PEACH SCAB

Harald Scherm
Department of Plant Pathology
University of Georgia
Athens, GA 30602

Phillip M. Brannen
Department of Plant Pathology
University of Georgia
Athens, GA 30602

Scab is a very common problem on stone fruits in the southeastern United States. The disease is caused by *Cladosporium carpophilum* Thuem., an asexual fungus that produces conidia (splash and airborne spores that infect shoots, leaves, and fruit during the season) and chlamydospores (thick-walled survival spores formed on infected twigs during the winter). Regionally, scab pressure is generally greatest in the Carolinas and decreases as one moves into south Georgia.The disease is readily controlled with fungicides, but control failures still occur and may result in considerable yield losses.

SYMPTOMS

The fungus causes twig, leaf, and shoot infections. Among these, leaf infections are generally least noticeable and least important. Twig infections, although not associated with direct yield losses, are epidemiologically very significant because they provide the fungus with an overwintering site. Fruit infections can result in considerable yield losses, mainly from grade reductions or culling of affected fruit that is less desirable in the marketplace.

Twig Symptoms. Twig infections take place as soon as new shoot growth is available in early spring, and they can continue to occur throughout the summer. Early symptoms, which develop during spring and summer, are minute, reddish-gray, diffuse spots of 1 to 2 mm in diameter. During fall and winter, these spots enlarge to form reddish-brown, irregularly circular to oval lesions that measure approximately 3 × 6 mm. Lesions tend to elongate along the stem and, as they mature during the winter, they develop a slightly raised, dark to brown-purple border (Figure 1). Sporulation does not generally occur on current year's lesions, but it occurs on mature lesions during the spring and summer of the year following infection. Examination of such lesions in late spring reveals a black, rough surface, which is evidence of sporulation. Spores are produced in large numbers as olivaceous tufts of conidia.

Figure 1. Scab twig lesions. Note the oval to irregular lesion shape with a raised margin. Image by P. F. Bertrand.

Fruit Symptoms. Fruit symptoms first appear when the fruit is in mid-development. Greenish-gray to olive circular spots that are 1 to 2 mm in diameter are formed, with more pronounced infections on the stem end of the fruit (Figure 2). Spots expand to 2 to 3 mm in size, and a yellow halo may form around them (Figure 3). The fungus sporulates on these fruit lesions, producing conidia that can lead to additional (secondary) infections of fruit and twigs. Fruit scab lesions generally have a raised, corky appearance, whereas in the case of bacterial spot infection, which causes similar fruit spotting, lesions are sunken. Severe infection may lead to cracking of the fruit skin surrounding scab lesions, generating entry points for fruit-rotting organisms such as the brown rot fungus.

Figure 2. Scab lesions on green fruit. Note that lesions are more concentrated near the stem end. Image by P. F. Bertrand.	**Figure 3.** Scab lesions on mature fruit. Note the yellow halo surrounding the lesions.

DISEASE CYCLE

Scab lesions on 1-year-old twigs play a key role in the disease cycle; they provide the sole overwintering site for pathogen survival. Overwintering takes place as mycelium in lesions and as chlamydospores on the surface of lesions. Production of conidia, which serve as infectious propagules, begins in late winter and continues throughout the spring and early summer. Maximum conidial production requires average daily temperatures exceeding 16°C in concert with high relative humidity for at least 24 hours. In the southeastern United States, peak conidial production occurs between petal fall and shuck-off, with numbers remaining high through mid- to late May. Thereafter, conidial numbers tend to taper off, signaling a period of reduced scab risk.

Conidia are carried to new infection sites (fruit and current season's shoot growth) by wind and rain-splash, with splashing being the more important mode of dispersal. Infection of current-season shoots can occur any time during the growing season. Fruit infections on peach are important from shuck-off to about 4 to 6 weeks before harvest; on nectarine, the susceptible period begins earlier (at shuck split) due to the lack of protective hairy fruit covering. Late infections (within 4 to 6 weeks of harvest) are generally unimportant due to the long time (40 to 70 days) between infection and symptom appearance. This lengthy "incubation period" is also the reason why secondary infections (those originating from conidia produced on early fruit lesions) are of limited importance other than in conditions of poor scab control on late-season varieties. On such varieties, both large lesions (from primary infection) and small spots (from secondary infection) may be present on fruit at harvest.

Infection is favored by the presence of free water (rain or dew) during periods when air temperatures exceed 10°C; the optimum temperature range for infection is 22° to 30°C. Seasonally, rainy weather during the first 6 weeks following shuck split (when conidial numbers are highest and fruit are susceptible) is strongly associated with increased scab risk. However, considerable infection occurs, even in the absence of rain, during periods of prolonged fruit wetness caused by dew or fog.

CONTROL

There are no cultural controls for scab and no resistant peach varieties are available. Thus, scab control relies exclusively on well-timed fungicide applications. Based on the disease cycle described above, the following control periods may be distinguished:

- *Petal fall.* At this time, no fruit tissue is exposed, and there is thus no need to protect fruit from infection. However, as stated above, the peak of conidial production on twig lesions may occur as early as petal fall. An application of a fungicide with antisporulant activity at petal fall may therefore be useful in suppressing conidial production on overwintered twig lesions and in reducing inoculum potential for subsequent periods. This may be particularly important for orchards that were not sprayed the previous season (e.g., orchards coming into production for the first time or those where the crop was lost the previous year due to spring freezes). It should be noted, however, that the benefits derived from a petal fall application often are inconsistent.
- *Shuck split.* At this time, scab conidial numbers tend to be very high and exposed fruit tissue may or may not be susceptible to infection, depending on the pubescence (hairiness) of the fruit. Research trials consistently document considerable benefits of an early shuck split application. This application should be made with a highly effective contact or systemic fungicide, rather than with the less expensive but less efficacious sulfur products.
- *Shuck-off and early cover sprays.* This period marks the greatest scab risk, given the presence of large conidial numbers and the increased susceptibility of the developing fruit. Closely spaced applications with effective fungicides are recommended, particularly for the shuck-off application and during rainy weather.
- *Mid-season cover sprays.* During this period, conidial production on twig lesions tapers off, leading into a period of reduced scab risk starting about 6 to 8 weeks past petal fall. Control intensity may also be reduced at this time. In middle Georgia, this can be implemented by using alternate-row middle (ARM) applications and/or by switching to sulfur as the primary fungicide. Note, however, that extensive use of sulfur may contribute to reduced fruit coloring and finish. If this period is very rainy, closer application intervals, use of

more effective fungicides, and/or a switch back to standard applications (instead of ARM) would be advisable.

- *Pre-harvest interval*. No fungicide applications against scab are needed during the final 4 to 6 weeks before harvest. This period can therefore focus on control of pre-harvest brown rot.

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