Sooty Blotch Fly Speck Model v. 1.0

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Other cover page content here

Description

URL: http://newa.cornell.edu/index.php?page=apple-diseases

The NEWA sooty blotch fly speck disease model predicts the infection risk due to this fungal pathogen complex. The user selects a US state, then chooses a desired location from a dynamic list of active (not inactive) data streams. Once a date of interest is chosen, the user clicks 'Calculate' and the model returns a panel of disease risk assessment parameters. By default, the sooty blotch fly speck model calculates an estimated first petal fall date after initial parameters are provided but can be changed if the estimate is inadequate. The user may also add date of most recent fungicide application to restart the model calculations from that point in time if needed.

Once active, the model generates a summary table with five contextual environmental calculations and one risk assessment calculation. Management guidelines are integrated directly to the output table using color coding and short dynamic messages which are linked to the risk assessment calculation.

The The soot blotch fly speck risk assessment calculation is 'Risk Level' and the five environmental calculations are 'Days since petal fall', 'Accumulated Leaf Wetness Hours ALWH', 'Daily Rain Amount (inches)', and 'Rain Probability (%) Day|Night'. Risk assessment and environmental calculations are made for an 8-day period of time, starting 2 days prior to the selected day of interest and ending 5 days in the future. Past and current day of interest values us historical location data while future days utilize National Weather Service forecasts provided by NRCC.

'Cougarblight 4-Day DH' and Infection Potential EIP value are derived from the Cougarblight model developed at Washington State University.

The disease management guidelines are comprised of two dynamic elements (Disease Cycle and Disease Management) that change depending on current day output of Ascospore Maturity Summary and Infection Events Summary. These guidelines were developed by project collaborators to provide the highest probability of successful disease management using the most accurate weather data and information available.

This model does not have save, print, or download capabilities.

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Important user-defined fields

Model input fields listed here must be saved to a database that links with a user profile. After initial input, the value saved by the user must pre-load.

Petal fall date for McIntosh
Most recent fungicide application date

Important formulas

Risk Level

α = Petal fall date
β = Date of last fungicide application
γ = Days since petal fall
δ = Rainfall total since α or β
ϵ = Accumulated leaf wetness hours since α

ζ = sooty blotch fly speck risk level

For date of interest:

IF $\gamma < 10$ AND $\delta < 1.5$ AND $\epsilon < 100$ THEN ζ = 'No risk'
ELSE IF $\gamma < 10$ AND $\delta < 1.5$ AND $\epsilon \geq 100$ AND $\epsilon < 130$ THEN ζ = 'Low'
ELSE IF $\gamma < 10$ AND $\delta < 1.5$ AND $\epsilon \geq 130$ AND $\epsilon < 170$ THEN ζ = 'Low'
ELSE IF $\gamma < 10$ AND $\delta < 1.5$ AND $\epsilon \geq 170$ THEN ζ = 'Low'

ELSE IF $\gamma < 10$ AND $\delta \geq 1.5$ AND $\delta < 2.0$ AND $\epsilon < 100$ THEN ζ = 'No risk'
ELSE IF $\gamma < 10$ AND $\delta \geq 1.5$ AND $\delta < 2.0$ AND $\epsilon \geq 100$ AND $\epsilon < 130$ THEN ζ = 'Low'
ELSE IF $\gamma < 10$ AND $\delta \geq 1.5$ AND $\delta < 2.0$ AND $\epsilon \geq 130$ AND $\epsilon < 170$ THEN ζ = 'Moderate'
ELSE IF $\gamma < 10$ AND $\delta \geq 1.5$ AND $\delta < 2.0$ AND $\epsilon \geq 170$ THEN ζ = 'Moderate'

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ELSE IF $\gamma < 10$ AND $\delta \geq 2.0$ AND $\epsilon < 100$ THEN $\zeta =$ 'No risk'
ELSE IF $\gamma < 10$ AND $\delta \geq 2.0$ AND $\epsilon \geq 100$ AND $\epsilon < 130$ THEN $\zeta =$ 'Low'
ELSE IF $\gamma < 10$ AND $\delta \geq 2.0$ AND $\epsilon \geq 130$ AND $\epsilon < 170$ THEN $\zeta =$ 'Moderate'
ELSE IF $\gamma < 10$ AND $\delta \geq 2.0$ AND $\epsilon \geq 170$ THEN $\zeta =$ 'High'

IF $\gamma \geq 10$ AND $\gamma < 14$ AND $\delta < 1.5$ AND $\epsilon < 100$ THEN $\zeta =$ 'Low'
ELSE IF $\gamma \geq 10$ AND $\gamma < 14$ AND $\delta < 1.5$ AND $\epsilon \geq 100$ AND $\epsilon < 130$ THEN $\zeta =$ 'Low'
ELSE IF $\gamma \geq 10$ AND $\gamma < 14$ AND $\delta < 1.5$ AND $\epsilon \geq 130$ AND $\epsilon < 170$ THEN $\zeta =$ 'Low'
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Model logic

All messages are dependent on Cascade A parameters.

Dynamic content for Disease Cycle and Disease Management Fields

Table 1. Message cascade thresholds and content for apple sooty blotch flyspeck message fields.

Conditions	Model Message
Petal fall is NULL	At this time, pest management is unecessary.
Petal fall in not NULL	Risk Level IPM Guidelines for Sooty Blotch and Flyspeck: NO RISK - No action needed. LOW RISK - If first cover application has not been made, make first cover fungicide application for apple scab. Otherwise, no action needed. MODERATE RISK - Check the 5-day forecast; a cover application should be made if two or more days with precipitation are predicted. See Fungicides below. HIGH RISK - A cover application for Sooty Blotch and Flyspeck should be made. See Fungicides below. Fungicides for Sooty Blotch and Flyspeck: To effectively limit fruit finish blemishes from Sooty Blotch and Flyspeck infection consider making a cover application of one of the following fungicides/tank mixes: {{ fungicide_list }}

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References

Brown, E.M. 1995. An empirical model for predicting the first symptoms of sooty blotch and flyspeck of apples. Plant Dis. 79:1165. (Go to article)

Gold, H.J. Gold, H.J., and Sutton, T.B. 1986. A decision analytic model for chemical control of sooty blotch and flyspeck diseases of apple. Agricultural Systems. 21:129-157. (Go to article)

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Appendix A - User Interface Elements Glossary

Table 2. Wireframe element reference, name, and description.

Reference	Description
1.0	User-defined NEWA location
2.0	Date of 90%(?) petal fall date for McIntosh apples
3.0	User-defined date of last fungicide application
4.1	User-selected date minus 2
4.2	User-selected date minus 1
4.3	User-selected date
4.4	User-selected date plus 1
4.5	User-selected date plus 2
4.6	User-selected date plus 3
4.7	User-selected date plus 4
4.8	User-selected date plus 5
5.1	Days since petal fall on user-selected date minus 2
5.2	Days since petal fall on user-selected date minus 1
5.3	Days since petal fall on user-selected date
5.4	Days since petal fall on user-selected date plus 1
5.5	Days since petal fall on user-selected date plus 2
5.6	Days since petal fall on user-selected date plus 3
5.7	Days since petal fall on user-selected date plus 4
5.8	Days since petal fall on user-selected date plus 5
6.1	Hours of leaf wetness on user-selected date minus 2
6.2	Hours of leaf wetness on user-selected date minus 1
6.3	Hours of leaf wetness on user-selected date

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6.4	Hours of leaf wetness on user-selected date plus 1
6.5	Hours of leaf wetness on user-selected date plus 2
6.6	Hours of leaf wetness on user-selected date plus 3
6.7	Hours of leaf wetness on user-selected date plus 4
6.8	Hours of leaf wetness on user-selected date plus 5
7.1	Sooty blotch fly speck risk level on user-selected date minus 2
7.2	Sooty blotch fly speck risk level on user-selected date minus 1
7.3	Sooty blotch fly speck risk level on user-selected date
7.4	Sooty blotch fly speck risk level on user-selected date plus 1
7.5	Sooty blotch fly speck risk level on user-selected date plus 2
7.6	Sooty blotch fly speck risk level on user-selected date plus 3
7.7	Sooty blotch fly speck risk level on user-selected date plus 4
7.8	Sooty blotch fly speck risk level on user-selected date plus 5
8.1	Total rainfall in inches on user-selected date minus 2
8.2	Total rainfall in inches on user-selected date minus 1
8.3	Total rainfall in inches on user-selected date
8.4	Total rainfall in inches on user-selected date plus 1
8.5	Total rainfall in inches on user-selected date plus 2
8.6	Total rainfall in inches on user-selected date plus 3
8.7	Total rainfall in inches on user-selected date plus 4
8.8	Total rainfall in inches on user-selected date plus 5
9.1	Day and night rainfall probability on user-selected date minus 2
9.2	Day and night rainfall probability on user-selected date minus 1
9.3	Day and night rainfall probability on user-selected date
9.4	Day and night rainfall probability on user-selected date plus 1
9.5	Day and night rainfall probability on user-selected date plus 2
9.6	Day and night rainfall probability on user-selected date plus 3

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9.7	Day and night rainfall probability on user-selected date plus 4
9.8	Day and night rainfall probability on user-selected date plus 5

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Appendix B - User Interface Elements Map

NEWA Apple Sooty Blotch and Flyspeck Model

Select a pest:

State:

Weather station:

Accumulation End Date:

Calculate

Map | Results | More info

Sooty Blotch and Flyspeck Risk Predictions for 1.0

Petal fall date for McIntosh: 2.0 Click if petal fall has not occurred

Petal fall date above is estimated based on degree day accumulations or user input.
Enter the actual date for blocks of interest and the model will calculate the accumulated leaf wetness hours since 10 days after petal fall more accurately

Most recent fungicide application date: 3.0

If petal fall has passed, enter the date of your most recent fungicide application.
If no fungicide applications have been made, do not enter a date.

In the Risk Summary table, not the accumulated leaf wetness hours since petal fall (Leaf Wetness Hours) and the Risk Level. Leaf wetness hours, rain events, and the last fungicide application date are taken into consideration in assessing risk level. To estimate risk in the near future, look at the probability of rain

Consult the Risk Level IPM Guidelines below the **Risk Summary table.**

Sooty Blotch and Flyspeck Risk Summary - Northeastern US

	Past	Past	Current	5-day Forecast Forecast details				
Date	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8
Days since petal fall	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8
Accumulated Leaf Wetness Hours - ALWH	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8
Risk Level	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8
Rain Events								
Daily rain amount (inches)	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8
Rain probability (%) Night|Day	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8

NA - data not available

Download Time: MM/DD/YYYY HH:MM

Risk Level IPM Guidelines for Sooty Blotch and Flyspeck:
- **NO RISK** - No action needed
- **LOW RISK** - If first cover application has not been made, make first cover fungicide application for apple scab. Otherwise no action is needed.
- **MODERATE RISK** - Check the 5-day forecast; a cover application should be made if two or more days with precipitation are predicted. See Fungicides below.
- **HIGH RISK** - A cover application for Sooty Blotch and Flyspeck should be made. See Fungicides below

Fungicides

This disease forecasting model was co-authored and developed in collaboration with Dr. Kerik Cox in the Department of Plant Pathology and Plant-Microbe Biology at Cornell University in Geneva, New York. Please contact Dr. Cox with any questions regarding the scientific content and recommendations delivered in model outputs.

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Figure 1. Model wireframe reference for design elements and variables.

Appendix C - Production Model Screenshot

NEWA Apple Disease Models

Select a disease: Sooty Blotch/Flyspeck

State: New York

Weather station: Geneva

Date of Interest: 06/30/2018

Calculate

Map | Results | More info

Sooty Blotch and Flyspeck Risk Predictions for Geneva

Petal fall date for McIntosh: 5/17/2018 Click if petal fall has not occurred

Petal fall date above is estimated based on degree day accumulations or user input. Enter the actual date for blocks of interest and the model will calculate the accumulated leaf wetness hours since 10 days after petal fall more accurately.

Most recent fungicide application date: Click to enter

If petal fall has passed, enter the date of your most recent fungicide application. If no fungicide applications have been made, do not enter a date.

In the Risk Summary table, note the accumulated leaf wetness hours since petal fall (Leaf Wetness Hours) and the Risk Level. Leaf wetness hours, rain events, and the last fungicide application date are taken into consideration in assessing risk level. To estimate risk in the near future, look at the probability of rain.

Consult the Risk Level IPM Guidelines below the Risk **Summary** table.

Sooty Blotch and Flyspeck Risk Summary - Northeastern US Model

	Past	Past	Current	Ensuing 5 Days				
Date	6/28	6/29	6/30	7/1	7/2	7/3	7/4	7/5
Days since petal fall	42	43	44	45	46	47	48	49
Accumulated Leaf Wetness Hours - ALWH	109	109	109	109	109	109	109	114
Risk Level	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Rain Events								
Daily rain amount (inches)	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.52
Rain probability (%) Night|Day ?			- | -	- | -	- | -	- | -	- | -	- | -

NA - data not available. Download Time: 7/6/2018 23:00

Risk Level IPM Guidelines for Sooty Blotch and Flyspeck:

- **NO RISK** - *No action needed.*
- **LOW RISK** - *If first cover application has not been made, make first cover fungicide application for apple scab. Otherwise, no action needed.*
- **MODERATE RISK** - *Check the 5-day forecast; a cover application should be made if two or more days with precipitation are predicted. See Fungicides below.*
- **HIGH RISK** - *A cover application for Sooty Blotch and Flyspeck should be made. See Fungicides below.*

Fungicides

This disease forecasting model was co-authored and developed in collaboration with Dr. Kerik Cox in the Department of Plant Pathology and Plant-Microbe Biology at Cornell University in Geneva, New York. Please contact Dr. Cox with any questions regarding the scientific content and recommendations delivered in model outputs.

Disclaimer: ***These are theoretical predictions and forecasts.*** *The theoretical models predicting pest development or disease risk use the weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage, pest presence, and disease occurrence determined through scouting or insect pheromone traps.*

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Figure 2. Model production example.