAL
SHRUBS

Woody ornamentals are one of the fastest growing crops in terms of sales and production for a nursery. This guide contains information on how to scout for different diseases and insect pests, as well as identify the appropriate measures needed to keep your crops beautifully strong year after year.

DISEASE and INSECT IDENTIFICATION

Diseases and insect pests not only destroy your plants, but they also can reduce the value and stunt the development of the ones that survive while increasing the cost of production. Since infected plants don't always show disease or insect symptoms, scouting is essential. The following guide tells you how to scout for diseases and insect pests and how to treat if you find them on your ornamentals.



AZALEAS

SHRUB: Azalea

INSECT: Azalea Bark Scale (*Eriococcus azaleae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Resembles a mealybug with its white wax covering, but not from the same family.
- Adult females are approximately three mm in length, with a dark red body that is covered by a white waxy egg sac. Males look similar to females, but are only half as long.
- Overwinters as immature pregnant females and matures in spring.
- Crawlers migrate to small branch crotches or to leaf axils.
- Nymphs feed in these protected areas and mature into either males or females to reproduce and start another generation (one generation in northern climates and two generations in the South annually).
- Heavy infestations can cause stunting of growth and reduced vigor of the plant.
- Infested plants become chlorotic (yellow) and under heavy infestations can cause dieback of stems and branches, coated with the black sooty mold fungus that grows on the honeydew.

TIPS

- Control applications should target overwintering nymphs in the fall (September–October) and newly hatched nymphs in the late spring (South) and early summer (North).



Azalea Bark Scale

SHRUB: Azalea

INSECT: Azalea Caterpillar (*Datana major*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Azalea caterpillar is a major defoliator of azaleas in southern states. The caterpillars are brightly patterned with yellow and black on the body. The head capsule and legs are red.
- In the spring, eggs are deposited in clusters on the undersides of azalea foliage by light brown moths.
- Young larvae, dull yellow-orange in color, feed as skeletonizers on the undersides of leaves and feed in clusters. As they grow, they become brightly colored. They consume whole leaves, often defoliating an azalea. Heavy defoliation can occur in August through October. One generation per year.
- Heavy infestations can defoliate a plant by late summer.

TIPS

- Examine undersides of leaves and remove egg clusters laid on the leaves and destroy them.
- Control is best achieved when applications are applied when the caterpillars are young.



Azalea Caterpillar

AZALEAS

SHRUB: Azalea

INSECT: Azalea Lace Bug (*Stephanitis pyrioides*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Look for lace bugs on undersides of foliage. Nymphs have spines covering the body and are dark brown to black. Adult lace bugs have transparent wings with a lace-like pattern, held flat over the back of the insect. There are two gray-brown bands on the lace-like wings. The adults are three mm in length.
- Overwinters as eggs that are laid by the females tucked into the leaf surface. Nymphs hatch in spring and feed in small clusters near the main leaf veins. Larger nymphs spread out across the leaf surface. There are at least two generations per year in the Northeast and may be three in the South.
- Nymphs and adults of lace bugs insert a stylet mouthpart into the foliage and extract plant juices, causing a white stippling in the foliage from the damaged plant cells.
- Heavy feeding causes foliage to turn white and progress to bronze color.
- Nymphs and adults excrete waste that appears dark green to black, causing unsightly spotting on the undersides of foliage. Heavily infested plants that host multiple generations can defoliate and cause decline or death of the plant.



Azalea Lace Bug



Azalea Lace Bug Injury

TIPS

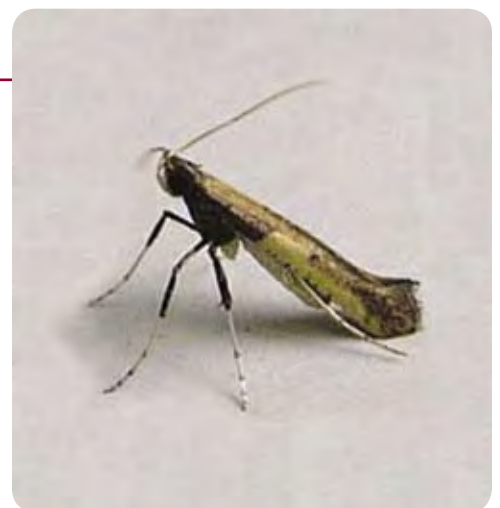
- Check for lace bugs on the undersides of the foliage in spring and early summer.
- Azaleas grown in sunny, hot areas suffer the most from azalea lace bug damage. Plants growing in partial shade will generally have a smaller population of lace bugs.

SHRUB: Azalea

INSECT: Azalea Leafminer (*Caloptilia azaleella*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Adult is a small, yellow moth with distinct purple markings on the wings.
- Eggs are deposited on the undersides of the leaves and hatch in four–five days.
- Young larvae are yellow and tunnel into the leaf tissue to feed, causing a blister-like mine, which eventually turns brown.
- As the larvae mature, they emerge and move to the tips of new growth where they pull the leaf tip over themselves for protection while they continue to feed.
- Mature larvae will select an undamaged leaf to roll up and pupate within the leaf roll.
- In the Northeast, there are two generations per year while in the South there are three–four generations per year. In Florida there is year-round activity of this pest. In Oregon it has been reported that this pest has three generations.
- Overwinters as a later instar (mature) larva or as a pupa.



Azalea Leafminer

TIPS

- Caterpillars attack low growing azaleas.
- Look for splotch-type leaf mine damage in the spring or rolled leaf tips in late spring/early summer.
- Since the larvae are protected while feeding, control can be a challenge. If possible, prune out rolled tips and apply controls at the first sign of adult moth or larval activity.

SHRUB: Azalea

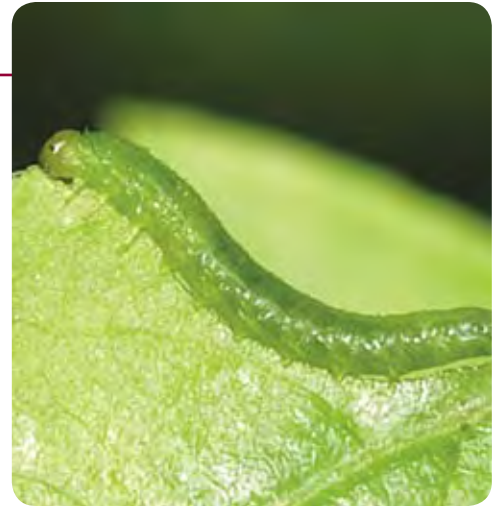
INSECT: Azalea Sawfly (*Amauronematus azaleae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- The larvae are light green with a dark brown head capsule and have more than five pairs of prolegs.
- Adults look like small dark-colored wasps and are active during the day.
- Females cut into the leaf tissue using a saw-like ovipositor to lay eggs. The green colored larvae feed on the undersides of foliage at first, while later instar larvae feed along the leaf edge. Larger larvae consume all of the leaf tissue except the main veins. Pupation occurs in the ground.
- Early instar larvae cause skeletonization of the undersides of leaves. More mature larvae consume all of the leaf tissue between major leaf veins. Heavily infested plants can be defoliated.
- One generation per year.

TIPS

- Larvae hatch from eggs deposited by females in late spring and early summer.
- Young larvae can ingest measurable amounts of foliage in a short period of time. Look for feeding activity in late spring and early summer.
- Insecticide applications can be made once larvae is observed.



Azalea Sawfly

SHRUB: Azalea

INSECT: Azalea Whitefly (*Pealius azaleae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Adults have wings held roof-like over the abdomen of the insect. The wings are covered with a fine white, dust-like wax.
- Nymphs are flat oval shaped and pale yellow and are found on the undersides of the foliage.
- Eggs are laid on the underside of the leaves. Nymphs hatch and are mobile for 12–24 hours. Nymphs settle on the undersides of foliage and insert their stylet mouthpart, excreting wax that covers the sessile insect for protection. They do not move until they pupate and emerge as a winged adult whitefly. Females mate with males then the females lay a clutch of eggs, inserting the eggs into the leaf.
- As nymphs feed they excrete honeydew that drops onto foliage below. The feeding of the nymphs causes leaves to yellow and, in high populations, foliage will drop off the plant.

TIPS

- Select azalea cultivars that have natural resistance to this pest.
- Examine plant for signs of shiny honeydew or growth of black sooty mold that will grow on the sugary excrement.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.



Azalea Whitefly



BOXWOOD

SHRUB: Boxwood (*Buxus*)

INSECT: Euonymus Scale (*Unaspis euonymi*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- A native of Asia, this scale is now common in the United States and Canada.
- The female is brown or gray and about 1.5 mm long with a pear-shaped body. Females are most commonly found on the stems of plants.
- Males are narrow, only 0.8 mm long, and white with a yellow cap on one end.
- After overwintering, females begin laying eggs under the protective cover of their armored shell in late April or May.
- Over a three-week period, eggs (tiny and yellow) hatch into small nymphs.
- Young nymphs move up and down the bark and foliage before settling in to feed. In four–six weeks, they develop into adults.
- Males feed under waxy covers; then mate with females and die.
- Females produce a second generation in late summer.
- The euonymus scale causes damage to the plant with its piercing-sucking mouthparts that remove fluids from plant cells.
- Feeding causes an overall decline in plant health. Symptoms include yellow striping and spotting of the foliage.
- Heavy infestations may occur on stems and leaves and cause a plant to defoliate. If left untreated, the plant may become too weak to recover and will die.



Euonymus Scale

TIPS

- Apply topical applications in the spring to target the early stage nymphs.
- Like most scales, its armor-plated shell can make it difficult to control with conventional insecticides.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.

SHRUB: Boxwood (*Buxus*)

DISEASE: Phytophthora Root Rot (*Phytophthora* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Plants wilt and growth is stunted.
- Leaves are at first light green, fading to yellow, bronze, or straw-colored.
- Leaf symptoms may be localized within the plant or occur throughout.
- Leaves will turn upward and lateral leaf margins typically roll.
- Bark at the base of the plant becomes infected and is easily removed from the wood.
- Once foliar symptoms are visible, roots have diminished.
- Roots turn dark brown to black and then die.
- The pathogen can be dispersed in water and with soil, diseased plants, infected plant debris, contaminated tools, and equipment.
- No obvious fruiting structures are formed.



Phytophthora

TIPS

- Plant disease-free stock.
- Avoid saturated substrate or soil conditions.
- Remove infected plants.
- For protection against this disease, apply a fungicide drench prior to symptom development.

BURNING BUSH

SHRUB: Burning Bush (*Euonymus alatus compactus*)

DISEASE: Anthracnose Leaf Spot (*Anthracnose*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Leaf spot anthracnose appears on foliage as small yellow to red spots that can reach 1/4 inch in diameter.
- Spots may grow together and form large blotches that make holes in the leaves.
- This disease occurs most often in warm, moist, humid conditions.
- Wind, splashed water, and overhead irrigation spread this fungus.
- Anthracnose overwinters on twigs and fallen leaves and sporulates in spring when temperatures reach 50° F.
- With advantageous conditions, anthracnose will spread rapidly from plant to plant.
- Minor infestation may only be aesthetic, but advanced stages can make plants weak and unsellable

TIPS

- Avoid overhead watering. Use drip irrigation when possible.
- Remove foliage from lightly infected plants and destroy heavily infected shrubs.
- When leaves appear in the spring, apply a registered fungicide and in warm months, during wet weather, repeat application at two-week intervals.
- Clean up fallen leaves to help prevent the anthracnose from overwintering.
- Apply fungicide sprays prior to symptom development.



Anthracnose Leaf Spot—Early Stage

SHRUB: Burning Bush (*Euonymus alatus compactus*)

INSECT: Two-spotted Spider Mite (*Tetranychus urticae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- When infested, leaves become stippled and yellow and may drop prematurely.
- A fine webbing sometimes appears on leaves and stems.
- Mites sap nutrients and energy from the plant.
- Two-spotted spider mite attacks this plant primarily during dry weather above 75° F.
- They live on the underside of leaves, and if untreated, can populate into large numbers by midsummer.
- Mites overwinter in plant debris or in cracks in the stems.
- Prompt control is mandatory to prevent rapid population growth.

TIPS

- Scout frequently and thoroughly, checking the underside of leaves.
- Place a sheet of white paper underneath a suspected leaf. Tap the leaf to loosen any mites. They will be clearly visible on the paper.
- Use miticides at first sign of infestation. Re-apply during hot, dry periods as necessary.
- Apply spray treatments to ensure good coverage on the undersides of the leaves.
- Space plants to provide good ventilation and maximum sunlight.



Two-spotted Spider Mite



Two-spotted Spider Mite Eggs

CAMELLIA

SHRUB: Camellia (*Camellia*)

DISEASE: Camellia Leaf Gall (*Exobasidium* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Infection by this fungus results in hypertrophy and hyperplasia of tissue causing swollen deformities (galls) on leaves, buds, floral parts, or shoot tips.
- Infected leaves appear thick, fleshy, and misformed.
- As the galls mature, white fruiting structures called basidia break through the infected tissue and release basidiospore, which are dispersed by wind and splashing water.
- The galled tissue eventually turns black, shrivels, and may fall off the plant.
- The fungus overwinters in infected plant parts and has a one year cycle.
- Infection occurs in the spring as new buds and leaves are developing.

TIPS

- The disease tends to be more of a problem on plants that are heavily shaded or when the foliage stays wet for extended periods.
- Inspect plants in spring for signs of infection and galls.
- Remove galls from ornamental plants before they sporulate.



Camellia Leaf Gall

SHRUB: Camellia (*Camellia*)

DISEASE: Mosaic/Mottle Virus (*Varicosavirus*)

DESCRIPTION, SYMPTOMS, AND SIGNS

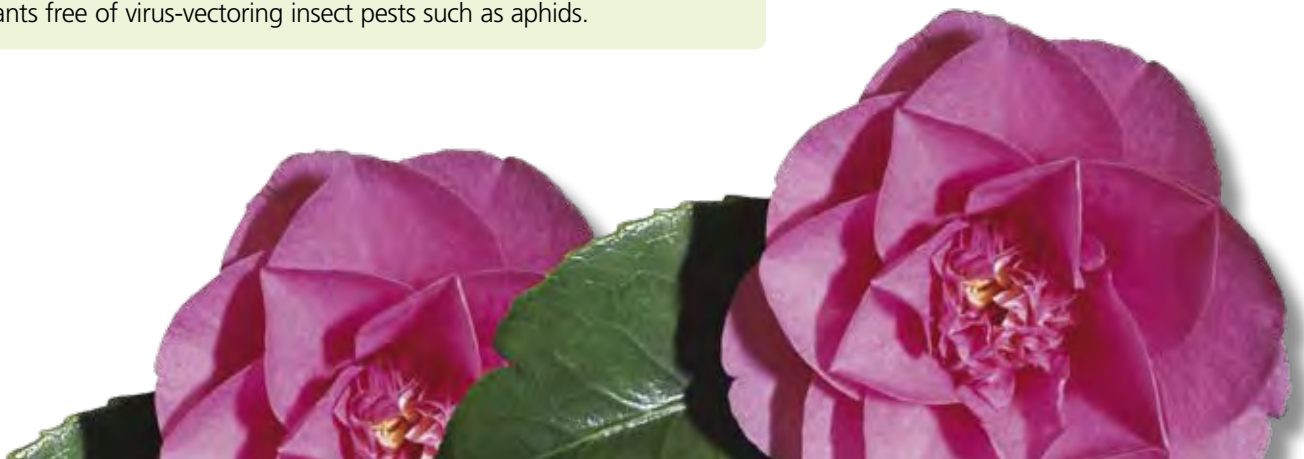
- Yellow mottling or circular to irregular or elongate yellow or white zones.
- Mosaic pattern of yellowing in leaf or concentration of yellowing along veins or margins.
- Chlorosis or albinism of entire leaves.
- Roughness or corkiness of the epidermis.
- Sometimes ringspots appear on leaves.
- Symptoms can be severe on younger tissue.
- Flowers show aberrant color patterns with white flecking and spotting.
- Infected tissue typically more susceptible to sunburn and winter damage.
- Virus is readily transmissible through grafts, including natural root grafts.
- Not mechanically transmitted in sap.
- Not transmitted through pollen or plant-to-plant contact.
- Modes of natural transmission are unknown.

TIPS

- Camellia clones free from virus can be obtained by propagating from meristems of vegetative buds.
- Remove and discard diseased plants.
- Keep plants free of virus-vectoring insect pests such as aphids.



Mosaic/Mottle Virus



SHRUB: Camellia (*C. japonica*)

DISEASE: Phytophthora (*Phytophthora cinnamomi*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Phytophthora is a fungus that causes root rot in Camellias. *Camellia japonica* varieties are the most susceptible.
- Although this disease usually appears in the landscape (due to poor drainage), it can also occur in the nursery (due to overwatering and poor management).
- The first symptom of the disease is slow growth. Plant growth will be stunted. In more advanced stages, leaves will turn yellow and one or more branches may wilt and die.
- Plants infected with root rot can't absorb water and eventually die from the stress.
- The roots of affected plants are black or dark brown and have a musty odor.
- This disease can enter the nursery on contaminated plant material or soil medium.
- If left unchecked, the disease could potentially wipe out an entire block of plants.
- Phytophthora can occur at any time of the year but is more problematic during hot, dry weather.



Phytophthora

TIPS

- To prevent this disease in the nursery, avoid overwatering and monitor containers routinely, checking the root system of plants for any signs of the disease.
- Avoid bringing infected plants into the nursery.
- At first sign of the disease, use a soil drench treatment of a registered fungicide.
- When possible, use resistant varieties of camellias. If problems occur frequently, grow mainly Sasanqua varieties since all are resistant to this type of root rot.

SHRUB: Camellia (*Camellia*)

INSECT: Tea Scale (*Fiorinia theae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Leaf drop.
- Thinning leaves.
- Scale on underside of leaf surface.
- Small scale approximately 1.3 mm long.
- Female scales are elongate, oval, and dark brown/gray to black in color.
- Male scales are narrow, linear, and snow white in color.
- Crawler activity (newly hatched scale) can be monitored by shaking infested leaves over a collecting surface.
- Heavy infestations will result in long, waxy filaments on the leaf, resulting in a cottony appearance.
- Female lays 10–16 yellow eggs, which remain protected beneath her body.
- Eggs hatch in one to three weeks.
- Bright yellow crawlers settle in feeding position on leaf days after hatching.
- 40–65 days to complete life cycle with multiple generations present during growing season.



Tea Scale

TIPS

- Inspect plant material prior to purchase or accepting shipment.
- This particular scale is common in the southeastern U.S. and is commonly introduced from plant material being shipped from this region.
- Pruning of heavily infested branches can offer some control.
- Apply topical applications in the spring to target the early stage nymphs.
- Like most scales, its armor-plated shell can make it difficult to control with conventional insecticides.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.

DWARF CRAPE MYRTLE

SHRUB: Dwarf Crape Myrtle (*Lagerstroemia*)

INSECT: Aphid (*Tinocallis kahawaluokalani*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Aphids are tiny (1/8 inch), pear-shaped insects that feed on the undersides of the leaves of most crape myrtle varieties.
- This pest reproduces rapidly and has the potential to create a damaging population.
- The first sign of aphid infestation is irregular discoloration of the leaves, typically in the form of yellow blotches. The yellow may quickly turn brown and the leaves may drop prematurely.
- As aphids feed on the sap of the leaves, they secrete a sticky substance called "honeydew."
- Eventually, a black sooty mold may grow on the honeydew, giving the leaves a burned appearance.
- A secondary insect drawn to the honeydew, ants may also appear on crape myrtles.
- Left unchecked, aphids can move from plant to plant and quickly damage large blocks of crape myrtles.



Aphids

TIPS

- Scout frequently for evidence of aphid feeding. Inspect the underside of the leaves closely.
- Look for the presence of shiny honeydew or growth of black sooty mold that will grow on the sugary excrement that will indicate the presence of an insect pest.
- Look for signs of beneficial insect activity (aphid mummies), they can play an important role in natural aphid control.
- Aphids can reproduce quickly, apply insecticide treatments once pest is observed.

SHRUB: Dwarf Crape Myrtle (*Lagerstroemia*)

DISEASE: Cercospora Leaf Spot (*Cercospora* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Cercospora fungus causes small circular spots that can reach 1/4 inch in diameter. They may be a combination of yellow, brown, or black. Spots develop when the fungus enters the leaf tissue.
- Over time, spots will join together, creating large blotches. Holes may even form in the leaves. Plants look unsightly and are weakened by cercospora.
- Infected leaves eventually drop off and severe defoliation may take place if the disease spreads throughout the plant.
- Cercospora most frequently occurs in moist, warm, humid weather.
- Wind and splashed water spread the cercospora.
- Cercospora survive the winter on twigs and surrounding plant debris.

TIPS

- Clean up and destroy old plant debris.
- Grow resistant crape myrtle varieties.
- Keep trees spaced to provide maximum ventilation.
- Use drip irrigation to avoid wetting foliage.
- Scout frequently and apply a registered fungicide in the spring when leaves are emerging.



Cercospora Leaf Spot

SHRUB: Dwarf Crape Myrtle (*Lagerstroemia*)

DISEASE: Powdery Mildew (*Erysiphe lagerstroemia*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- This fungus infests susceptible crape myrtles and can thrive in either humid or dry conditions.
- The disease occurs primarily in the spring and early fall but it can attack whenever conditions are favorable.
- Symptoms include a gray-white powdery material that coats leaves, stems, and flower buds.
- Powdery mildew drains the plant of nutrients and vigor. Leaves and shoots may be stunted and flowering may be affected.
- Premature leaf drop occurs if infestations are severe.
- The fungus attacks plants that are spaced too tightly together or are located in shaded areas.
- The fungus overwinters in buds and develops quickly in the spring. The wind spreads spores to healthy plants.

TIPS

- To control, use an approved fungicide on both the upper and lower leaves.
- The spray program should begin in the spring before buds open. Follow-up spraying may be needed at regular intervals until hot weather.
- Select resistant varieties to grow, and grow in well-spaced areas that receive full sun.
- If possible, avoid overhead irrigation.



Powdery Mildew



EUONYMUS

SHRUB: Euonymus (most cultivars)

INSECT: Euonymus Scale (*Unaspis euonymi*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Of all scales, this is the most destructive to euonymus.
- Adult scales appear on the stems and undersides of euonymus leaves. The narrow white scales are males, while the female scales are larger, brown and resemble an oyster shell.
- The female scales spend the winter attached to the plant, then lay eggs in early spring.
- In late spring, the young crawlers cover the plant or are borne by wind to other plants and mature in four–six weeks.
- The small, soft-bodied young suck sap from plants and cause discoloration and general lack of vigor in plants. The upper surface of the leaves will have small yellow spots corresponding to the scales feeding on the undersides. Leaves that are heavily infested may defoliate prematurely.
- In general, these scales limit vigor and heavy infestations may eventually kill certain varieties.
- Without careful scouting, euonymus scale may be difficult to detect until plants exhibit serious damage.
- Two–three generations per year.



Euonymus Scale

TIPS

- Check plants frequently, being sure to look at the undersides of leaves and stems.
- During the winter, check the base of the plant for hidden overwintering females.
- Apply topical treatments in the late spring targeting the early crawler stage. Repeat applications throughout the summer to control subsequent generations.

SHRUB: Euonymus (most cultivars)

INSECT: Powdery Mildew (*Oidium euonymi japonica* and *Microsphaera alni*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Powdery mildew is a major pest of euonymus cultivars. Some varieties are more susceptible than others.
- Symptoms include a white, powdery film on the tops of leaves.
- The white powder is actually millions of thin spores that harm the plant by sapping nutrients, causing leaf discoloration and death of the leaf or plant.
- Infection is favored by temperatures of 70–80° F and thrives in both humid and dry conditions, making it difficult to control.
- If left unchecked, it will reproduce rapidly and will spread by wind to other plants.
- In late summer the fungus forms small, black, spore-producing bodies. They remain dormant during the winter, but the following spring they produce more spores.
- This fungus is more devastating in low-light situations and is primarily a problem in the nursery during spring and fall.



Powdery Mildew

TIPS

- Space plants for maximum ventilation and allow for maximum light.
- If possible, avoid overhead irrigation.
- Grow resistant varieties.
- Treat affected plants with an appropriate fungicide.
- Remove and destroy fallen plant leaves that are infected.

HOLLY

SHRUB: Holly (*Ilex*)

DISEASE: Anthracnose (*Glomerella cingulata*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Pathogen infects both leaves and stems.
- Sunken depressions and girdling can occur on stems.
- Infected leaves wilt, turn brown, and die.
- Presence of many pinkish blisters on infected foliage and stems.
- Reproductive structures “acervuli” are produced on killed plant parts.
- Can survive on plant debris on the ground.
- Infection is initiated by conidia or ascospores—which are dispersed by insects, wind, and water.
- Germination occurs under wet conditions and plant surface is penetrated directly.
- Lesions will appear immediately or remain quiescent before colonizing host.
- Lesions give rise to secondary cycles.

TIPS

- Remove infected plant debris from around the plant.
- Avoid overhead watering.
- Apply foliar fungicide at the first sign of disease.



Anthracnose

SHRUB: Holly (*Ilex*)

DISEASE: Black Root Rot (*Thielaviopsis ephemeraeformis*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Loss of plant growth.
- Sparse foliage in canopy.
- Poor foliage coloration.
- Shoot and stem dieback.
- Death of fibrous roots.
- Darkening (brown to black) of main root system.
- Conidia serve as dormant survival structures in soil.
- Conidia germination is triggered by secretion of root exudate.
- Fungus grows intercellularly and causes small, dark lesions that coalesce and blacken roots.
- Conidia form within the lesions.
- Can be spread by shore flies in greenhouse situations.

TIPS

- Periodically inspect the root system for disease.
- Inspect planting stock.
- Avoid saturated growing conditions.
- Apply a fungicide drench at the first sign of disease development.



Black Root Rot



HOLLY

SHRUB: Holly (*Ilex*)

INSECT: Holly Pit Scale (*Asterolecanium puteanum*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Stems become rough, pitted, and distorted.
- Growth slows and foliage becomes sparse.
- Typically scale infestation is high before symptoms develop.
- Found on stems and usually cause a depression "pit" on the stem.
- Adults are yellowish-green in color and about 1.5 mm in size.
- Scale crawlers appear in late June.
- Little known about biology of pest.

TIPS

- Inspect plant material prior to purchase or accepting shipment.
- This particular scale is common on the eastern seaboard of the U.S.
- Pruning of heavily infested branches can offer some control.
- Apply topical applications in the spring to target the early stage nymphs.
- Like most scales, its armor-plated shell can make it difficult to control with conventional insecticides.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.



Holly Pit Scale



SHRUB: Holly (*Ilex*)

INSECT: Tea Scale (*Fiorinia theae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Leaf drop.
- Thinning leaves.
- Scale on underside of leaf surface.
- Small scale approximately 1.3 mm long.
- Female scales are elongate oval and dark brown/gray to black in color.
- Male scales are narrow linear and snow white in color.
- Crawler activity (newly hatched scale) can be monitored by shaking infested leaves over a collecting surface.
- Heavy infestations will result in long waxy filaments on the leaf, resulting in a cottony appearance.
- Female lays 10–16 yellow eggs which remain protected beneath her body.
- Eggs hatch in one–three weeks.
- Bright yellow crawlers settle in feeding position on leaf days after hatch.
- 40–65 days to complete life cycle with multiple generations present during growing season.



Tea Scale

TIPS

- Inspect plant material prior to purchase or accepting shipment.
- This particular scale is common in the southeast U.S. and is commonly introduced from plant material being shipped from this region.
- Pruning of heavily infested branches can offer some control.
- Apply topical applications in the spring to target the early stage nymphs.
- Like most scales, its armor-plated shell can make it difficult to control with conventional insecticides.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.

SHRUB: Holly (*Ilex crenata* and *cornuta*)

DISEASE: Phytophthora Root Rot (*Phytophthora cinnamomi*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Phytophthora is a water-mold fungus that causes root rot on hollies.
- It is most common in wet or poorly drained areas. Planting too deep or overmulching may also lead to the development of this disease.
- First noticeable is the yellowing of leaves, particularly at the shoot tips. Plants may begin defoliation as the disease gets stronger.
- Plants affected from Phytophthora will have black and musty smelling roots.
- Growth of the shrub will slow or cease entirely. One by one, limbs will begin to die back.
- Excess water moves this disease in soil, where it can reproduce and survive for decades.



Phytophthora Root Rot

TIPS

- To prevent this disease in the nursery, avoid overwatering and monitor containers routinely, checking the root system of plants for any signs of disease.
- Avoid bringing infected plants into the nursery.
- Be sure to plant hollies in amended, well-drained soil. Avoid setting them out in low areas.
- Fungicides can be effective as a preventive and curative treatment. Soil drenches may slow the spread of the disease.
- At first sign of the disease, use a soil drench treatment of a registered fungicide.

HOLLY

SHRUB: Holly (*Ilex cornuta*)

DISEASE: Leaf Spot (*Anthracnose*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Of the several fungi that attack holly species, anthracnose is one of the most common.
- This disease typically jumps on plants that are weak from nutrient deficiency, low temperatures, overwatering, or other cultural and environmental stresses.
- Leaf spot anthracnose occurs as brown, gray, or yellow spots that range in size from barely visible to a 1/2 inch in diameter. Several spots may join together to form blotches. Leaves may eventually turn yellow and die.
- This disease is most severe in warm humid weather.
- The fungus overwinters on leaves and twigs or material in the bottom of the container.
- In the spring, as temperatures warm, the spores enter the leaf tissue and spread to the stems. The disease is most active in temperatures between 55° and 90° F.
- If severe, plants may suffer partial defoliation.



Leaf Spot

TIPS

- When possible, remove and destroy infected leaves.
- Avoid wetting the foliage, use drip irrigation.
- Apply a foliar fungicide when leaves emerge in the spring and make follow-up applications as needed throughout the growing season.

SHRUB: Holly (*Ilex cornuta*)

INSECT: Scale (various species, including wax scale, greedy scale, and oleander scale)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Scales are sometimes difficult to detect. Adult female and most immature nymphs are immobile, wingless, and lack a distinctive head or recognizable body parts.
- Young scales and adult females are round or oval with an elongated or flattened body. They are white or gray in color.
- Males are normally mobile and have a single pair of wings. However, they are rarely seen, as they live only a few hours after mating.
- Damaging scales appear as small, hardened bumps on the stems and trunks of hollies.
- They cause damage by inserting their mouthpart into plants and sucking fluid.
- Scale is often detected in the winter months as less foliage may be on the plants and the female shell is visible.
- Symptoms of infestations usually include slow growth and yellowing leaves.



Scale

TIPS

- Scales can be difficult to control once they develop their protective waxy cover. Thus the timing of insecticide applications is critical.
- Apply topical applications in the spring to target the early stage nymphs.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.

HYDRANGEA

SHRUB: Hydrangea (*Hydrangea macrophylla*)

DISEASE: Alternaria Leaf Spot (*Alternaria*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Alternaria causes brown to black spots to form along the leaf margins and sometimes on the leaf petioles.
- Spots that develop elsewhere on the leaf are generally oval.
- The disease may cause leaves to fall prematurely. When the disease is severe, entire leaves may die.
- It is most probable that this fungus survives on fallen leaves.
- In the spring, spores infect new leaves.

TIPS

- Minimize leaf wetness by watering early to allow the foliage to dry by the evening or irrigate using drip or micro-irrigation.
- To protect new leaves, apply a foliar fungicide in the spring as leaves emerge.



Alternaria Leaf Spot

SHRUB: Hydrangea (*Hydrangea macrophylla*)

DISEASE: Cercospora Leaf Spot (*Cercospora*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Brown spots will appear, primarily along the leaf margins.
- Because leaf veins inhibit expansion, spots that form elsewhere on the leaf tend to be angular.
- If the disease is severe, entire leaves and flowers die.
- The fungus survives in fungal fruiting structures on twigs and fallen leaves.
- In the spring, rain splashes the spores to new leaves, which will become infected.

TIPS:

- Minimize leaf wetness by watering early to allow the foliage to dry by the evening or irrigate using drip or micro-irrigation.
- Apply fungicide sprays early at the first sign of disease and to protect new leaves.



Cercospora Leaf Spot



HYDRANGEA

SHRUB: *Hydrangea (Hydrangea macrophylla)*

DISEASE: Leaf Spot (*Anthracnose*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- In late spring, spots appear on leaves, which may begin to fall.
- Leaf spots may turn from yellow to red, tan, purple, and black. Several spots may merge together to form large blotches.
- Leaf spotting is most severe in moist, humid weather.
- Light infestations of anthracnose are more aesthetic than harmful. Heavy infestations can render plants weak and unsellable.
- Wind and splashed water spread this fungus. The spots form where fungus enters the leaf tissue.
- In warm, humid conditions, the disease can spread rapidly to all parts of the plant, as well as nearby hydrangea.
- Anthracnose overwinters on twigs and fallen plant debris. Spores become active when temperatures reach 50° F. They stay active until 85° F.



Anthracnose

TIPS

- To avoid wetting the foliage, use drip irrigation.
- When possible, remove and destroy infected leaves.
- To control this disease, use an approved fungicide when leaves emerge in the spring. In wet weather, reapplications may be needed every two to three weeks.
- To allow for maximum ventilation, create space between containers.
- If plants become severely infested, remove and destroy them.



INDIAN HAWTHORN

SHRUB: Indian Hawthorn (*Raphiolepis umbellata*)

DISEASE: Leaf Spot (*Entomosporium*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- *Entomosporium* leaf spot is the most common problem of Indian Hawthorn. It causes purplish, red spots on young and old leaves and spreads throughout the plant.
- Circular spots may grow together, eventually forming large dark blotches.
- Leaves turn yellow and, when heavily infected, fall.
- Lesions expand to brown-gray irregular spots 2–5 mm in diameter on foliage.
- Mature lesions often have red or dark brown halos at the border of green on leaf surface.
- Plants are stunted and weak; overall plant health declines when the disease becomes more severe.
- *Entomosporium* develops in warm, humid weather or when air circulation is poor.
- Wind, splashed rain, and overhead irrigation spread the disease.
- The disease develops most readily in temperatures between 55°–95° F.
- *Entomosporium* can affect large blocks of plants and may eventually kill significant numbers of them.
- Primary infection begins in spring when conidia are dispersed by splashing water to developing leaves.
- Overwinters in fallen leaves and in lesions on persistent leaves and young green stems.



Leaf Spot

TIPS

- Avoid overhead irrigation and space plants for proper ventilation.
- Select and grow resistant varieties.
- Remove and destroy heavily affected plants.
- Begin fungicide sprays when new leaves emerge in the spring. Repeated applications will probably be needed throughout the growing season.



JUNIPER

SHRUB: Juniper (*Juniperus*)

DISEASE: Canker (*Seiridium* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Girdling cankers on twigs, branches, or mainstems.
- Foliage death.
- Lens-shaped cankers that become sunken, leaving diseased bark dead with healthy bark tissue surrounding.
- Resin exudes from active lesions.
- Scattered black pustules can develop at infection site.
- Cankers on trunks of young, rapidly growing trees can be as great as two feet long.
- Severe infection can kill entire plants.
- Pathogen survives winters and dry summers in colonized bark.
- Most infections are caused by conidia during wet weather.
- Wounds on twigs and branches are common infection sites, but intact foliage can be infected.
- Fungi colonize bark and sapwood intracellularly and produce pycnidia and conidia within several weeks.
- Conidia are dispersed locally in splashing and running water.
- The conidia can survive several weeks, up to a year, in dry conditions.

TIPS

- Avoid overhead irrigation.
- Can be transmitted via pruning tools, infested seed, and on planting stock.
- Prune out and discard infected branches and stems. Be sure to cut into clean wood.
- Avoid wounding or water stress.
- No chemical control measures recommended for the disease in the landscape or nursery.



Canker

SHRUB: Juniper (*Juniperus*)

INSECT: Cypress Tip Miner (*Argyresthia* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Discoloration of foliage tips.
- Twig and branch dieback.
- Small holes in scaled foliage.
- Heavy infestations will result in general browning of entire plant.
- Silvery-tan moth approximately 6 mm long reproduces in spring and early summer.
- Eggs are laid on green tips of first- and second-year juniper growth.
- Larvae tunnel into leaf scales and mine until late winter or early spring of the following year.
- Larvae leave mines and spin white paper-like cocoons within foliage.
- Adult leaves cocoon and mates in the spring.
- One generation per year.

TIPS

- If you tip dieback of foliage, inspect closely.
- Insecticide application is most effective before or during egg-laying.
- Systemic insecticide is effective when larvae initiate feeding.
- Broad-spectrum insecticide effective when cocoons appear in spring.



Cypress Tip Miner

SHRUB: Juniper (*Juniperus*)

INSECT: Juniper Scale (*Carulaspis juniperi*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Loss of normal lustrous color.
- Leaves begin to yellow/brown.
- Infested foliage fails to put on new growth.
- Heavy infestation results in yellow and dead foliage.
- Occur primarily on leaves.
- Female is circular, white, and 1.5 mm in diameter.
- Males are white and linear.
- Females overwinter filled with eggs.
- Crawlers appear in spring (timing dependent on region).
- Egg laying and crawler emergence continues for 30–40 days.
- Crawlers seek new site on same host to feed, however are light enough to be blown in the wind to new hosts.
- Typically one generation per year.



Juniper Scale

TIPS

- Inspect plant material prior to purchase or accepting shipment.
- Pruning of infested stems can offer some control.

SHRUB: Juniper (*Juniperus*)

DISEASE: Tip Blight (*Phomopsis juniperivora*, *Kabatina juniperi*, and *Sclerophoma pythiophila*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Lesions on immature foliage in the form of tiny yellow spots.
- New shoots turn a light green–yellow then fade to reddish-brown.
- Grayish band develops at the base of the necrotic shoot (marks infection site).
- Killed shoots remain on plant for several months eventually turning gray.
- When lateral shoots of susceptible plants become infected, the fungus can grow into stems and sometimes cause canker.
- Can be lethal to seedlings.
- *Phomopsis juniperivora*: Infection occurs when new succulent growth is present. Infection in spring is from conidia from shoots or twigs killed during the previous year. Late-season infections are caused from conidia formed in the spring on infected tissue. It can sporulate on dead tissue up to two years. Conidia are dispersed by splashing or wind-driven rain and can tolerate temporary drying out. During warm wet weather, symptoms may show three–five days after infection, but longer incubation periods are found. Pycnidia appear on shoots three–four weeks after infection.
- *Kabatina juniperi*: Usually found on tips that turn brown in spring as new growth begins. Cycle similar to *Phomopsis*. Fruiting bodies are numerous in early spring and diminish thereafter.
- *Sclerophoma pythiophila*: Attacks year-old stems and sometimes older twigs and is associated with twig dieback in late spring and summer. Cycle similar to *Phomopsis*. Forms slimy colonies and produces conidia without fruiting bodies.



Tip Blight

TIPS

- Avoid overhead irrigation.
- Remove infected and dying branch tips, cutting back into clean tissue/wood.
- Application of certain fungicides in the spring will provide protection against many of these fungal pathogens. Consult the product labels for specific instructions regarding control of the various fungal disease.

LIGUSTRUM AND LILAC

SHRUB: Ligustrum (*Ligustrum*)

DISEASE: Leaf Spot, aka "Frog Eye" (*Cercospora* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Circular lesions on leaves first appear as chlorotic spots.
- Lesions enlarge 5–15 mm across, becoming depressed in leaf.
- Leaf lesions are tan to brown in center with wide purple-red margins.
- Chlorotic halo forms around margins of lesion on the leaf.
- Small brown stromata arise on surface of lesion.
- Leaves drop.
- Thinning growth.
- Overwinters in fallen leaves and in lesions on persistent leaves and young green stems.
- Primary infection begins in spring by splashing water to developing leaves.
- Lesions form on infected foliage 10–12 days after inoculation.
- Two–three weeks after infection, stromata rises to lesion surface.
- Secondary cycles of infection then occur.



Leaf Spot

TIPS

- Avoid overhead irrigation.
- Remove dropped leaves and infested foliage.
- Avoid summer pruning (this promotes a secondary flush of new susceptible growth).
- Apply foliar fungicides as needed for control on new growth.

SHRUB: Lilac (*Syringa vulgaris*)

DISEASE: Bacterial Blight/Leaf Spot (*Pseudomonas syringae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- This disease is caused by a bacterium (*Pseudomonas syringae*) that is particularly problematic when conditions are cool and damp.
- In early spring, leaves develop brown spots that are surrounded by large areas of yellow. Young leaves and stems are usually affected first.
- Young stems that are affected bend over, wither, and die. Buds may turn dark brown and die without opening. Flower parts may also be affected with this disease.
- Spots coalesce to form large lesions.
- Death and shriveling of leaves.
- Infected stems, leaves, petioles turn black and die.
- Lesions on mature wood are uncommon.
- Lesions on woody green stems may appear as black streaks.
- *Pseudomonas* overwinters in lilac buds, twigs, and plant debris, as well as in other hosts.
- Wind, rain, and irrigation splashed on the leaves all spread this disease.
- Requires free water for multiplication and pathogenic activity.
- Bacteria secrete proteins, killing host cells. Bacteria replicate in the presence of the host and maintain a moist state.



Bacterial Blight/Leaf Spot

TIPS

- Minimize leaf wetness by watering early to allow the foliage to dry by the evening or irrigate using drip or micro-irrigation.
- Maintain health of plant.
- Ensure proper sterilization of tools with a bleach or other sterilizing agent.
- Scout frequently to detect onset of disease.
- If possible, prune and destroy heavily affected foliage.
- Space plants to allow for good air circulation.
- Foliar applications of copper-based products can help limit the spread of this disease.
- For control, use a registered bactericide as soon as the disease is detected.

SHRUB: Lilac (*Syringa vulgaris*)

DISEASE: Powdery Mildew (*Microsphaera syringae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Powdery mildew is a common fungus that attacks many nursery crops, including lilacs. The fungus obtains nutrients from the plant causing leaves to turn yellow and drop prematurely.
- Leaves become covered with a thin layer of irregular gray-white powdery material. New growth is often stunted.
- The wind spreads the white powdery spores from branch to branch and plant to plant.
- In late summer, small black spots (spore producing organisms) are found scattered over the white patches as the disease prepares for overwintering.
- This disease occurs in a variety of environments, but primarily in humid conditions in the spring and fall.

TIPS

- Scout plants frequently to detect early onset of disease.
- Provide good ventilation between plants.
- Apply registered fungicides at the first signs of disease, being sure to get complete coverage on the upper and lower surfaces of the leaves.



Powdery Mildew

SHRUB: Lilac (*Syringa*)

INSECT: Scale, several species: (*Asterolecanium arabidis*,
Chionaspis lintneri, *Lepidosaphes ulmi*, *Pseudaulacaspis* spp.,
and *Pulvinaria innumerabilis*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- *Asterolecanium arabidis*: Pit-making pittosporum scale—infests stems, twigs, and leaf petioles. Causes retardation of plant growth with distorted shoot development. Scale is convex and typically white to brown in color and 3–4 mm long.
- *Chionaspis lintneri*: Lintneri scurfy scale—primarily infesting stems. Small white scale, linear with thin shell. Little damage to host, more cosmetic.
- *Lepidosaphes ulmi*: Oystershell scale—found on stems and leaves. Symptoms include stunted growth, leaf drop, and whitening of branches. Scales resemble oyster shells with distinct bands within the armor.
- *Pseudaulacaspis* spp.: White peach scale—primarily on bark of trunk and larger limbs. Encrusting of the stems is common. Heavy infestations result in branch dieback and death of plants in some instances. Sometimes masses of cottony secretions are apparent.
- *Pulvinaria innumerabilis*: Cottony maple scale—soft scale found both on foliage and stems of lilac. Cottony egg sacs will be visible on stems of infected plants resembling a mealy bug infestation. Infected plants will have slower growth, and discolored foliage. Heavy infestations often result in stem dieback and honeydew will be exuded when consumed by sooty mold.
- *Asterolecanium arabidis*: Little known.
- *Chionaspis lintneri*: One generation per year. Eggs held by female. Crawlers active less than 24 hours in spring.
- *Lepidosaphes ulmi*: Overwinters in egg stage beneath female. Multiple generations per year. On some hosts and in some regions, eggs produced asexually.
- *Pseudaulacaspis* spp.: Overwinters as adult female. In spring, a female deposits hundreds of eggs. Multiple generations occur per season and the number of generations is dependent on the region. Crawlers appear sporadically through a season due to multiple generations of the pest.
- *Pulvinaria innumerabilis*: Before fall, females migrate back to the stems. The females overwinter on stems and in spring they grow considerably, producing egg sacs with more than 1,000 eggs with the characteristic cottony appearance on the stem. One generation per year and crawlers appear in June–July when they move to leaves.



Scale

TIPS

- Inspect plant material prior to purchase or accepting shipment.
- Pruning of stems can offer some control.
- Many armored scales can be difficult to control once become mature.
- Apply topical applications in the spring to target the early stage nymphs.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.

PHOTINIA

SHRUB: Photinia

DISEASE: Fire Blight (*Erwinia amylovora*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Fire blight is a bacterial disease that occurs most often in early spring if the weather is warm.
- Fire blight can be very destructive to many trees and shrubs, including varieties of photinia.
- Near the top of the plant, blossoms, stems, and leaves suddenly wilt, turn black, and look as if they were scorched. The leaves will curl and the stems will bend over in the shape of a shepherd's crook.
- The bark at the base of the blighted twigs becomes water soaked, dark, and sunken. Cracks may develop at the edge of the sunken area.
- The bacteria overwinter in cankers on the branches. In the spring, the bacteria oozes out of the cankers and then is spread by insects to other parts of the plant or nearby plants.
- The bacteria will spread rapidly in warm, humid weather of more than 65° F.
- Tender or damaged leaves may be re-infected in midsummer.



Fire Blight

TIPS

- In early spring, scout trees to detect the disease before it spreads.
- Prune out infected leaves and stems, cutting back several inches to good wood.
- To avoid spreading the disease, disinfect pruning shears after each cut.
- A protective spray of a bactericide containing basic copper sulfate or streptomycin sprayed before bud break will help prevent infection.
- Repeat treatment every five to seven days until symptoms are no longer present.
- In the fall, prune out any remaining infected branches.

SHRUB: Photinia

DISEASE: Leaf Spot (*Entomosporium*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- *Entomosporium* causes purple-brown spots on the leaves. These spots may grow together in time to form large blotches.
- Leaves often turn yellow and the plant can begin to defoliate, causing it to become weak and look unsightly.
- Wind, splashed rain, and improper irrigation spread the fungus. Spots begin to develop where the fungus enters the leaf tissue.
- *Entomosporium* is most active when the weather is warm and humid. Damage primarily occurs when outside temperatures are between 55° and 90° F.
- Severe spotting can spread to the entire plant or even to adjacent containers when plants are spaced too tightly.
- If left untreated, this disease can render a block of plants unsellable or lead to death of the plant.



Leaf Spot

TIPS

- If possible, avoid overhead watering and allow extra spacing between plants to create good air circulation.
- Remove and destroy infected foliage and dropped leaves.
- When leaves flush in the spring, begin a fungicide spray program.

SHRUB: Photinia

INSECT: Scale (several types)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Most types of scale are white and have flat, hard bodies. These insects attach themselves to the stems and leaves of plants, such as photinia. Once imbedded, they suck juice from the hosts.
- Scale insects will cause plants to turn yellow, become stunted, and lose vigor.
- A scale may be difficult to detect as it hides inside the inner part of plants and plants may take a while to show symptoms.
- The female lays her eggs on the trunk and twigs and then attaches herself over the eggs so they can overwinter.
- In early spring, young insects, called “crawlers,” emerge and move to other areas of the plant, where they begin sucking sap.
- If left unchecked, scales may kill a plant in two–three years.
- The male is mobile but dies shortly after mating, so is rarely a problem for the plant.



Scale

TIPS

- Scout frequently for early signs of scale.
- Prune out infested limbs and destroy them.
- Many armored scales can be difficult to control once they become mature.
- Apply topical applications in the spring to target the early stage nymphs.
- Use systemic insecticides as a foliar spray or soil drench around the root zones.



RHODODENDRON

SHRUB: Rhododendron (*Rhododendron*)

DISEASE: Phytophthora (*Phytophthora cinnamomi*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Phytophthora is a major disease of rhododendron growing both in the nursery and in the landscape.
- It is a water-mold disease that thrives in wet conditions and in poorly drained soils.
- The most common symptom is a wilted plant with curved leaves and a yellow color. Roots will appear black and soggy and have a musty odor.
- Plants may appear to be suffering from lack of water, but ironically, too much water is the problem.
- The fungus destroys the roots as it works its way into the stems.
- Symptoms may develop over a period of several weeks, but it may take a few months before the problem is detected.

TIPS

- It is important to prevent this disease initially, because chemical controls can be ineffective once the problem is widespread.
- Choose resistant varieties and monitor irrigation carefully. Cut back on watering during times of excessive rainfall.
- Regularly inspect roots to look for signs of the disease.
- Avoid bringing infected plants into the nursery.
- At first sign of the disease, use a soil drench treatment of a registered fungicide.



Phytophthora



ROSE

SHRUB: Rose (*Rosa*)

INSECT: Aphid (*Macrosiphum rosae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Discolored leaves.
- Distorted foliage and flowers.
- Viral disease.
- Colonies of insects on stems and newly emerging foliage/buds.
- Pink and green forms of aphid.
- Presence of “mummies”— dead or parasitized aphids.
- Overwinters as eggs.
- Stem mother hatches from egg in spring.
- Asexual reproduction though male and female forms exist.
- In the event of high populations, winged forms develop to find new hosts.
- Continual generations occur throughout summer.

TIPS

- Inspect plants regularly for the presence of insects.
- Look for the presence of shiny honeydew or growth of black sooty mold that will grow on the sugary excrement that will indicate the presence of an insect pest.
- Look for signs of beneficial insect activity (aphid mummies); they can play an important role in natural aphid control.
- Aphids can reproduce quickly, apply control treatments once pest is observed.



Aphids

SHRUB: Rose (*Rosa*)

DISEASE: Downy Mildew (*Peronospora sparsa*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- During cool, damp spring weather, purplish-brown spots on the upper surface of the leaves appear.
- Infected leaves may turn yellow and defoliate.
- A fuzzy mat of spores (sporangia) are produced on the undersides of the leaves when conditions are humid.
- Severe stunting, distortion of new growth, and purplish areas on the twigs can occur if the disease becomes systemic.
- The disease is spread in the spring by airborne spores.
- Downy mildew survives on infected plants or as thick-walled spores (oospores) in and around the growing area.

TIPS

- Scout plants frequently in the spring to detect the early onset of disease.
- Provide plants with adequate spacing to allow for good air movement.
- Minimize leaf wetness by watering early to allow foliage to dry before evening or irrigate using drip or micro irrigation.
- Remove fallen leaves or infected plants/parts from the growing area.
- Apply preventive fungicides in the spring when conditions are conducive to infection and disease development or at the first sign of disease.



Downy Mildew

ROSE

SHRUB: Rose (*Rosa*)

DISEASE: Powdery Mildew (*Sphaerotheca pannosa*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Powdery mildew creates white, talcum-like spots on leaves, stems, and flower parts.
- Over time, the fungal growth can coat much of the plant's surface.
- Colonies often develop on the underside of the leaf first, but the upper side of the leaf will have a corresponding chlorotic or necrotic spot.
- Heavily infected plants may become stunted and will not grow.
- The powdery mildew fungi survive on fallen leaves, as well as on immature sexual fruiting structures on the surface of the plant. In the spring, the airborne spores land on new leaves and twigs and attack the plant.
- Powdery mildew prefers temperatures of 62°–75° F and relative humidity greater than 70%.

TIPS

- Collect and destroy fallen leaves in autumn.
- Where powdery mildew is a problem, resistant varieties (if available) should be grown.
- Begin fungicide applications when the first white patches are noticed during the growing season.
- Repeat application of fungicides as indicated on the product label during cool humid weather.



Powdery Mildew

SHRUB: Rose (*Rosa*)

INSECT: Whitefly (*Trialeurodes vaporariorum*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Yellowing and drying of foliage.
- Honeydew residue on leaf surfaces.
- Presence of sooty mold feeding on honeydew.
- White flies swarm from foliage when brushed.
- Small (1–3 mm) powder-white insects on underside of leaf surface.
- Eggs are laid on underside of leaf surface and are light yellow, fading to gray as they incubate.
- One–three weeks later, eggs hatch depending on season and temperature.
- Nymphs crawl for several hours until they settle to feed.
- They will fix when settled until maturity.
- Nymphal period is three–four weeks.
- Pupa appears and remains in a case fixed to the leaf. Adults emerge from the case.
- Multiple generations are simultaneously occurring.

TIPS

- Inspect plants regularly for the presence of insects.
- Apply insecticide treatments early once pest is observed.



Whitefly

SPIREA

SHRUB: Spirea (*Spiraea*)

DISEASE: Fire Blight (*Erwinia amylovora*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Blight of blossoms, fruitlets, fruit spurs, and leafy shoots.
- Affected flowers and flower clusters appear water-soaked and darkened.
- Lesions on fruit progress onto peduncles and fruit spurs then to branches.
- Tips of diseased shoots droop, darken, and turn brown to black.
- Plant may appear scorched in the event of many infected shoots.
- Cankers form in twigs and branches.
- Host defense can heal around cankers, leaving a corky appearance.
- Bark at edges of stem lesions can crack during dormant season.
- Twig dieback is common in heavily infested plants.
- Bacteria overwinter in diseased tissue at the margins of cankers.
- Bacteria can also overwinter in asymptomatic buds and twigs that were infected with blight the previous season.
- Bacterial activity resumes in spring when ooze drops from infected cankers onto new growth.
- Ooze is transmitted by animals, splashing, running water, humans, etc.
- Pollinators are the most effective transmitters of the disease.
- Bacteria enter plants in flowers, fruits, leaves, and multiply rapidly.
- Bacteria move intercellularly in a watery matrix and degrade host material.
- Blight appears one–three weeks after initial infection.

TIPS

- Buy resistant plant cultivars.
- Keep plant material healthy (pest infestations and wounded plants are more susceptible).
- Prune out infected plant stems and branches.
- Disinfect pruning tools between use.
- Avoid warm, humid weather conditions during bloom.



Fire Blight

SHRUB: Spirea (*Spiraea*)

DISEASE: Leaf Spot (*Cylindrosporium filipendulae*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Light yellow lesions on both leaf surfaces.
- Lesions will darken and turn brown when tissue dies.
- Lesions are typically 1–2 mm in diameter and during heavy infestations will coalesce.
- Leaves can appear blighted in the event of heavy disease pressure.
- Defoliation is common in badly infected specimens.
- Waxy appearance sometimes observed from fruiting bodies.
- Overwinter in fallen leaves during host dormancy.
- Late spring and early summer spores discharge to actively growing foliage, initiating first infection of the year.
- Secondary infections occur.

TIPS

- Keep foliage dry.
- Remove infected leaf litter and fallen leaves from plant.
- Spray protectant fungicides in late spring and early summer to prevent disease.



Leaf Spot

SPIREA

SHRUB: Spirea (*Spirea x bumalda*)

INSECT: Spirea Aphid (*Aphis spiraecola* Patch)

DESCRIPTION, SYMPTOMS, AND SIGNS

- These are considered “green aphids.” They are about 1/8 inch long and are usually found near long shoots or on terminal branches.
- The young nymphs can be confused for other species of aphids because they show similar characteristics and have a bright green color.
- The eggs are tiny, black, and shiny.
- Adults and nymphs cause discoloration of the leaves, distortion of the foliage, and general loss of plant vigor.
- Like most aphids, control is needed to combat these rapidly reproducing insects.

TIPS

- Inspect plants regularly for the presence of insects.
- Look for the presence of shiny honeydew or growth of black sooty mold that will grow on the sugary excrement that will indicate the presence of an insect pest.
- Look for signs of beneficial insect activity (aphid mummies); they can play an important role in natural aphid control.
- Aphids can reproduce quickly, apply control treatments once pest is observed.



Spirea Aphids

SHRUB: Sweetspire (*Itea*)

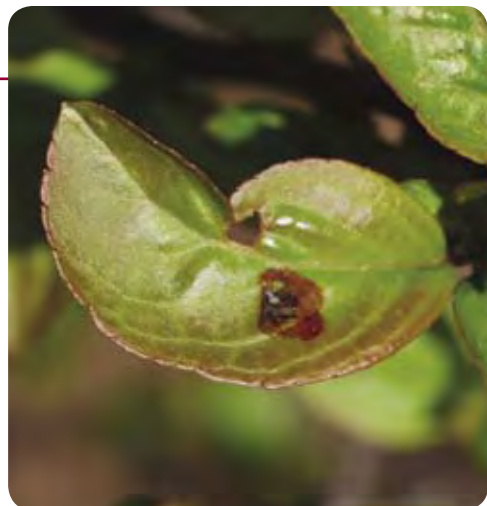
DISEASE: Leaf Spot (*Phyllosticta* spp.)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Small necrotic lesions on leaf surface.
- These lesions (leaf spots) are contained to a small area—the plant’s defense mechanism generally contains the infection.
- Diseased leaves may be abscised from the plant.
- Typically, little loss of photosynthetic ability.
- Generally, no plant stunting or dieback.
- Overwinter in leaf material beneath the plant as immature pseudothecia or on previously infected organs.
- In spring, ascospores are liberated into the air while new foliage is developing and conditions are wet.
- Ascospores cause infection if they fall on leaves that remain wet for several hours.
- Lesions develop in 10–20 days.
- New pycnidia develop in late spring and can initiate secondary disease cycles.

TIPS

- Plant disease-free stock.
- Avoid overhead irrigation.
- Keep plants mulched and free of stress.
- Remove senesced leaves.
- Apply fungicide before or during early stages of infection.



Leaf Spot

VIBURNUM

SHRUB: *Viburnum* (*Viburnum*)

Note: Some viburnum cultivars are evergreen.

DISEASE: Gray Mold (*Botrytis cinerea*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- The disease causes brown spots to form on flower parts and leaves.
- Gray, fuzzy fungal growth appears on young leaves, twigs and flowers, particularly if they have been damaged by frost.
- Masses of dusty, gray spores can be seen on the shrub tissue.
- It commonly appears on dead or dying tissues and when the weather is very mild and moist in the spring, it opportunistically invades damaged tissue or otherwise healthy tissue.
- If infected plant parts fall on healthy leaves and twigs, the fungus readily spreads to the healthy tissue.
- Over a short period of time, gray mold produces thousands of spores that are spread long distances by wind and short distances by wind and splash.
- *Botrytis* infects most severely between temperatures of 65°–75° F, when the leaves are wet or the relative humidity is greater than 85%.



Gray Mold

TIPS

- Inspect the plants regularly for disease development.
- Apply fungicide sprays on a 14 day interval when conditions are favorable for disease development.

SHRUB: *Viburnum* (*Viburnum* spp.)

INSECT: Snowball Aphid (*Neoceruraphis viburnicola*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Mature aphids are approximately 2.5 mm long. They have a bluish-white body that is dusted with a white powder.
- They can be found clustered in large numbers at the tips of branches.
- Snowball aphids feed by injecting saliva into viburnum and sucking fluids from sap cells.
- They cause the foliage to curl and become deformed and branches to bend and twist.
- These aphids also secrete “honeydew,” a sugar-rich substance that attracts ants, yellow jackets, and wasps.
- A sooty mold may appear on the surface of the leaves, growing on honeydew.
- In the fall, aphids lay eggs on the twigs and buds of viburnum.
- The eggs overwinter until the spring and hatch when the buds open. Within three weeks after bud break, the leaves of affected plants become grossly distorted.
- Two months after the eggs hatch, all the progeny migrate away from the viburnum.
- In September, they return to the viburnum and give birth to the sexual forms that produce the overwintering eggs.



Snowball Aphids

TIPS

- Treat aphid infestations when first detected, usually at budbreak.
- Make a second application about 7–10 days after the first one. Be sure to cover the foliage with the treatment.
- Do not apply acephate to *Viburnum suspensum* because of potential flower damage
- Do not overfertilize plants with nitrogen.
- Beneficial insects can play an important role in natural aphid control.
- Inspect plants regularly for the presence of insects.
- Look for the presence of shiny honeydew or growth of black sooty mold that will grow on the sugary excrement that will indicate the presence of an insect pest.
- Look for signs of beneficial insect activity (aphid mummies)—they can play an important role in natural aphid control.
- Aphids can reproduce quickly—apply control treatments once pest is observed.

VIBURNUM

SHRUB: Viburnum (*Viburnum*)

INSECT: Southern Red Mite (*Oligonychus ilicis*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- This is the most common spider mite species that feeds on viburnum.
- Adults are 0.4–0.8 mm long and oval.
- This pest primarily injures the plant by stippling the foliage. Heavily infested foliage will look bronze.
- Many generations are produced each year, but this pest is most abundant during cooler periods of the growing season.
- It overwinters as red eggs that are laid on the lower surface of the leaves.
- Can also be a serious pest of azaleas.

TIPS

- Inspect plants regularly for the presence of mites, particularly the undersides of the interior canopy.
- Mites can reproduce quickly, apply miticide treatments once pest is observed.
- Treat in spring before populations begin to increase. Repeat applications may be necessary.
- To reduce the number of viable overwintering eggs, apply miticide treatments in the early fall, before temperatures drop below 65° F.



Southern Red Mites

SHRUB: Viburnum (*Viburnum*)

INSECT: Viburnum Leaf Beetle (*Pyrrhalta viburni*)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Adults are 4.5–7 mm long. Their head, thorax, and abdomen are olive brown.
- Mature larvae are 10–12 mm long and, in the spring, feed on the foliage in groups.
- The leaf beetle overwinters in the egg stage in small masses that are laid in straight rows on terminal twigs.
- A female can lay up to 500 eggs. Eggs hatch during the first half of May.
- Both larvae and adults feed on the host plant foliage.
- Larvae consume all but the major veins of the leaves.
- Once leaves drop in the fall, it is easier to notice the sites on the terminal twigs where eggs have been laid.
- Viburnums that are repeatedly defoliated for several years may die.

TIPS

- Before egg masses on the twigs hatch in the spring, prune them out from late October through March.
- Apply treatment from late April through early May, when young larvae are actively feeding on the foliage.



Viburnum Leaf Beetles

VIRGINIA SWEETSPIRE

SHRUB: Virginia Sweetspire (*Itea virginica*)

INSECT: Leaf-feeding Beetles (several types)

DESCRIPTION, SYMPTOMS, AND SIGNS

- Although itea is generally a tough, resistant plant, leaf-feeding beetles, such as the Japanese beetle or the willow leaf beetle, can prey on the young itea leaves.
- Most leaf-feeding type beetles overwinter in the ground or in nearby leaf litter.
- The larvae of these beetles feed on roots of grass and plant material, but emerge as adults to feed on plant foliage.
- They are more of a problem during the warmer months of spring (for willow leaf beetle) and early summer (for Japanese beetle) as adults.
- Most often they attack young, succulent foliage, creating notches or skeletonizing leaves.
- If left unchecked, symptoms may include skeletonized leaves or partial defoliation.
- Although beetles are only a pest for a few weeks at a time, the damage they inflict may weaken itea and cause enough damage to make the plants unsellable.



Leaf-feeding Beetles

TIPS

- Scout the nursery frequently, looking for early infestations of insects.
- Learn to distinguish the beneficial beetles from the damaging pests.
- Treat plants with an appropriate insecticide before insects build up large populations.
- To discourage overwintering, keep perimeter areas mowed cleanly.
- Rotate chemical controls to prevent resistance to the product.



COMMON WEED IDENTIFICATION AND MANAGEMENT

COMMON WEEDS THAT THREATEN NURSERY OPERATIONS:

BARNYARDGRASS (*Echinochloa crus-galli*)

- An upright summer annual grass, growing as high as 60 inches in height.
- Long, flat leaves and upright stems that are often purplish at the base.
- Commonly found in wet areas.
- Can produce up to 40,000 seeds per year.
- Pre-emergence or selective post-emergence herbicides will control barnyardgrass.



BITTERCRESS (*Cardamine flexuosa* or *C. oligosperma*)

- Winter annual that is problematic from fall through early spring in overwintering structures throughout North America.
- Identified by green and deeply lobed foliage.
- Grows in individual clumps up to several inches tall and wide.
- Reproduces by seed and can germinate year-round in container nurseries. Disseminates seed up to three feet from host plant.
- Apply pre-emergence herbicides prior to overwintering to prevent severe infestations. Sanitation is also crucial to preventing spread.



COMMON CHICKWEED (*Stellaria media*)

- Germinates during November and matures by March or April.
- Prolific in field soils.
- Unique stem hairs occur in one or two straight lines. Stems root at internodes. Flowers appear to have 10 petals, but are actually five deeply lobed petals.
- Sanitation is key. Brittle stems and roots make hand weeding difficult. Pre-emergence herbicides with oxadiazon are ineffective in controlling chickweed.



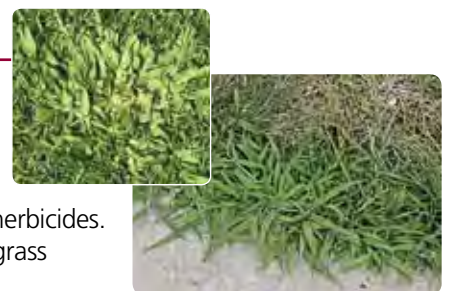
COMMON GROUNDSEL (*Senecio vulgaris*)

- Annual that germinates year-round, but is most prolific during cool weather in the fall and spring.
- Seeds attached to a cotton-like pappus from just a few groundsel plants can drift long distances in the wind, creating a big problem for both field and container nurseries.
- Good sanitation will reduce populations of common groundsel in containers.



CRABGRASS (*Digitaria* spp.)

- The most prevalent weed species in North America.
- Grow well in nursery fields and containers as prostrate or tall-growing plants.
- Able to produce 150,000 seeds per season that germinate in the late spring and early summer.
- Can be controlled with pre-emergence herbicides or selective post-emergence grass herbicides.
- Apply pre-emergence herbicides when the local forsythia blooms are wilting for crabgrass control in field production.



Nursery operations of all sizes face a constant, year-round threat from a host of weeds such as chickweed, creeping wood sorrel, and spurge. In order to produce beautifully strong ornamental crops, nurseries must be diligent in preventing and controlling these problem weeds. To succeed, nurseries must first identify and understand these threats.

CREeping WOOD SORREL (*Oxalis corniculata*)

- Perennial weed that is common throughout the U.S.
- Distinctive green-to-purple, clover-like foliage. Can grow several inches high and spreads in small clumps.
- Reproduces quickly by seeds and spreading stolons.
- Spreads via nursery liners. Pre-emergence herbicides are virtually ineffective in controlling regeneration when infested liners are put into containers.



LONG-STALKED PHYLLANTHUS (*Phyllanthus tenellus*)

- Erect perennial primarily found in greenhouses and container ornamentals in the Southeastern U.S.
- Has alternately arranged, hairless, oval- to elliptical-shaped leaves with two rows of alternately arranged leaflets.
- Small, inconspicuous, white to greenish-white in color with star-shaped flowers.



NORTHERN WILLOW HERB (*Epilobium ciliatum*)

- Perennial prevalent in the Northeast, Upper Midwest, and along the West Coast.
- Has pink flowers that mature into cigar-shaped seed pods. Grows upright, overshadowing other container plants.
- Seeds attached to hair tufts are dispersed by wind, germinating within four days after landing.
- Aggressive control measures are necessary for non-crop areas. Post-emergence control can be achieved with glyphosate. Thorough hand weeding is essential.



PEARLWORT (*Sagina procumbens*)

- Common in cooler regions of the Pacific Northwest and Northeast U.S.
- Diminutive weed grows slowly and prostrate along the substrate surface.
- Spreads up to 30 inches from host plant via splashing water.
- Often infests nursery liners, especially the substrate, which is a common point of entry into nursery containers. Difficult to remove from containers.
- Inspect to make certain that liners are weed-free before potting.



POA ANNUA (Also known as annual bluegrass)

- A widespread low-growing to an upright plant in cooler temperate climates and distributed throughout most of the U.S.
- Distinguished from other grasses by the typical leaf tip shaped like the bow of a boat.
- Dense with low spreading tufts 3 to 12 inches tall.
- Multiple biotypes from a winter annual weed in Southern U.S. to a perennial weed in cooler regions.
- Pre-emergence or selective post-emergence herbicides will control *Poa annua*.



PROSTRATE SPURGE (*Chamaesyce maculata*)

- Summer annual in the family *Euphorbiaceae* that grows prostrate along the substrate surface.
- Severed stems produce a milky sap.
- Seed are expelled forcefully from mature fruit, germinate within five days after release, and mature in four weeks.
- Apply pre-emergence herbicides soon after potting, prior to spurge germination. Sanitation is extremely important to controlling spurge.



PURPLE CUDWEED (*Gnaphalium purpureum*)

- Low-growing summer or winter annual or biennial.
- Common in the South, but found throughout U.S.
- Rosette of grayish-green, woolly foliage has clusters of small, tannish-white flowers.
- Identified by distinct woolly, white foliage.



YELLOW NUTSEDGE (*Cyperus esculentus*)

- A perennial weed species that is native to warm temperate to subtropical regions.
- Grows up to 35 inches tall with flowers that appear as a cluster of flat, oval seeds surrounded by four hanging leaf-like bracts.
- Solitary triangular stems grow from a tuber, an underground plant structure and primary means of propagation.
- Foliage is light green, shiny, and can often be mistaken for grass.
- Difficult to remove permanently due to its layered root system, with tubers connected to fragile roots prone to snapping when pulled on, making it difficult to grab the entire root.
- Quickly regenerates, even if a single tuber remains.



BARRICADE® HERBICIDE

One of the most effective solutions to prevent these weeds is Barricade® herbicide, the longest-lasting pre-emergence herbicide on the market. Barricade delivers low-rate, season-long efficacy against more than 30 of the most common weeds. It works by preventing development and growth of newly germinated weeds. Barricade also has an easy-to-use, non-staining formula in a unique flowable formulation. One application lasts all season.

FUSILADE® II HERBICIDE

Selective herbicide for control of annual and perennial grass weeds over the top of ornamental plantings. Eliminates the time and expense of costly hand weeding. Systemic post-emergence grass weed control.

PENNANT MAGNUM® HERBICIDE

Pre-emergence herbicide offering long-lasting control of yellow nutsedge, tough annual grasses, and broadleaf weeds. A shoot inhibitor—a different mode of action than most pre-emergence herbicides. Can be used on a wide range of ornamental plants. MAGNUM® technology provides superior control of labeled weeds at 33% reduction in use rate. With an easy-to-use liquid formulation, can be used alone or in approved tank-mix combinations.

REWARD® HERBICIDE

A fast-acting, non-selective herbicide that does not volatilize and works in just hours. Use Reward® around sensitive plants. Effective aquatic weed control. Labeled for greenhouse and nursery use.

TOUCHDOWN PRO® HERBICIDE

A non-selective foliar systemic herbicide with a unique glyphosate IQ® formulation for fast plant intake. Spreads evenly and stays put for consistent, reliable weed control. Labeled for greenhouse and nursery use.

Disease Solutions

Disease	Solution
Alternaria Leaf Spot (<i>Alternaria</i>)	Banner MAXX®, Daconil®, Heritage®, Medallion®
Anthracnose (<i>Glomerella cingulata</i>)	Banner MAXX, Daconil, Heritage
Anthracnose Leaf Spot (<i>Anthracnose</i>)	Banner MAXX, Daconil, Heritage
Bacterial Leaf Spot (<i>Pseudomonas syringae</i>)	Copper or Mancozeb based products
Black Root Rot (<i>Thielaviopsis ephemeriformis</i>)	Medallion
Botrytis Blight (<i>Botrytis cinerea</i>)	Banner MAXX, Daconil, Heritage, Medallion
Canker (<i>Seiridium</i> spp.)	Daconil, Medallion
Cercospora Leaf Spot (<i>Cercospora</i> spp.)	Daconil, Medallion, Heritage
Crown Gall (<i>Agrobacterium tumefaciens</i>)	None—disease exclusion only
Entomosporium Leaf Spot	Banner MAXX, Daconil, Heritage
Gray Mold	Daconil, Medallion
Leaf Spot or Frog Eye (<i>Cercospora</i> spp.)	Daconil, Heritage, Medallion
Phytophthora (<i>Phytophthora</i> spp.)	Hurricane™, Subdue MAXX®
Phytophthora (<i>Phytophthora cinnamomi</i>)	Hurricane, Subdue MAXX
Powdery Mildew (<i>Erysiphe lagerstroemia</i>)	Banner MAXX, Daconil, Heritage
Powdery Mildew (<i>Microsphaera</i> spp.)	Banner MAXX, Daconil, Heritage
Powdery Mildew (<i>Oidium</i> spp.)	Banner MAXX
Tip Blight	Banner MAXX, Heritage

Insect Solutions

Insects	Solution
Aphid (<i>Tinocallis kahawaluokalani</i>)	Avid®, Endeavor®, Flagship® 25 WG/0.22G, Scimitar® GC
Aphid (<i>Macrosiphun rosae</i>)	Avid, Endeavor, Flagship 25 WG/0.22G, Scimitar GC
Azalea Bark Scale (<i>Eriococcus azalea</i>)	Scimitar GC
Azalea Caterpillar	Scimitar GC
Azalea Lace Bug (<i>Stephanitis pyrioides</i>)	Scimitar GC
Azalea Sawfly (<i>Amauronematus azalea</i>)	Flagship 25 WG, Scimitar GC
Azalea Whitefly (<i>Pealius azaleae</i>)	Avid, Endeavor, Flagship 25 WG/0.22G
Cypress Tip Miner (<i>Argyresthia</i> spp.)	Avid
Euonymous Scale (<i>Euonymus fortunei</i>)	Scimitar GC
Euonymus Scale (<i>Unaspis euonymi</i>)	Scimitar GC
Holly Pit Scale (<i>Asterolecanium puteanum</i>)	Scimitar GC
Wax Scale (<i>Ceroplastes</i> spp.)	Scimitar GC
Juniper Scale (<i>Carulaspis juniper</i>)	Scimitar GC
Leaf-feeding Beetles (various)	Scimitar GC
Scale	Scimitar GC
Snowball Aphid	Avid, Endeavor, Flagship 25 WG/0.22G, Scimitar GC
Southern Red Mite (<i>Oligonychus ilicis</i>)	Avid, Scimitar GC
Spirea Aphid (<i>Aphis spiraecoloea Patch</i>)	Avid, Endeavor, Flagship 25 WG/0.22G, Scimitar GC
Tea Scale (<i>Fiorinia theae</i>)	Scimitar GC
Two-Spotted Spider Mite (<i>Tetranychus urticae</i>)	Avid, Scimitar GC
Viburnum Leaf Beetle (<i>Pyrrhalta viburni</i>)	Scimitar GC
Whitefly (<i>Trialeurodes vaporariorum</i>)	Avid, Endeavor, Flagship 25 WG/0.22G, Scimitar GC

Scimitar GC is a Restricted Use Pesticide.

PRODUCTS *for* PROTECTION OF WOODY

FUNGICIDES

A preventive approach against disease requires knowledge of the pathogens, as well as a management strategy utilizing a rotation of fungicides with different modes of action. Heritage, Hurricane, Daconil, Medallion, and Subdue MAXX provide the protection to control diseases that threaten woody ornamentals.



Banner MAXX Fungicide

- Superior control of powdery mildew and rust.
- Broad-spectrum control of fungal leaf-spotting diseases in a low odor, highly compatible, and easy-mixing MAXX® formulation.
- The unique formulation and fine particle size allows for excellent coverage and activity on the plant.
- Systemic action delivers high performance.



Daconil ULTREX Fungicide

- Strong on *Botrytis*, *Cercospora*, and *Colletotrichum* (anthracnose).
- Take note that it may fade dark flowers.
- Multi-site mode of action is effective in resistance management programs.
- Premium contact fungicide.



Heritage Fungicide

- Longest-lasting broad-spectrum preventive ornamental fungicide.
- Controls all four major classes of fungi, up to 28 days.
- Highly effective as the only systemic strobilurin.
- Provides protection with foliar and drench applications.
- A highly cost-effective drench in a rotation.



Hurricane Fungicide

- Delivers effective, easy protection against all major root rot diseases (one 1.5 oz bag/100 gal).
- Systemic and contact dual action provides comprehensive control of *Pythium*, *Phytophthora*, and *Rhizoctonia* root disease through both systemic and contact action.
- Reduces the need to tank mix several products and eases the time-consuming identification of root rot diseases.
- Hurricane can be applied to the roots of the plants by drenching using microjet, drip irrigation, or hydraulic systems. It can also be incorporated as a pre-potting media drench.



Medallion Fungicide

- Most effective contact fungicide for control of *Rhizoctonia*.
- Broad-spectrum control against root and other foliar disease.
- A unique class of contact fungicide, it is derived from naturally occurring molecules.
- Low-use rates with little odor and no residue.
- Use after flower bud initiation.
- Two–four oz/100 gals for *Botrytis*, alternate with Heritage 50WG.
- One–two oz/100 gals for *Alternaria*, *Cercospora*, *Septoria*, and *Myrothecium*.
- Apply before/after seedling or transplanting of plugs.
- Repeat after transplanting plants.



Subdue MAXX Fungicide

- Long-lasting, cost-effective control of damping-off and root and stem rot diseases.
- Excellent *Pythium* control.
- Offers impressive control of *Phytophthora* as well.
- Quality formulation, mixes clear in water and won't settle out in tank or clog filters. Leading-edge MAXX formulation technology.



INSECTICIDES

Insects pose a threat to woody ornamentals due to unsightly residues, damage to stems or foliage, and in some cases, the vectoring of pathogens. Measures can be taken, such as improved sanitation, careful inspection of all plant materials before they enter or leave a nursery, avoiding over-watering and over-fertilization to reduce algae growth. The optimal use of products, following an integrated solution with scouting for early detection and resistance management practices, will help to eliminate the threat.



- The standard for mite and leafminer control.
- Suppression of aphids, thrips, and whiteflies.
- Avid insecticide/miticide's unique chemistry and mode of action make it ideal for rotation in resistance management programs.



- Unique mode of action. Insect growth regulator for effective, economical control of leafminers.
- IPM tool for fly control.
- Does not harm insect predators used in integrated pest management (IPM) programs.
- For use in indoor and outdoor nursery settings.
- Excellent resistance management tool.



- Unique mode of action to control aphids and whiteflies.
- Inhibits feeding activity resulting in death of the insect.
- Compatible with beneficial species.



For uniform quality production use Fafard® premium soil-less growing media customized to your crop needs. www.fafard.com



- Fast systemic activity allows for soil drench or foliar spray applications.
- Fast foliar translaminar absorption stores Flagship within the leaves for longer control.
- Broad spectrum of soil, sucking, chewing insect pests controlled with flexible application methods and excellent plant tolerance.
- Flagship can be used as a tool in integrated pest management programs.
- Available in sprayable, wettable granules and ready-to-use granule formulations.



- Water-based capsule suspension. Pyrethroid formulation that is safe to use on a wide range of plants.
- Fast-acting, long-lasting control of aphids, armyworms, and black cutworms.
- **Scimitar GC is a Restricted Use Pesticide.**



For more information on beneficials such as predatory mites and parasitic wasps, contact Syngenta Bioline® at 1-805-986-8265 or visit www.syngentabioline.com





Choosing the right protection and plan of action for your woody ornamentals is essential. Syngenta offers not only the products needed to protect your crops, but the industry's leading technical support as well. We're here should you have any questions about diseases or pests affecting your crops or the best way to use a particular product we offer. Call 1-866-SYNGENTA (796-4368) to contact the Syngenta Customer Center, and we will provide the support you need.

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