New Developments for Managing Onion Leaf Diseases in New York

Christy Hoepting
Cornell Cooperative Extension Vegetable Program

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Acknowledgements

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• CVP Program Aid: Elizabeth Buck
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  – BASF
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  – CVP
Overwinter as sclerotia in soil, cull piles, onion debris.
Optimum conditions: 59 – 65 °F + 12 hours leaf wetness, 9 am to 12 noon, infection
Greatly reduced above 81 °F
Botrytis Leaf Blight Lesions

“Model” BLB lesions: straw-colored necrotic spot with silvery halo

“Small Necrotic Spot” BLB lesions: Do not have halos

“Old” BLB lesions: Center spot splits
Botrytis Leaf Blight Look-a-Likes

- **Chemical Injury**
- **Pelting Rain Injury**
- **Onion Thrips Feeding**

Silver streaking without necrotic spots
Botrytis Leaf Blight

Early Season Disease, start spraying at 3 BLB lesions per leaf plants grow out of BLB during heat of July
Alternaria Purple Blotch

Overwinter in crop residue and cull piles

Optimum conditions: 77 °F + 90% RH, long periods of leaf wetness,

min: 55 °F; max: 97 °F

Look for purple or tan boat-shaped lesions on otherwise green leaf tissue
Alternaria Purple Blotch

Mid to Late-Season Disease, attacks plants once leaf dieback begins during bulbing.


Planting  BLB  Onions  Harvest

PB
Downy Mildew

- DM infection favored by cool temperatures (less than 72 °F) and wet conditions.
- Spore germinations favored by 50 to 54 °F.
- High daytime temperatures (> 74°F) and short or interrupted periods of humidity at night can prevent sporulation.
Downy Mildew

Onions die standing up
Hot spots with [black sporulation] and leaf dieback are a sign of downy mildew.
Downy Mildew
Downy Mildew

Sporadic, Late-Season Disease, favored by cool nights with dew in August, can affect late onions.

- DM
- PB
- BLB
In cool seasons, DM can come in July and become very destructive.
Stemphylium Leaf Blight in New York: 2013

“onions are dying with their boots on!”
Stemphylium Leaf Blight in New York: 2013

Normal

Excessive leaf die-back
SLB usually associated with PB and DM, not an aggressive primary pathogen

Alternaria Purple Blotch  Stemphylium leaf blight (black) chasing downy mildew
Stemphylium Leaf Blight in New York: 2013

Tan and black lesions

Alternaria

S. vesicarium
Why?

• Prolonged moderate temperatures and heavy dews pushed SLB from its usual background position as a secondary disease into the forefront as aggressive pathogen.

• Other??
Stemphylium Leaf Blight in New York

Why some fields worse than others?

- Related to plant stress?
- Fungicide program?

Based on situation with SLB in Ontario, Canada, it is expected that SLB will occur regularly in New York, thus, new fungicide program is needed.
2013 Onion Fungicide Trial

- 21 treatments, 5 replicates
- In-field, small-plot (5 ft x 15 ft)
- Pembroke Muck (Genesee County)
- Cv. Santana
- 10 weekly sprays: Jul-2, 9, 18, 26, 31, Aug-9, 16, 22, 28 & Sep-6
- CO2 backpack sprayer: 40 gpa, 20-25 psi
Treatments

- Untreated Control

Labeled Products – all weekly sprays

- Bravo Weatherstik 3 pts  M5
- Mancozeb 3 lb  M3
- Bravo 1.5 pt + Scala 9 fl oz  M5 + 9
- Scala 18 fl oz  9
- Rovral 1.5 pt  E3
- Inspire Super 20 fl oz + Induce 0.25% v/v  3 + 9
- Quadris Top 14 fl oz  11 + 3
- Pristine 18.5 oz + Induce 0.25% v/v  7 + 11
- Koveral (mancozeb) 3 lbs + Induce 0.25% v/v (Cheminova)  M3
- Tanos 8 oz + mancozeb 3 lbs  11 + M3
My Recommendation (Hoepting Program):

- Bravo 3 pt + mancozeb 3 lb AB
- Bravo 1.5 pt + Scala 9 fl oz CD
- Bravo 1.5 pt + Scala 9 fl oz + mancozeb 3 lb EG
- Bravo 1.5 pt + Quadris Top 14 fl oz + mancozeb 3 lb F
- Quadris Top 14 fl oz + mancozeb 3 lb H
- Pristine 18.5 oz + mancozeb 3 lb IJ
## Relative Performance of Fungicides for Control of BLB & PB

<table>
<thead>
<tr>
<th>Relative performance</th>
<th>Fungicide</th>
<th>Rank Score</th>
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<tbody>
<tr>
<td><strong>BEST</strong></td>
<td>Scala 9 fl oz + Bravo 1.5 pt</td>
<td>12</td>
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<tr>
<td>2</td>
<td>Bravo 3 pt</td>
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<tr>
<td>3</td>
<td>Bravo 1.5 pt + Penncozeb 3 lbs</td>
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<td><strong>2nd Best</strong></td>
<td>Endura 6.8 fl oz</td>
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<tr>
<td>Mediocre</td>
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<tr>
<td>6</td>
<td>Switch 14 oz</td>
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<td><strong>POOR</strong></td>
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<td>8</td>
<td>Pristine 18.5 fl oz</td>
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<td>9</td>
<td>Cabrio 12 fl oz</td>
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<td>9</td>
<td>Penncozeb 3 lbs</td>
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<tr>
<td>10</td>
<td>Quadris 12.3 fl oz</td>
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<tr>
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<th>Rank Score</th>
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<tr>
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<td>Scala 9 fl oz + Bravo 1.5 pt</td>
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<tr>
<td>2</td>
<td>Scala 18 fl oz</td>
<td>23</td>
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<tr>
<td>3</td>
<td>Rovral 1 pt</td>
<td>24</td>
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<tr>
<td>4</td>
<td>Switch 14 oz</td>
<td>26</td>
</tr>
<tr>
<td><strong>2nd Best</strong></td>
<td>Endura 6.8 fl oz</td>
<td>37</td>
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<tr>
<td>Mediocre</td>
<td>Quadris 12.3 fl oz</td>
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<td>7</td>
<td>Cabrio 12 fl oz</td>
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<td><strong>POOR</strong></td>
<td>Bravo 3 pt</td>
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<td>9</td>
<td>Bravo 1.5 pt + Penncozeb 3 lbs</td>
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<tr>
<td>10</td>
<td>Penncozeb 3 lbs</td>
<td>50</td>
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Pipeline Products (not labeled in NY)

**FRAC Group**

- Luna Tranquility 16 fl oz (Bayer) weekly 7 + 9
- Merivon 9 oz (BASF) + Induce 0.25% v/v weekly 7 + 11
- Fontelis 1 pt (DuPont) + MSO 0.25% v/v weekly 7
- Fontelis 1.5 pt + MSO 0.25% v/v weekly 7
- Fontelis 1.5 pt alt. Bravo 2 pt 7 + M5

- Rotation restrictions for group 7, 9 & 11
- *Hoping to find something to replace Bravo for BLB due to tank-mix interaction with insecticides*
Botrytis Leaf Blight:

- 6-10 plants per plot
- No. “model” lesions per leaf (3 outer leaves)
- “necrotic spot” lesion size & count rating (0-5)
- Jul-18, Aug-1 & Aug-14 = 9 data points
Botrytis Leaf Blight Rating Scale for Lesion Size and Density

**Lesion Size**
- Pin-head size, 0.5 mm in size, not sunken: 0
- 1.0 mm size, straw-colored center, sunken: 1

**Density**
- 11-20 lesions per leaf: 2
- 21-41 lesions per leaf: 3
- 41 lesions and above: 4
- 51 lesions and above: 5

Mutschler et al.
**Purple Blotch:**

- 6-10 randomly selected plants per plot
- No. “purple” lesions per plant
- Incidence per plot (%PB)
- Aug-1, Aug-14 & Aug-28 = 5 data points

- Due to downy mildew occurring in the trial, to avoid this confounding variable only lesions not in combination with DM were included for data analysis
Stemphylium Leaf Blight:

• 6-10 randomly selected plants per plot
• No. black, tan and brown lesions per leaf
• % die-back per plant
• Aug-28
• Did not include lesions on top of DM lesions
  = 2 data points
Lesions With and W/o DM

- Black lesions without DM
  - Included in analysis

- Black lesions with DM
  - Not Included in analysis
Lesions With and W/o DM

Tan lesions without DM

Included in analysis

Tan lesions with DM

Not Included in analysis
Evaluation

Stemphylium Leaf Blight:

- Closely related to “Overall Plant Health”
  - % leaf defoliation per plot – Aug-14
  - % dieback per plant – Aug 28 (non-DM)
  - No. green leaves per plant – Aug 28 (non-DM)
  - % leaf die-back per plant – Aug 28 (non-DM)
  - % dying standing up per plot – Sep 17
    = 5 data points

Yield and Grade
Botrytis Leaf Blight Disease Score (9 data points)

**Cumulative BLB Score**

BEST!

VERY GOOD

MEDIocre

POOR

FAIL!

90% control

81% control

78% control

76% control

90%

control

54% control

45% control

29% control

29% control

untreated


Hoepting 2013
Purple Blotch Disease Score (5 data points)

*PB Score = (Aug1 No. PB x 9/3 lvs) + (Aug 1 %PB/100) + (Aug 14 No. PB x 7.5/3 lvs) + (Aug 28 No. PB/lf x 7 lvs)
Stemphylium Leaf Blight & Purple Blotch Total Disease Score
(2 data points)

**SLB/PB Score** = (Aug 28 all non-DM lesions/lf x 7 lvs) + (Aug 28 %leaf dieback/pt)

<table>
<thead>
<tr>
<th>Product/Program</th>
<th>Cumulative SLB/PB Score*</th>
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</thead>
<tbody>
<tr>
<td>Luna Tranquility A-F</td>
<td>4.37</td>
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<tr>
<td>Merivon A-F</td>
<td>7.8</td>
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<td>Fontelis MSO 1 A-F</td>
<td>8.72</td>
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<td>Fontelis MSO 1.5 A-F</td>
<td>8.92</td>
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<td>Inspire Super (I) A-F</td>
<td>11.83</td>
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<td>Pristine (I) A-F</td>
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<td>Hoepting Program</td>
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<td>Tanos mancozeb CDEF</td>
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<td>Bravo 1.5 + Scala 9 A-F</td>
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<td>Koveral (I) A-F</td>
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<td>20.36</td>
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</table>

- BEST! 79% control
- MEDIOCRE 57% control
- POOR 38% control
- FAIL! 26% control
Overall Plant Health Score (4 data points)

*Plant Health Score = \[100 \cdot (\text{Aug 14 1\% defoil/plot}) + (\text{Aug 28 No. green lvs/pt}) \times 10] + [100 \cdot (\text{Aug 28 \% leaf dieback/pt})] + [100 \cdot (\text{Sep 17 \% die stand up/plot})

+ 50%

+ 41%

+ 30%

+ 23%

+ 16%

VERY GOOD

BEST!
Results: General Plant Health

Untreated 9/6/3013

Merivon 9/6/3013
Results: General Plant Health

Untreated

Inspire Super

9/6/3013
Results: General Plant Health

Fontelis 1 pt

Scala 18 oz

9/6/2013
Results: General Plant Health

Untreated

Luna Tranquility

9/6/2013
Results: General Plant Health

Rovral

Luna Tranquility

9/6/2013
Results: General Plant Health

Untreated

Pristine

9/6/2013
Results: General Plant Health

Bravo 1.5 pt + Scala 9 fl oz

Untreated

Merivon

9/6/2013
Marketable Yield Including Small, Medium & Jumbo Bulbs

Average Marketable yield (small, medium & jumbo bulbs) - lb per plot (52 ft of row)

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Average Yield (lb)</th>
<th>Letter Grade</th>
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<tbody>
<tr>
<td>Luna Tranquility A-F</td>
<td>61.0</td>
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<tr>
<td>Fontels MSO 1.5 A-F</td>
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<td>Merion A-F</td>
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<td>E</td>
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<td>Fontels MSO ACE Bravo BDF</td>
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<td>Inspire Super (I) A-F</td>
<td>52.6</td>
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<td>f</td>
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<tr>
<td>untreated</td>
<td>41.0</td>
<td>f</td>
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</table>

Notes:
- Points are separated by 0.5 lb per plot.
- Letters indicate significant differences in yield.
- Best yield is colored black (60.0 lb).
- Fail yield is colored green (41.0 lb).
Total Rank Score For Cumulative Scores
(BLB + PB + SLB + Plant Health + Yield)

For Cumulative Scores (BLB + PB + SLB + Plant Health + Yield)

- BEST!
- VERY GOOD
- GOOD
- MEDIUM
- POOR

- Control: 85%
- 75% control
- 68% control
- 61% control
- 41% control
- 36% control
- 30% control
- 25% control

- VERY GOOD: 75%
- GOOD: 61%
- MEDIUM: 41%
- POOR: 30%
- UNTREATED: 25%

- Best!
- Good
- MedioCre
- Poor
- untreated
Summary

• Exciting new fungicides in the pipeline for control of “target-spot” lesions (PB/SLB)
  – Fontelis (Sec 3 on onions)
  – Merivon (Sec 3 on fruit, not onions)
  – Luna Tranquility (Sec 3 on apple, potato, grape)

• Best control of BLB achieved with Bravo & Merivon, others mediocre at best

• Best control of PB achieved with Luna Tranquility, Merivon & Scala, many failures
Summary

• Best control of SLB achieved with Luna Tranquility, Merivon & Fontelis, followed by Inspire Super & Pristine
  – Bravo, Rovral & mancozeb failed
  – Scala, Quadris were poor
• Healthiest foliage achieved with Merivon, Inspire Super, Fontelis, Luna Tranquility & Pristine
• Best yields with Luna Tranquility, Fontelis, Pristine & Merivon
• Best overall: Merivon, Luna Tranquility & Fontelis
Recommendaions

• Scout your fields and know what disease pressure exists in order to make spray apps accordingly
• Subscribe to *Veg Edge* for weekly recommendations
• Know which fungicides control which diseases
Recommendations

• Try Inspire Super and Pristine for control of Stemphylium Leaf Blight
  – tank-mix Inspire Super with Bravo or Scala for improved BLB & PB
• Bravo is very good against BLB, but weak against other diseases
• Mancozeb is a very good protectant against DM, but is weak on other leaf diseases
  – Quadris, Tanos & phosphorous acid suppresses DM
• Be aware of rotation restrictions for resistance management and plan accordingly
Questions?