Mayhaw Diseases

Mayhaws are native species of hawthorn that are popular in Mississippi and the Deep South for their small, edible, apple-like fruits that can be transformed into jellies, preserves, and syrup. Mayhaws (*Crataegus aestivalis, C. opaca*, or *C. rufula*) are in the rose family (Rosaceae), which also includes apples, and are prone to similar disease problems. Because mayhaw is a less commercially popular fruit than its apple cousin, there are fewer options for disease resistance and chemical control. This publication discusses the most common disease problems encountered on mayhaws in the Southeast.

Rust Diseases (quince rust and cedar apple rust)

Mayhaws are susceptible to quince rust and cedar apple rust. Although caused by two different species of the fungus *Gymnosporangium*, both rusts produce similar symptoms and signs on mayhaws.

Symptoms and Signs

Twigs, fruits, thorns, petioles, and leaves of mayhaws may be infected by rust fungi. Symptoms are visible about 7–10 days after infection. Fungal infection causes cells to grow abnormally large (hypertrophy), giving plant tissue a swollen appearance. Infected mayhaw twigs have spindle-shaped swellings. Leaf veins, common infection sites, swell and diseased leaves curl and die. Infected fruit appear covered with white, tube-like projections about 2–3 millimeters long. Each white tube splits open lengthwise, revealing orange spores on the fruit surface (**Figure 1**). Spore stages of the fungus are produced on infected twigs, fruits, petioles, and bases of thorns. Infected tissue typically dies after spore production, resulting in twig dieback.

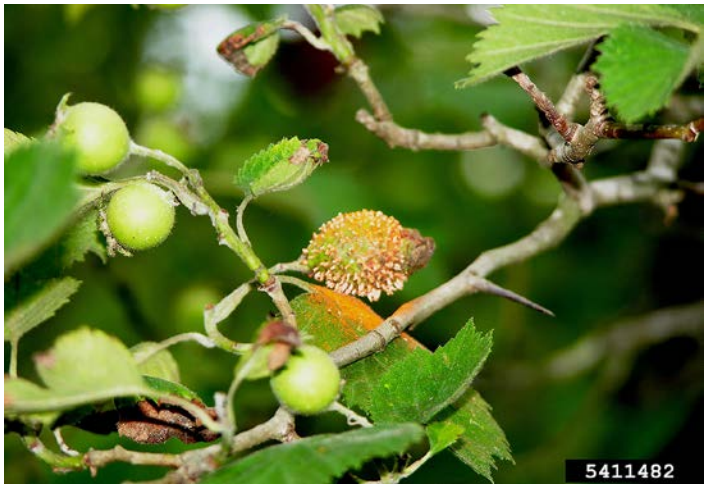

Figure 1. Quince rust on mayhaw fruit.
Photo credit: Don Ferrin, LSU AgCenter, Bugwood.org

Ecology and Spread

All rust fungi are obligate parasites, meaning that they can only survive on a living plant. The quince rust fungus has a very complicated life cycle and needs to spend part of its life on a juniper or red cedar and part of its life on a plant in the rose family to complete its life cycle. Susceptible plants in the rose family are listed in **Table 1**.

During wet or humid weather in midsummer to early fall, spores are released from mayhaws and other susceptible plants in the rose family and are carried by the wind to juniper leaves and green twigs, which may then become infected. In spring of the following year, slightly swollen, spindle-shaped areas called galls form on quince rust-infected juniper twigs and become covered in orange, cushion-like masses of spores (**Figure 2**). Galls caused by the cedar apple rust fungus are round with orange spore tendrils poking out of them. Spores produced on the juniper galls are blown to mayhaws and other susceptible hosts in the rose family, where infection may occur during favorable conditions. Galls on junipers are often perennial

Table 1. Susceptible plants in the rose family (Rosaceae).	
Common Name	**Latin Name**
Apple	*Malus* sp.
Chokeberry	*Aronia* sp.
Flowering quince	*Chaenomeles* sp.
Hawthorn/mayhaw	*Crataegus* sp.
Mountain ash	*Sorbus* sp.
Pear	*Pyrus* sp.
Quince	*Cydonia oblonga*
Serviceberry	*Amelanchier* sp.
Red tip	*Photinia* sp.
Mespilis	*Mespilis* sp.
Cotoneaster	*Cotoneaster* sp.

Figure 2. Quince rust on Eastern red cedar.
Photo credit: Edward L. Barnard, Florida Department of Agriculture and Consumer Services, Bugwood.org

and produce spores annually for many years, until the branch dies. Occasionally, the fungus will grow into a year-old branch of mayhaws or rosaceous hosts, and a canker (an area of dead tissue) may form. The fungus can overwinter in cankers and produce spores again the following spring. More typically, the infected tissue on the rosaceous host dies after the first year, resulting in twig dieback.

Management

The potential for rust exists wherever junipers and mayhaws grow near each other. Removing junipers from the area immediately surrounding a mayhaw planting can help reduce disease development. However, the spores of the fungus can travel many miles on air currents, so attempting to remove the juniper host from the environment is not always a reasonable management strategy.

There are no rust-resistant mayhaws. Sterol inhibitor (SI) fungicides, such as myclobutanil or flutriafol, provide the best control of rust. Strobilurin (QoI) fungicides, such as pyraclostrobin and kresoxim-methyl, can help suppress rust but are less effective than SI fungicides, especially when disease pressure is high. See **Table 2** for chemical control options.

Fire Blight

Fire blight is a bacterial disease caused by *Erwinia amylovora* that infects plants in the rose family, including mayhaws.

Symptoms and Signs

Fire blight bacteria often enter the plant through flower blossoms, causing an infection that progresses from the bloom down the branch. Blossom blight, in which blossoms wilt, turn brown, and die, may occur. During periods of wet weather, bacterial ooze may be seen in blossoms. Diseased branch tips and shoots become blackened and appear scorched (**Figure 3**). The ends of affected branches often bend, giving the appearance of a shepherd's crook. Cracked or rough areas of bark (cankers) appear on blighted twigs and branches.

Figure 3. Fire blight symptoms on hawthorn.
Photo credit: Don Ferrin, LSU AgCenter, Bugwood.org

Ecology and Spread

Fire blight bacteria overwinter in branch cankers and splash onto blossoms during spring rains. Wet weather favors disease spread, and severity of disease outbreaks will vary from year to year depending on environmental factors. Insects visiting infected flowers become coated in bacterial ooze, which is abundant during the bloom periods, and can transfer that bacteria to healthy blossoms. Flies and pollinating insects, such as bees, spread fire blight bacteria very efficiently.

Management

Managing fire blight is difficult because plants are susceptible to infection for many weeks during which fire blight bacteria are usually produced in large quantities. Also, there are few effective chemical control options. Reducing the amount of bacteria available to cause new infections in the spring is a very important part of managing fire blight. The management suggestions below will help with fire blight prevention and suppression.

1. Cultivars vary in their resistance to fire blight. Planting a cultivar with a high level of resistance will reduce disease incidence. A list of commercially available cultivars and their level of resistance to fire blight is provided in **Table 3**.
2. Prune out blighted branches during winter dormancy. Pruning should be done in dry weather. Make pruning cuts at least 4 inches below any dead bark, and disinfect pruners with 70 percent alcohol, hydrogen dioxide (ZeroTol 2.0), or quaternary ammonium salts (Fertilome Consan 20).
3. Avoid cultural practices, such as excessive nitrogen fertilization or excessive winter pruning, that promote succulent spring growth, which is very susceptible to fire blight.
4. See **Table 2** for a list of chemical control options. During bloom, apply potassium phosphite and the antibiotic kasugamycin with a surfactant, like Tactic. Potassium phosphite and the antibiotic can be used individually, as well, but using them in combination may result in better control. *Bacillus subtilis* QST 713 (Serenade Max) and *Streptomyces lydicus* WYEC 108 (Actinovate AG) are OMRI listed for organic control and labeled for use on mayhaw. As of October 2014, antibiotics are no longer on the USDA national list of substances allowed for organic production.

Hawthorn Leaf Blight

Hawthorn leaf blight is caused by the fungus *Monilinia johnsonii* and can cause severe damage to mayhaw leaves and fruit. This disease is similar to brown rot of peaches, which is caused by a different species of *Monilinia*.

Symptoms and Signs

Infected leaves wilt and turn brown. Infected fruit are hard and shriveled (mummified) and drop to the ground before reaching maturity.

Ecology and Spread

The fungus overwinters on mummified fruit. Spores released from mummified fruit infect leaf buds or newly emerging leaves. Spores produced on blighted leaves in the spring can infect blossoms. Fruit formed from infected blossoms mummifies and drops to the ground, where it will produce the spores that cause infections the following year.

Cultivars that have late leaf emergence or slow leaf growth and cultivars that bloom early or quickly are more likely to escape infection (Scherm and Savelle, 2003).

Management

Selection of early-blooming cultivars or cultivars with late leaf emergence or slow leaf growth can reduce disease incidence by preventing the timing of spore dispersal from overlapping with the time that susceptible plant growth is present. Fungicide applications when conditions are favorable for disease development can help prevent hawthorn leaf blight (see **Table 2**).

Table 2. A guide to fungicides labeled and registered for use in Mississippi for management of fire blight, rusts, and hawthorn leaf blight on mayhaws.*

Active Ingredient	Brand Names	Pre-harvest Interval	Fire Blight	Rust	Leaf Blight
mono- & di-potassium salts of phosphorous acid FRAC: 33	Rampart	0	1–3 qt in 100 gal water Prevention Apply at lower rate at 2- to 4-week intervals. Control Apply at the higher rate at 2- to 3-week intervals.	N/A	N/A
kasugamycin FRAC: 24	Kasumin 2L Bactericide	90 days	**Risk of resistance is HIGH.** Use only when conditions favor disease. 0.5 gal/acre Begin applications at 20–30% bloom. Repeat at 7-day intervals or when conditions are favorable for disease. **Do NOT apply after petal fall.** **Do NOT make more than two consecutive applications.**	N/A	N/A
Bacillus subtilis FRAC: 44	Serenade MAX OMRI listed	0	2–3 lb/acre Apply with a surfactant. Suppression Begin applications at 1–5% bloom and repeat as needed to protect open, untreated blossoms when conditions favoring disease development are likely to occur (every 2–7 days). Continue applications after petal fall on 7-day intervals while environmental conditions favor disease.	1–3 lb/acre Apply with a surfactant. Begin applications pre-bloom when environmental conditions favor disease development. Repeat every 7–14 days or as needed. Use higher rates at shorter intervals when disease pressure is high.	N/A
Streptomyces lydicus FRAC: NC	Actinovate AG OMRI listed	0	3–12 oz in 10–150 gal water/acre Make first application prior to onset of disease season. Reapply every 7–14 days depending on disease pressure. For best results, use with a spreader-sticker.	N/A	3–12 oz in 10–150 gal water/acre Make first application prior to onset of disease season. Reapply every 7-14 days depending on disease pressure. For best results, use with a spreader-sticker.
myclobutanil FRAC: 3	Spectracide Immunox Multi-purpose Fungicide Rally 40WSP	14 days	N/A	Spectracide: Mix 2–3 fl oz with 1 gal water Rally: 5–8 oz/acre (see label) Apply at pink bud stage. Reapply every 7–10 days through the second cover spray.	N/A
flutriafol FRAC: 3	Topguard Fungicide Specialty Crops	14 days	N/A	8–12 fl oz/acre Begin applications at green tip and continue through cover sprays.	N/A

difenconazole plus cyprodinil FRAC: 3 & 9	Inspire Super	14 days	N/A	12 fl oz/acre Begin applications preventively. Apply alone or in combination with a protectant fungicide on a 7- to 10-day schedule through the second cover spray.	N/A
kresoxim-methyl FRAC: 11	Sovran	30 days	N/A	Suppression only. **HIGH risk for resistance.** 3.2–6.4 oz/acre Begin applications at half-inch green and repeat at 7- to 10-day intervals. **Do NOT make more than two sequential applications of Sovran.** Rotate with a non-strobilurin (non-QoI) fungicide when disease pressure is high.	N/A
pyraclostrobin + boscalid FRAC: 11 & 7	Pristine	0	N/A	Suppression only. **HIGH risk for resistance.** 14.5–18.5 oz/acre Begin applications prior to disease development and repeat at 7- to 10-day intervals. **Do NOT make more than two sequential applications of Pristine.** Rotate with a non-strobilurin (non-QoI) fungicide when disease pressure is high.	N/A
* The label is the law. This table is a guide, and specific label instructions may differ. Always read and follow label instructions. 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.					

Table 3. Fire blight ratings of mayhaw cultivars listed below are derived from data presented by Pyzner (2010), Ivey (2014), and Louisiana Mayhaw Association (December 2014 newsletter). All ratings are based on very limited, subjective data. Actual performance of an individual cultivar may vary depending on local environmental conditions.

Cultivar Name	Fire Blight Resistance
Cajun	Moderate
Charlie Johnson	Fair
Crimson	Moderate
Double G	Fair
Elite	High
Heavy	Moderate
Hope 13	Moderate
Marlene	Moderate
Mason	Fair
Maxine	High
Radiant Red	Poor
Red Champ	Moderate
Red Splendor	Fair
Royal Star	Poor
Royalty	Fair
Saline	Fair
Spectacular	High
Super Spur	Moderate
Texas Star	Poor
Winnie #5	Moderate

References

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Scherm, H., and A.T. Savelle. 2003. Epidemic development of hawthorn leaf blight (*Monilinia johnsonii*) on mayhaw (*Crataegus aestivalis* and *C. opaca*) in Georgia. Plant Disease 87: 539-543.

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