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Weather Inputs to a Warning System for Sooty Blotch and Flyspeck of Apple

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Abstract
Sooty blotch and flyspeck (SBFS) is a mid- to late-season disease of apple. SBFS fungi show up as dark smudges and clusters of black dots on the fruit surface. Since blemished fruit are downgraded, crop losses can exceed 90 percent of the fresh market value.

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Weather Inputs to a Warning System for Sooty Blotch and Flyspeck of Apple

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Introduction

Sooty blotch and flyspeck (SBFS) is a mid- to late-season disease of apple. SBFS fungi show up as dark smudges and clusters of black dots on the fruit surface. Since blemished fruit are downgraded, crop losses can exceed 90 percent of the fresh market value.

In Iowa, SBFS is the main target of fungicide sprays every 10 to 14 days from shortly after petal fall until harvest. It would help growers cut down on pesticide expenses if they could spray less but still control SBFS. Disease-warning systems use information about the crop and the weather to help growers apply fungicide sprays only when there is a real risk of SBFS outbreaks. Previous proposed weather-based warning systems for SBFS relied mainly on growers monitoring leaf wetness duration (LWD). However, LWD is highly variable even within a single apple tree, so is difficult to measure accurately.

Based on research at ISU and in Iowa orchards, we proposed a relative humidity (RH)-based alternative warning system. This new warning system is driven by cumulative hours of relative humidity above 97 percent. This SBFS warning system extends the period between first and second cover fungicide sprays. Sprays are made at 14-day intervals until harvest following second cover. The work reported here field-tests the RH-based SBFS warning system at the ISU Horticulture Station. In addition, we compared use of remotely estimated RH data with measurements made in the orchard, to see if we could get away from depending on sensors and data loggers.

Materials and Methods

The trial block consisted of 21-yr-old Golden Delicious, Red Delicious, Jonathan, and McIntosh trees on M.7 rootstock (12 × 25 ft spacing) at the ISU Horticulture Station. All fungicide treatments were applied with a rate of 200 gal/acre at 200 psi using an airblast sprayer.

The RH-based warning system extends the period between first- and second-cover sprays until 215 hours of RH > 97 percent have accumulated since first cover. Treatments (Table 1) were replicated five times in a randomized complete block design; each subplot consisted of three trees of a single cultivar.

Treatments:

- Unsprayed control: No fungicide sprays after first cover (Treatment 1).
- Grower-practice control: Calendar-based (biweekly) sprays of captan + thiophanate-methyl from first cover until harvest (Treatment 2).
- Spray timing based on RH measurements in tree canopy using Spectrum WatchDog A-Series RH sensors (Treatments 3, 4, 5).
- Spray timing based on remotely estimated RH (Figure 2) using a web-based decision tool developed with Penn State University (Treatments 6, 7, 8).

All plots including controls were sprayed with Nova 40W at 5 oz/acre to control powdery mildew, rust and apple scab from tight cluster through petal fall (May 5).

According to the warning system, the second-cover fungicide spray is applied after 215 hours of relative humidity ≥ 97 percent has accumulated since the first-cover spray. Once the second-cover spray was applied, later fungicide sprays were applied every 10 to 14 days until close to harvest. Relative humidity data was measured with either on-site equipment (Spectrum® WatchDog A150-Temp/RH data logger placed at the base of the tree canopy, Treatments 3, 5, 7), or remotely estimated using a prototype web-site decision tool (www. cei.psu.edu/sbfs/, Treatments 4, 6, 8). Treatments that used weather data to determine the timing of the second-cover spray were subsequently sprayed biweekly with captan + thiophanate-methyl.

Treatments were evaluated immediately after harvest by rating 50 fruit per tree for SBFS incidence (percent apples with SBFS).

Results and Discussion

Using on-site and off-site RH measurements, the warning system saved 2 and 3 fungicide sprays, respectively, compared with the calendar-based treatment, while providing statistically equivalent control of SBFS. Strobilurin-containing fungicides controlled SBFS as effectively as the thiophanate-methyl + captan tank mix when used in conjunction with the warning system (first- and second-cover sprays).

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Table 1. Severity of sooty blotch and flyspeck (SBFS) at the ISU Horticulture Station, 2011.

Trt #	Weather data source	Fungicide used	Rate/acre	Cover sprays[b]	Percent apples with SBFS
1	Unsprayed control[a]	Captan 80WP + Topsin M 4.5 Fl	3.7 lb + 15 fl oz	1	25.1 a[c]
2	Spray every 14 days	Captan 80WP + Topsin M 4.5 Fl	3.7 lb + 15 fl oz	7	0.22 b
3	Sensor	Captan 80WP + Topsin M 4.5 Fl	3.7 lb + 15 fl oz	5	0.13 b
4	Sensor	Pristine[d]	1 lb	5	0.17 b
5	Sensor	Flint[d]	2 oz	5	0.90 b
6	Website	Captan 80WP + Topsin M 4.5 Fl	3.7 lb + 15 fl oz	4	4.13 b
7	Website	Pristine	1 lb	4	1.20 b
8	Website	Flint	2 oz	4	6.80 b
LSD					9.29

[a]No sprays after first cover.
[b]Includes all fungicide sprays from first cover until harvest.
[c]Means followed by the same letter are not significantly different ($P<0.05$).
[d]Captan + Topsin was applied as cover sprays following second cover