IPM Fact Sheet Series

UMass Extension Fruit Team
Fact Sheet #AD-001

Apple – Apple Scab (*Venturia inaequalis*)

Overview

- **Apple scab** is the most important disease of apples in New England, and if left unmanaged, will cause significant damage to fruit and leaves.
- **Infections** start in the early spring, initially caused by fungal spores from leaves infected the previous year that lie in or next to an orchard. New infections produce more spores, rapidly spreading scab during wet weather in spring and early summer.
- **Management** should involve both cultural and chemical control, with fungicide sprays guided by weather conditions and fungicide properties, preferably using disease forecast models and reliable weather data for the orchard site.
- **Scab-resistant cultivars** have been grown commercially on a limited basis and can eliminate the need for scab fungicides, though some fungicide applications will probably be needed for other diseases.
- **Sanitation** targeting apple leaves in the orchard should be done in fall or early spring to decrease scab risk.
- **Resistance to fungicides** is common in apple scab. Application strategies to reduce resistance risk, such as mixing different FRAC groups, including multi-site fungicides, and limiting amounts of any one FRAC group per season should be used.

Symptoms

Apple scab infections occur on leaves, shoots, blossoms and fruit of apple trees; leaf and fruit infections are most common, and the first leaf infections may show up as early as three weeks after buds break as velvety-brown to olive colored spots on the underside of blossom cluster leaves. New infections can develop on other leaves as they emerge. These spots turn black. Diseased leaves may turn yellow, die and drop prematurely. Early fruit infections look like leaf infections, but over time become brown and corky. Fruit infected early in the season may become misshapen and can crack as it develops. Early fruit infections often appear near the blossom (calyx) end of the fruit. Later lesions can be anywhere on the fruit. Late summer fruit infections are not visible at harvest but can develop in storage as tiny spots, "pin-point" scab. (**See illustrations** at the end of this fact sheet)

Disease Cycle

V. inaequalis **overwinters** in apple leaves infected the previous season that fell to the ground in or close to the orchard. Warming temperatures in the spring around **bud-break** stimulate the fungus to make ascospores in old, overwintered leaves. The first mature spores are generally available at the same time trees are first producing green tissue, **green tip**. Ascospores continue to be produced and released until approximately **one to two weeks after petal fall**, though this timing varies.

Daytime rains release mature ascospores into the air when they are mature. Those spores may land on emerging apple leaves or new fruit, causing **primary infections** if the tissue stays wet for long enough. The length of a **wetting period** needed to cause infection varies with temperature. Near freezing, leaves must be wet for 2 days to be infected. At 61ºF to

75ºF infection takes only 9 hours. After infection, it takes from 9 to 17 days from the time of infection for visible symptoms to show, again depending on temperature.

Primary infections produce conidia, spores that cause **secondary infections**. **Several additional secondary infection cycles can occur during a growing season**, depending on rain, though apple tissue becomes more resistant to scab as summer progresses. In the fall, leaves drop and a new generation of ascospores develops the next spring.

Management

A key to scab management is preventing **primary infections** early in the growing season. If primary scab is controlled, then there is no need to continue scab fungicide applications during the rest of the growing season. If it isn't, keeping fruit from being infected will require several fungicide applications. Primary control greatly reduces the chance that resistance to fungicides will develop, and reduces the chance of scab in the next season.

Monitoring: To manage scab efficiently and effectively, it is highly recommended that growers either maintain a weather station at the orchard, or subscribe to a weather monitoring service. Linking weather data to a decision support system that can evaluate scab risk gives valuable management information.

The amount of scab present in an orchard after harvest will have a significant impact on scab risk in the next growing season. Significant scab damage will result in a large amount of inoculum the next spring, increasing the chances for scab infections. At the same time, no scab in an orchard greatly reduces scab risk the next year.

Control Strategies

Cultural/Resistance:

- Eliminate wild or untended apple trees from areas adjoining the orchard.
- Apply 5% urea to trees after harvest or to leaf litter in the fall or spring to hasten leaf decomposition and reduce primary inoculum.
- Chop leaf litter on the orchard floor in fall or early spring to speed up leaf decay and destroy scab inoculum.
- Prune trees to open the canopy to light, air, and spray penetration.
- If possible, plant resistant cultivars when establishing new orchard blocks. Several good cultivars are available.

Biopesticides:

There are an increasing number of biopesticide products that have been labelled for controlling apple scab. However, while they may work reasonably well under low inoculum conditions, they are limited in their ability to manage apple scab under high disease pressure. The effectiveness of these materials can be greatly improved by carefully timing applications using an appropriate decision support system.

Chemical

- Refer to the New England Tree Fruit Management Guide for specific materials and rates recommended for managing Apple Scab.

There are many fungicides available to manage apple scab, including OMRI approved materials. Fungicides for a given application should be selected based on their effectiveness against scab, as well as effectiveness against other diseases. Timing fungicide applications relative to infection risk is critical, and fungicides should be applied based on timing information from weather data and decision support systems.

The apple scab fungus can become resistant to a wide range of fungicides. To decrease the risk that this will happen, use fungicides with different FRAC groups, applying them alternately, and limiting the number of times any one fungicide is used in a season.

Figure 1) Top left: apple fruitlet and leaf petiole (stem) with scab lesions. **Top right**: early season infections worsening and leading to corking and cracking on unripe fruit. **Bottom left**: ripening fruit scab lesion beginning to crack in the center. **Bottom right**: scab lesion on apple in storage. [**Photo Credit**: E. Garofalo, UMass Extension]

Figure 2) Left: many light olive-colored, young scab lesions developing on leaf. **Right**: expanded leaf infection detail showing two separate lesions in close proximity. These lesions will develop new spore and cause additional infection. [**Photo Credit**: E. Garofalo, UMass Extension]

Figure 3) Scab lesion from spore landing on lower/underside of leaf. [**Photo Credit**: E. Garofalo, UMass Extension]

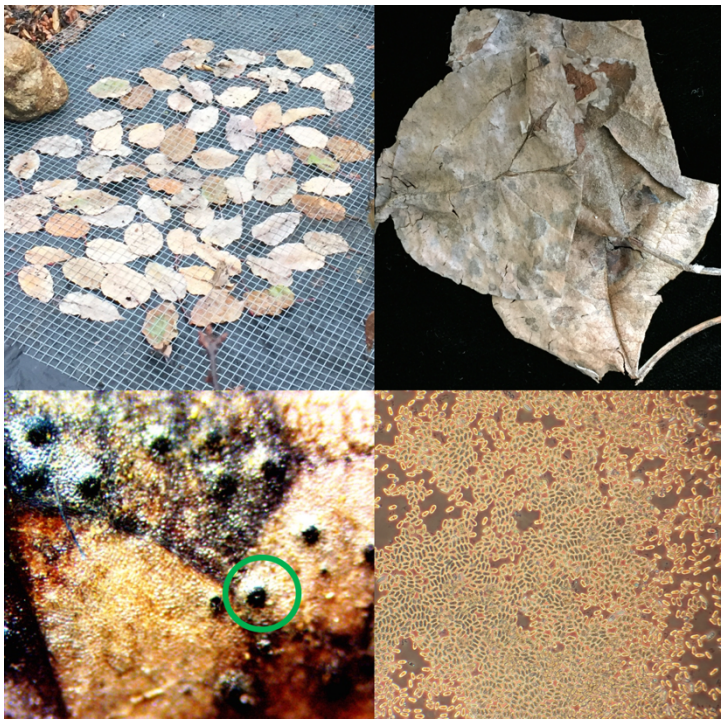

Figure 4) Top left: scab infected leaves lie on the ground overwinter. **Top right**: overwintered apple leaves with scab lesions still visible. **Bottom left**: close up of overwintered scab infected apple leaves showing fruiting bodies that contain the spore that cause primary infections in the spring. **Bottom right**: ascospores ejected from fruiting bodies. When these land on leaves in the spring, they cause lesions that produce new spore, leading to additional infections. [**Photo Credit**: E. Garofalo, UMass Extension]

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Visit our website: http://ag.umass.edu/fruit

Additional information available on the MYIPM app: https://apps.bugwood.org/apps/myipmseries/

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