Validation of the Gleason-Duttweiler Warning System for Sooty Blotch and Flyspeck Management Using a Modified Relative Humidity Threshold

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Introduction

The appearance of black blotches and blemishes on apples infected with sooty blotch and flyspeck (SBFS) fungi reduces the fresh fruit quality and market value. In order to control the infection of SBFS, most of the growers in North Central region spray fungicide every 10 to 14 days from shortly after petal fall until harvest. The fungicides widely used are thiophanate-methyl and captan, both of which carry substantial safety risks.

In 2010 and 2011, a study was conducted at the ISU Horticulture Research Station, Ames, Iowa, to validate the Gleason-Duttweiler SBFS warning system driven by cumulative hours of relative humidity (RH) > 97 percent. This SBFS warning system extends the period between first and second cover fungicide sprays. The study used a threshold of 215 hours of RH > 97 percent since first cover to initiate the second-cover spray. Subsequent sprays following second cover were made at 14-day intervals until harvest.

The study found that relying on the threshold of 215 cumulative hours of RH > 97 percent since first cover spray saved 2 to 3 fungicide sprays per growing season compared with the calendar-based treatment, and also provided statistically equivalent control of SBFS incidence.

The study also found there was substantial variation between adjacent RH sensors in recording RH > 97 percent. In order to minimize the RH variation between sensors, it was suggested the RH threshold should be decreased from RH > 97 percent to RH ≥ 90 percent.

The present study is being carried out in 2013 and 2014 to validate the Gleason-Duttweiler SBFS warning system by using the modified (90%) RH threshold. The total number of hours above the threshold was correspondingly adjusted to 385 cumulative hours of RH ≥ 90 percent.

In addition, the present study compares the conventional fungicides thiophanate-methyl and captan with the reduced-risk fungicides Flint (common name: trifloxystrobin) and ProPhyt fungicide (common name: potassium salts). Concerns with resistance require that Flint applications should be limited to four times per year. Therefore, Flint sprays were rotated with Phophyt.

Materials and Methods

The trial plots consisted of 21-year-old Golden Delicious, Red Delicious, Jonathan, and McIntosh trees on M.7 rootstock (12 × 25 ft spacing) at the ISU Horticulture Research Station. All fungicide treatments were applied at the rate of 200 gal/acre at 200 psi by an airblast sprayer. The warning system extends the period between first- and second-cover sprays until the threshold, 385 hours of RH ≥ 90 percent, has accumulated since first cover. Each treatment

(Table 1) was replicated five times in a completely randomized experimental design and each subplot consisted of five trees of a single cultivar, with the end trees in each subplot acting as guards.

All five treatments were sprayed with Rally® and Rubigan® at 4 oz/acre from the green tip stage of foliar development stage through petal fall to control apple scab, powdery mildew, and rust. Topsin (1-1.5 lb/acre) plus Captan (4 lb/acre) were used in the first-cover spray for all treatments.

Relative humidity data was measured with two Spectrum® WatchDog A150- Temp/RH data loggers that were placed at 1.5-m height in the tree canopy of the treatment plot. The second-cover spray for RH warning system treatments was applied when either one of the two sensors had reached the threshold. Once the second-cover spray was applied according to the treatment, later fungicide sprays were applied every 14 days until the earliest ripening variety, MacIntosh, was harvested.

At harvest, 50 fruit/tree from the middle three trees of each subplot were collected to assess the incidence (%) of SBFS. Differences among treatments were determined using PROC GLM statement in SAS program followed by a protected least significant difference test ($P<0.05$).

Results and Discussion

In 2013, with a very dry July and August, the warning system saved five fungicide sprays compared with the calendar-based treatment and controlled SBFS as well as the calendar-based treatment (Table 1). The reduced-risk fungicides treatments (Flint and Prophyt) were not different than the conventional fungicide (Topsin) in controlling the SBFS. The present SBFS warning system study showed a very good result. However, the 2013 growing season was considered to be a low/light SBFS disease pressure year due to drought conditions. The SBFS warning system trial will be repeated next year for comparison study.

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Table 1. Treatments used to control SBFS, number of cover sprays, and percentage of apples with SBFS.

Timing	Fungicide treatment[1]	Rate/acre	Cover sprays[2]	% with SBFS[3]
Control	No fungicide	-	0	16.4 a
Warning System	Captan 80WDG + Topsin M 4.5 FL	6 lb + 17.5 oz	2	2.0 b
Warning System	Captan 80WG+Flint (twice), then	6 lb + 5 pints	2	
	Captan 80WDG + Prophyt (three times), then	6 lb + 2 oz		
	Captan 80WG+Flint (twice)	6 lb + 5 pints		0.1 b
Calendar	Captan 80WDG + Topsin M 4.5 FL	6 lb + 17.5 oz	7	0.1 b
Calendar	Captan 80WG+Flint (twice), then	6 lb + 5 pints	7	0.4 b
	Captan 80WDG + Prophyt (three times), then	6 lb + 2 oz		
	Captan 80WG+Flint (twice)	6 lb + 5 pints		

[1]The first-cover spray using Captan 80WDG (6 lb)+Topsin M 4.5 FL (17.5 oz)/acre was applied to all treatments.
[2]Not including the first-cover spray that was applied to all treatments.
[3]Means with the same letter are not significantly different with ($P<0.05$) according to least significant difference test.