

# **Evaluating Reduced-Risk Fungicides and Wetness-Based Warning Systems to Control Summer Diseases of Apple in Illinois in 2004**

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## ***Introduction***

Major summer diseases of apple in Illinois are sooty blotch/flyspeck and fruit rots. The sooty blotch/flyspeck (SBFS) disease complex (fungi: *Peltaster fructicola*, *Leptodontium eliatum*, *Geastrumia polystigmatis*, and *Zygophiala jamaicensis*) blemish the fruit cuticle, which can make 100% of the crop unmarketable. Fruit rots, including bitter rot (*Glomerella cingulata*), black rot (*Botryosphaeria obtusa*), and white rot (*Botryosphaeria dothidea*) are fungal diseases that occur commonly in Illinois and can cause significant yield loss if effective control measures are not applied. The objectives of this study were: (i) to determine the success of a disease-warning system with two types of weather data (on-site collected and remotely-sensed) and (ii) to determine the efficacy of reduced-risk fungicides for control of summer diseases.

## ***Material and Methods***

The trial was conducted at the University of Illinois Pomology Research Farm at Urbana, IL. The experimental design was a randomized complete block with four replications (2-tree block each) of 10 treatments. The treatments included were an untreated check; a conventional control (Topsin-M 70WSB at 6 oz/100 gal + captan 50WP at 1 lb/100 gal); Sovran (kresoxim-methyl), a reduced-risk fungicide, at 1.6 oz/100 gal alternated with Topsin-M + captan; and Kaligreen (potassium bicarbonate), an organic fungicide, at 3 lb/100 gal. These chemicals were applied every two weeks from the second cover-spray (2 June) until 8 September (a total of 7 sprays). Additionally, we tested the disease-warning system with the input of on-site (Spectrum Technologies Leaf Wetness/Temperature logger) or remotely-sensed (SkyBit, Inc.) weather data. For these treatments, Topsin-M + captan was applied at first cover, but the second cover spray was not applied until the threshold of leaf wetness hours (LWH) had accumulated. Treatments included in the disease-warning system were application of Topsin-M + captan after 175 LWH according to the on-site sensor; Sovran alternated with Topsin-M + captan after 175 LWH according to the on-site sensor; Topsin-M + captan after 400 LWH according to SkyBit; Topsin-M + captan after 500 LWH according to SkyBit; Sovran alternated with Topsin-M + captan after 500 LWH according to SkyBit; and Topsin-M + captan after 600 LWH according to SkyBit. Following the second cover-spray, the trees were sprayed on a two-week schedule until 8 September, two weeks before harvest. Sprays were applied to both sides of the tree rows with a hydraulic hand-gun tractor sprayer.

At the end of season, 60 apples from each tree were examined for the incidence (percentage of fruit infected) and severity (percentage of surface area of fruit affected) of sooty blotch, flyspeck, and fruit rots. In each tree, five apples from each of upper, middle, and lower canopies in each of the four sides (northern, eastern, southern, western) were examined. Also, the incidence of

scab, rust, fire blight, and powdery mildew on fruit and foliage was determined. The data were analyzed in SAS using the GLM procedure, and comparisons were made using Fisher's protected LSD ( $P < 0.05$ ).

### ***Results and Discussion***

Use of the wetness-based disease-warnings system saved three, three, three, and four fungicide applications for on-site (175 LWH), SkyBit 400 LWH, SkyBit 500 LWH, and SkyBit 600 LWH treatments, respectively, when compared to the conventional control (Tables 2).

In 2004, only sooty blotch and fly speck occurred in the experimental plots. Fruit rots, scab, rust, fire blight, and powdery mildew were not observed in the plots. There was no significant difference in incidence or severity of sooty blotch or flyspeck among treatments (Table 1). However, incidence and severity of both sooty blotch and flyspeck were significantly higher in untreated plots than sprayed plots. The reduced-risk fungicides, Sovran, and the organic fungicide, potassium bicarbonate (Kaligreen) provided control of summer diseases equal to the conventional control (Topsin-M plus captan) (Table 1).

Table 1. Effect of reduced-risk fungicides and reduced-spray programs on the incidence and severity of sooty blotch and flyspeck of apple, 2004.

Treatment	Sooty blotch		Flyspeck	
	Incidence (%) <sup>x</sup>	Severity (%) <sup>y</sup>	Incidence (%) <sup>x</sup>	Severity (%) <sup>y</sup>
Topsin + captan (conventional) .....	0.0 b <sup>z</sup>	0.00 b	0.0 b	0.00 b
Sovran alternated with Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
Potassium bicarbonate (Kaligreen) .....	0.0 b	0.00 b	0.0 b	0.00 b
On-site (175 LWH)-based Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
On-site (175 LWH)-based Sovran alternated with Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
SkyBit (400 LWH)-based Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
SkyBit (500 LWH)-based Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
SkyBit (500 LWH)-based Sovran alternated with Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
SkyBit (600 LWH)-based Topsin-M + captan .....	0.0 b	0.00 b	0.0 b	0.00 b
Untreated check .....	10.6 a	0.11 a	6.9 a	0.07 a
<i>LSD (P&lt;0.05)</i>	<i>1.2</i>	<i>0.01</i>	<i>1.0</i>	<i>0.01</i>

<sup>x</sup> Mean number of 120 apples with SB or FS signs.

<sup>y</sup> Percentage of surface area of fruit affected.

<sup>z</sup> Values in each column followed by the same letter are not significantly different according to Fisher's protected LSD ( $P=0.05$ ).

Table 2. Dates, hours of wetness, and fungicide sprays according to weather-based disease-warning systems in 2004.

Treatment <sup>w</sup>	Date of 2 <sup>nd</sup> cover spray	Wetness hours at 2 <sup>nd</sup> cover spray	Days between 1 <sup>st</sup> and 2 <sup>nd</sup> cover sprays <sup>x</sup>	Sprays saved (no)
Topsin + captan (conventional) .....	2-June	0	14	_____
Sovran alternated with Topsin-M + captan .....	2-June	0	14	_____
Potassium bicarbonate (Kaligreen) .....	2-June	0	14	_____
On-site (175 LWH)-based Topsin-M + captan ...	19-July	162 <sup>y</sup>	61	3
On-site (175 LWH)-based Sovran alternated with Topsin-M + captan .....	19-July	162 <sup>y</sup>	61	3
SkyBit (400 LWH)-based Topsin-M + captan ...	8-July	424 <sup>z</sup>	50	3
SkyBit (500 LWH)-based Topsin-M + captan ....	13-July	510 <sup>z</sup>	55	3
SkyBit (500 LWH)-based Sovran alternated with Topsin-M + captan .....	13-July	510 <sup>z</sup>	55	3
SkyBit (600 LWH)-based Topsin-M + captan ...	23-July	602 <sup>z</sup>	65	4
Untreated check .....	_____	_____	_____	_____

<sup>w</sup> Spray timing according to the warning system is based on weather data derived from either on-site sensor measurements or remote estimation (SkyBit, Inc.).

<sup>x</sup> First Cover spray was applied on 19 May.

<sup>y</sup> Leaf wetness hours recorded on-site.

<sup>z</sup> Leaf wetness hours provided by SkyBit, Inc.