Some observations on using multiple disease forecasting models during the 2013 growing season from an Extension perspective

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University of Massachusetts Amherst
Extension Educator

- Statewide tree fruit responsibility
- Grower visits, calls
- Healthy Fruit newsletter
- Twitter (@jmcextman) and Facebook
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- Jack of all trades, master of none…
Spring, 2013

Table of Contents

- Jon Clements and Win Cowgill Received the 2013 International Fruit Tree Association’s ‘Extension Award’
- A Comparison Of Two Sources Of Environmental Data And Three Model Outputs For Primary Apple Scab In 2012 At The UMass Cold Spring Orchard
- International Fruit Tree Association, 56th Annual Meeting, Boston
- Hazelnuts: An Emerging Crop for the Northeast

For the whole issue click here.

- Environmental/weather data: SkyBit and on-site weather station (Rainwise MKIII LR)
- Models: NEWA, Orchard Radar, SkyBit, RIMPro
Conclusions

- “It appears all four [apple scab] models based on two sources of weather data were pretty much in agreement and would be useful information in managing primary scab.”

- “More specifically, models aligned well in infection periods, but differed more in declaring end of primary scab season based on 100% ASM.”
More conclusions

- “One advantage of using SkyBit (and Orchard Radar) is the predictive forecasts.”
- “All four models using two sources of weather data were/are very useful in managing sprays and apple scab during the primary season and should be used by all growers/Extension/consultants.”
2013 options

- NEWA
- SkyBit
- Orchard Radar
- RIMProWeb
2013 NEWA

- Network for Environment and Weather Applications
- 21 on-site weather stations (Rainwise, Onset)
- Includes airports (23)
- Weather data and disease/insect models
- http://newa.cornell.edu
**NEWA Apple Disease Models**

**Select a disease:** Apple Scab

**Weather Station:** Belchertown, MA

**Date of Interest:** 05/11/2013

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<thead>
<tr>
<th></th>
<th>Past</th>
<th>Past</th>
<th>Current</th>
<th>5-Day Forecast</th>
<th>Forecast Details</th>
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<tr>
<td><strong>Ascospore Maturity</strong></td>
<td></td>
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<tr>
<td>May 9</td>
<td>38%</td>
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<td>May 10</td>
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<td>71%</td>
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<td><strong>Infection Events</strong></td>
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<td></td>
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<tr>
<td><strong>Days to Symptoms</strong></td>
<td>NA</td>
<td>NA</td>
<td>12-13</td>
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</table>

**Wetness Events**

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<th>Rain Amount</th>
<th>Rain Prob (%) Night</th>
<th>Dew</th>
<th>Leaf Wetness (hours)</th>
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<td>0.24</td>
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<td>Dew</td>
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<td>Yes</td>
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<td>Yes</td>
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<td>Leaf Wetness (hours)</td>
<td>19</td>
<td>14</td>
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</table>

NA - not applicable

An apple scab infection period has been predicted and ascospores are mature. Ensure that young leaves and fruit are protected. Click here for pesticide information.

The Ascospore Maturity degree day model begins at 50% green tip on McIntosh flower buds. To recalculate ascospore maturity for your orchard, enter your green tip date:

**Green Tip Date:** 4/14/2013
Primary scab season is over. Ascospores were essentially all released on May 22. Focus on protecting trees from secondary scab infections as needed, based on infection events.

### Apple Scab Infection Events (March 1 - August 5)

<table>
<thead>
<tr>
<th>Start Date &amp; Time</th>
<th>End Date &amp; Time</th>
<th>Wet Hours</th>
<th>Temp Avg. (F)</th>
<th>Rain (in.)</th>
<th>Days to Symptoms</th>
<th>Combined Event</th>
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<tr>
<td>August 1 12:01 PM</td>
<td>August 2 9:00 AM</td>
<td>21</td>
<td>65</td>
<td>0.94</td>
<td>9-10</td>
<td>Yes</td>
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<tr>
<td>July 25 6:01 PM</td>
<td>July 26 12:00 PM</td>
<td>16</td>
<td>61</td>
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<td>July 22 6:01 PM</td>
<td>July 23 5:00 PM</td>
<td>21</td>
<td>72</td>
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<td>July 10 2:01 PM</td>
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<td>20</td>
<td>73</td>
<td>0.13</td>
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<td>July 7 3:01 PM</td>
<td>July 9 8:00 AM</td>
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<td>72</td>
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<td>July 1 12:01 PM</td>
<td>July 2 11:00 AM</td>
<td>14</td>
<td>72</td>
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</table>

Dry conditions last 72 hours at download
Ascospore Maturity and Weather Summary for Belchertown

Green tip date (4/13) is indicated by a dashed green line.

The Ascospore Maturity model predicts that 95% of the spores are matured. At this point, essentially all ascospores will be released after a daytime rain of greater than 0.10 inch with temperatures above 50 deg F.

- **Temperature (°F)**
- **Precipitation (inches)**

Legend:
- Blue: Daily lowest and highest hourly temperatures
- Green: Daily precipitation
- Orange: Forecast lowest and highest hourly temperatures
- Yellow: Forecast precipitation
NEWA

- What I like…
  - Many sites and partial “ownership”
  - Linked to specific pesticide recommendations
  - Historical weather data and flexibility
  - Disease, insect, and horticulture
  - Multiple crops
  - Available to anyone, with the most data sites
What I don’t like…

- Cost (currently $5,750 annual fee)
- A bit information-dense, can take some wading through
- User interface could use some improvement
- Reliance on weather stations (maintenance, accuracy, etc.)
- Have to set out pheromone traps and enter biofix for maximum accuracy
2013 SkyBit E-weather

- Subscription-based weather data and models
- Site-specific (Belchertown, MA)
- Daily e-mail (no web)
- Disease, insect (horticulture beta)
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<th>TMN</th>
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<th>ARH</th>
<th>LW</th>
<th>ASM</th>
<th>AW</th>
<th>TW</th>
<th>PW</th>
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</table>

Based on Observations

Based on Forecasts

**IMPORTANT:** Check the dates at the top of each column.

Green Tip Date - is used for Apple Scab
Blossom Date - is used for Fire Blight
Petal Fall Date - is used for Sooty Blotch

ASM = Apple Scab Maturity Percentage
ADH = Accumulated degree-hours from blossom date up to a max of 225.
ALW = Accumulated leaf wetness hours from petal fall date.
AW = Accumulated wetness hours for the most severe event.
TW = Average temperature during the most severe event.
PW = Pest Wait/Watch/Warning: - = not active
+ = active but no infection
++ = possible infection & damage
SkyBit

- What I like...
  - Daily “in-face” e-mail
  - Simple interpretation
  - Includes forecast
  - Can be set up for any site-specific location
  - Seasonal on/off
What I don’t like…

- Cost?
- Have to set out pheromone traps and enter biofix for maximum accuracy
- Tendency to be pretty conservative, especially on forecast, i.e., accuracy is a bit vague…is this a good thing or a bad thing?
2013 Orchard Radar

- Glen Koehler, U. of Maine
- SkyBit subscription-based data source
- Disease/insect/horticulture
- http://pronewengland.org/allmodels/RadarIntro.htm
Belchertown MA, - Orchard Radar

Apple Pest Monitoring Pocket Guide

Apple Calendar - Early season  Apple Calendar - Late season

Jump down to sections:
Scab  Fire blight  Flyspeck  Insects & Mites  Horticulture  Weather

Some of the longer tables may require hitting "refresh" (F5 key for Internet Explorer) to completely download.

* CURRENT WEATHER *  Weather archive is at bottom of this page.
Hourly weather chart  32 day temp. chart  32 day rain chart

Hourly forecast table
Hourly observations - 7 days back

* APPLE SCAB *

Apple scab - Key dates

SCAB BIOLOGY
Daily scab infection conditions rating chart  Ratings on this chart account for ascospore maturity, previous ascospore releases, leaf wetness duration, amount and timing of rain, average temperature, leaf size, and foliar susceptibility. It is a comprehensive, but relative, estimate of primary scab infection conditions. It does not estimate the actual absolute risk because it does not account for inoculum level, which is the single most important component of scab risk.

Daily scab conditions in Table format
Orchard Radar

Daily primary scab infection potential as % of yearly total

Belchertown MA

Forecast values begin July 3, 2013

Percent of primary scab potential

50%
40%
30%
20%
10%
0%
Orchard Radar

Development and Release of Primary Scab Infection Potential

Percent Primary Scab Potential, Released (box), & 0.01 inches rain

Forecast values begin July 3, 2013

Belchertown MA
What I like…
- Site-specific using SkyBit data
- Excellent forecasting of insect/disease/horticulture “situation”
- Good historical record (for current year only)
- Developer well-versed in biology and modeling (despite himself!)
- Have used info in Healthy Fruit newsletter
Orchard Radar

- What I don’t like…
  - Cost?
  - Not yet a commercial turn-key application
  - Text-heavy, information dense, i.e., requires time and study to get the most out of it… sometimes it is just too much information
Marc Trapman, Bio Fruit Advies
Uses on-site weather station
Includes forecast
PC application and web
Scab, fireblight, codling moth, weather data

http://www.biofruitadvies.nl/rimpro/rimpro_e.htm
What I like…

- Intuitive, quick-switching, tabbed interface
- All graphical, no text
- Good forecasting
- Models seemed very in-tune with real situation
- Developer very knowledgeable of biology and modeling
What I don’t like…

- Not a turn-key solution (yet)
- Unknown cost?
- Relies on weather station for current and past situation
- Needs some help with interpreting output
- Apple and grape (experimental) only
- Currently only a few pest models (but important ones)
Conclusion…
Wish list...

- Mobile first
- Push notification
- Simple, decisive interface w/o too much text to read
- Linked to immediate and specific action
- Models for all important diseases/pest
- Modest cost
Wish list…

- Does not rely on hardware-based on-site stations, but has site-specific accuracy
- Link to pesticide information and recordkeeping
- Above all, easy for *grower* to sign-up, configure, interpret, and perform action…
Above all: more time for beer…