College of Food, Agricultural, and Environmental Sciences, Department of Plant Pathology

Sooty Blotch and Flyspeck of Apple

Melanie L. Lewis Ivey, Associate Professor, Department of Plant Pathology, The Ohio State University-Ohio Agricultural Research and Development Center, Wooster, OH.

Sooty blotch and flyspeck (SBFS) are two separate diseases but are usually managed together as a disease complex. The SBFS complex includes more than 100 fungal species worldwide. In the eastern and midwestern United States, SBFS fungi are diverse and vary by orchard and region. The fungi grow superficially on the cuticle of apple and pear and mainly reduce fresh-market value, though heavy SBFS infections can also increase fruit water loss and shorten storage life. Frequent rain, prolonged leaf wetness, high relative humidity, dense tree canopies, heavy shade, poor air movement, and sites near woods or bramble thickets increase disease risk.

Disease Development and Symptoms

SBFS fungi are epiphytes—they colonize the cuticular wax on apple and pear fruit rather than invading the flesh. The fungi overwinter on the twigs or canes of many woody or semi-woody reservoir hosts around orchards, including plums, pears, wild brambles, wild grapes, willow, sycamore, and smooth sumac. The fungi can also originate from apples or pears within the orchard. Spores from SBFS fungi are moved into orchards from reservoir hosts by rain and wind, beginning around petal drop. Secondary spread can continue through summer and fall when leaf wetness and high humidity persist. Temperatures near 60 degrees Fahrenheit to 70 F (15.5 degrees Celcius–21 ºC) with relative humidity above 96% favor infections, while hot, dry periods suppress disease development. Fruit infections can occur as early as two to three weeks after petal drop in wet years, but signs of the pathogen often do not become visible until three weeks or more after infection.



Figure 1. Signs of sooty blotch and fly speck (SBFS) on apple. A) SBFS on apple in a neglected apple tree. B) SBFS on a yellow-skinned (cv. Golden Delicious) apple. The greenish black blotches are mycelial mats of sooty blotch fungi while the tiny black spots are fungal bodies of fly speck fungi. C) Close-up of fly speck fungal bodies on a Honeycrisp apple. Photos by Melanie L. Lewis Ivey.

Sooty blotch fungi form dark olive-green, gray, or black mycelial mats on the fruit that appear as smudges or blotches with diffuse margins (Figure 1). Colonies may remain small or merge until large areas of the fruit surface are covered. The signs are superficial and are often partly removable by rubbing or washing, especially when infections are not old or deeply embedded in the wax layer.

Flyspeck fungi (commonly attributed to multiple species of *Zygophiala* and related fungi) do not form a visible mycelial mat; rather, they form small,

black bodies that appear as clusters of shiny, black, sharply defined dots (Figure 1). Clusters commonly include 10–50 dots, and under severe conditions may include many more. Symptoms are most obvious on yellow, green, and other light-colored cultivars. Similar to signs of sooty blotch, the fungal bodies are superficial and can be picked off the fruit.

Although SBFS does not rot the flesh, heavily affected fruit may be downgraded from fresh-market to processing grade. For backyard orchards, affected fruit is typically safe and usable after washing, rubbing, peeling, or trimming.

Management

Cultivar Selection

All apple and pear varieties are susceptible to SBFS. Susceptibility is largely driven by extended exposure to moisture rather than genetic resistance. Because SBFS fungi live on the fruit surface, late-maturing, light-skinned varieties such as Golden Delicious apples, or Bartlett and D'Anjou pears, are the most visibly affected.

Cultural Practices

Cultural practices that reduce the introduction of spores into the orchard, reduce prolonged leaf wetness, increase air movement through the canopy, and improve spray penetration are the most effective at reducing the risk of SBFS.

- Reduce inoculum near orchard borders by managing wild brambles, neglected apple and pear trees, and dense hedgerow vegetation where feasible. Removal will not eliminate SBFS because many plants can serve as reservoirs, and spores may disperse several hundred meters from inoculum sources.
- Remove fruit mummies from cultivars or blocks that retain them, because mummies may harbor SBFS fungi.
- Prune annually to open the canopy, improve spray penetration, and speed drying after rain or dew. Annual pruning will also reduce inoculum surviving in apple twigs.
- Thin clusters and maintain separation among fruit where practical to reduce humidity and water retention around the stem and calyx.
- Mow groundcover to reduce humidity in the lower canopy.

Chemical and Biological Control

Commercial orchards. In the absence of resistant varieties, the use of fungicides is the most effective way to prevent and control SBFS. After the first SBFS cover spray (~10 days after petal drop), a common rule is that a protectant cover is generally considered spent after about 14 days or about 2 inches of rain, whichever occurs first. Therefore, to protect against SBFS, fungicides should be applied at least every 14 days after the first cover spray. Alternatively, a weather-based risk model can be used to time the first application after the first cover spray (referred to as the second cover spray application). The Northeastern United States apple risk model is based on accumulated leaf wetness beginning at first cover. A conservative approach is to begin the SBFS-specific protection program just before the orchard reaches about 190 accumulated leaf-wetness hours (ALWH) from first cover. Older empirical symptom-prediction guidance used about 270 wetting hours to predict first visible sooty blotch symptoms; however, because symptoms lag infection, preventive fungicide timing should occur earlier than symptom appearance. Leaf wetness accumulation requires a weather station with a leaf wetness sensor and can be calculated by taking daily readings or by using an online tool such as the Network for Environment and Weather Applications (NEWA). The NEWA model summarizes risk as no, low, moderate, or high using days since petal fall, ALWH, rainfall since petal fall or the last fungicide, and forecasted precipitation. The tool displays an eight-day window: two days before the date of interest, the

selected date, and five forecast days. The output uses a stoplight color schematic (low risk=green, moderate risk=yellow/orange, high risk=red) to communicate risk and provides a brief interpretation of the results as well as fungicide spray recommendations (Table 1).

Commercial growers can also use the *Midwest Fruit Pest Management Guide* (ag.purdue.edu/department/hla/extension/sfg-sprayguide.html) for current fungicide recommendations and spray schedules. Because SBFS fungi grow on the fruit surface, contact/protectant coverage and canopy penetration are important for effective control.

Backyard orchards. Backyard growers are limited in the number of highly effective fungicides or biological-control products available for apple disease management, including SBFS. Backyard growers should focus first on pruning, sanitation, sun exposure, and harvest timing (i.e., select early varieties such as Gala, Ginger Gold, Zestar!®, Pristine, and Sweet Tango®). Only use fungicide products labeled for apples and follow the label exactly. Backyard growers can refer to *Controlling Diseases and Insect Pests in Home Fruit Plantings (Bulletin 780)* or *Disease Management in Home Apple Plantings* (u.osu.edu/fruitpathology) for chemical and biological control recommendations. Always follow product labels and current regional recommendations. Fruit with SBFS blemishes can usually be eaten fresh after washing/rubbing or used for processing after peeling.

Additional Resources

- Fruit Pathology, Ohio State University Extension (u.osu.edu/fruitpathology)
- NEWA | Integrated Pest Management Tools for Crop Production (newa.cornell.edu/crop-and-pest-management)
- NEWA, Sooty Blotch and Flyspeck model page (newa.cornell.edu/sooty-blotch-flyspeck)

Table 1. The Network for Environment and Weather Applications (NEWA)* Sooty Blotch and Flyspeck tool to assess daily and forecasted infection risk for apple disease management.

Model result	Interpretation	Suggested action	Notes
No risk	Conditions have not accumulated enough wetness/rain to justify SBFS action.	No SBFS-specific spray needed. Continue routine scouting and other disease programs.	Check again after rain or prolonged wetting.
Low	Early or limited risk.	If first cover has not been made, maintain the regular cover program. Otherwise, no additional action solely f or SBFS.	Watch shaded, slow-drying blocks.
Moderate	Weather is becoming favorable.	Check the five-day forecast; consider a cover application if two or more wet days are forecast.	Best timing is before extended wet periods.
High	Conditions favor infection.	Make a labeled cover application for SBFS, respecting PHI, REI, resistance-management, and label limits.	Commercial decisions should use the current regional spray guide.

*The Network for Environment and Weather Applications (NEWA) is a Cornell Integrated Pest Management, Northeast Regional Climate Center, and land grant university partnership. The Ohio State University is a partner of NEWA and provides free access to NEWA to Ohio stakeholders. For more information, view a tutorial on using the NEWA Northeastern United States sooty blotch and fly speck risk model (help.cornell-ipm.org/hc/en-us/articles/1500003852761-Sooty-Blotch-and-Fly-Speck-Model-7-minutes).

CFAES provides research and related educational programs to clientele on a nondiscriminatory basis. For an accessible format of this publication, visit cfaes.osu.edu/accessibility. Copyright © 2023, The Ohio State University