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Evaluation of Weather Data asInputsto a Disease-Warning System for Control of Sooty Blotch and Flyspeck

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Abstract
The sooty blotch-flyspeck (SBFS) disease complex is the major target of fungicide sprays from shortly after petal fall until harvest. The fungi in this complex blemish the fruit cuticle. The result can be loss of up to 94% of the crop's market value,since blemished fruit are downgraded from fresh-market to cider grade and water loss is accelerated during storage of SBFS-infested apples.

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Evaluation of Weather Data as Inputs to a Disease-Warning System for Control of Sooty Blotch and Flyspeck

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Introduction

The sooty blotch-flyspeck (SBFS) disease complex is the major target of fungicide sprays from shortly after petal fall until harvest. The fungi in this complex blemish the fruit cuticle. The result can be loss of up to 94% of the crop's market value, since blemished fruit are downgraded from fresh-market to cider grade and water loss is accelerated during storage of SBFS-infested apples.

Disease-warning systems are tools that aid growers in applying fungicides to optimize control while reducing chemical and labor expenses. Weather data are used as inputs to the disease forecast system. However, obtaining accurate weather data requires time and expense from the growers. Weather data acquisition is a primary reason that growers continue to apply fungicides using a calendar-based schedule rather than employing a disease-warning system.

Commercially available site-specific weather data (i.e. ZedX Inc., Bellefonte, PA) has potential to help growers take advantage of disease forecasting system tools. Furthermore, forecasted data, rather than data previously obtained (hindcast), may also benefit the grower in planning spray applications to avoid inclement weather conditions. Correction models have also been developed to increase the accuracy of a disease-forecasting model.

The objective of this study was to evaluate weather data sources, data acquisition periods, and model corrections used as inputs for a SBFS disease-warning system.

Materials and Methods

Fungicides were applied to 18-yr-old Golden Delicious, Red Delicious, Jonathan, and McIntosh trees on M.7 rootstock at the ISU Horticultural Station. All fungicide treatments were applied to runoff at 200 psi using tractor driven sprayer. Nine treatments (Table 1) were replicated four times in a randomized complete block design; each subplot consisted of three trees.

All plots including controls were sprayed with Nova 40W at 5 oz/A to control powdery mildew, rust, and apple scab from tight cluster through first cover (May 27). Thereafter, Captan 50WP at 1.0 lb/A + Topsin-M 70WSB at 5 oz/A was applied at biweekly intervals in the calendar-based control (Treatment 7). The other treatments delayed the second cover spray until leaf wetness (LW) hours accumulated at predetermined thresholds of 175 or 225 hr. Leaf wetness data were measured with either on-site equipment (Spectrum Watch Dog Plant Disease mini Station placed at the base of the tree canopy) (Treatment 9) or remotely estimated (ZedX Inc.) with a combination of timeframe estimations and model corrections (Treatments 1 to 6) (Table 1). Treatment 8, a negative control, did not receive fungicides following first cover. Treatments that used weather data to determine the timing of the second-cover spray were subsequently sprayed biweekly with Captan 50WP at 1.0 lb/A + Topsin-M 70WSB at 5 oz/A until harvest.

The fungicide programs were evaluated immediately after harvest. Fifty fruit per tree (150 fruit per replication or 600 fruit per treatment) were harvested and observed to determine the percent of fruit with SBFS with the aid of a standard area (note: because of a late spring frost some apple trees did not have enough fruit, so in that case all the available fruits were picked).

Results and Discussion

The calendar-based control (Treatment 7) did not differ from the unsprayed control, whereas Treatment 9 had the highest severity of SBFS symptoms and was different from all the rest of the treatments (Table 1). There were no differences among remote-estimation treatments, regardless of time frame or model correction. No differences were found among trees within subplots.

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Table 1. Severity of sooty blotch and flyspeck (SBFS) at the ISU Horticulture Station, 2007.

Trt #	Weather data source	Time frame of data input	Model correction[a]	SBFS severity[b]	
9	On-site	Hindcast	--	36.5	A[c]
8	--	Unsprayed	--	29.8	AB
7	--	Calendar-based	--	15.4	BC
5	ZedX Inc.	72-h forecast	none	13.9	BC
4	ZedX Inc.	24-h forecast	corrected	12.7	C
6	ZedX Inc.	72-h forecast	corrected	12.2	C
3	ZedX Inc.	24-h forecast	none	12.1	C
2	ZedX Inc.	Hindcast	corrected	11.7	C
1	ZedX Inc.	Hindcast	none	11.6	C

[a]Kim et. al 2002, 2004
[b]Percent severity of SBFS was determined using a standard area diagram (Batzer, 2003).
[c]Means followed by the same letter are not significantly different ($P < 0.05$).