



2019 Report on Disease Efficacy Trials at HVRL: Apple Scab, Fire Blight

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1. PRELIMINARY REPORT ON 2019 APPLE SCAB EFFICACY TRIAL #1 IN HIGHLAND NY

Apple scab inoculum. *V. inaequalis* ascospores in leaf litter from natural infections in 2018 season.

Apple scab fungus ascospore release detected in Highland NY with spore tower in HVRL available online at: [3/28/2019: First Apple Scab Ascospores Detected in Vacuum Spore Trap in Leaf Litter from Highland NY – Farms in Lower Hudson Valley Set your Scab Biofix!](#)

Apple varieties, experiment design, disease rating. Jersey Mac, Cortland 'RedCort', Golden Delicious 'Smoother' as mature 24-yr-old trees on M.9 rootstock planted in discrete three-cultivar replicated plots at 25 ft. between rows, 10 ft. between trees within rows, and 20 feet between plots within rows. Treatments were replicated four times using a complete randomized design (CRD). Each replicate plot consisted of all three cultivars listed above. The percent scab infection incidence on spur leaves was calculated from the number of leaves with scab lesions versus the leaves without lesions on 20 randomly selected spur leaf clusters per tree. The percent incidence on fruit was calculated from the number of fruit with scab lesions versus the fruit without lesions on 25 randomly selected fruit clusters per tree, for a total of up to 50 fruits per tree replicate. Disease incidences on leaves and fruit were subjected to Wilcoxon Rank Sum Test, LSD or Tukey's tests, respectively ($\alpha=0.05$), for a completely randomized design.

Equipment. Treatments were sprayed dilute (300 gal/A) to drip using a tractor-carried handgun sprayer (Rear's Pak-Tank 100-gal sprayer, 250 PSI) to secure good coverage with the spray solution.

Maintenance sprays. Various insecticides according to entomologist Peter Jentsch's recommendations for 2019 season: <https://blogs.cornell.edu/jentsch/>. Standard herbicides and fertilizers.

Spray dates. Dates of the treatments according to the protocol from Syngenta with BBCH growths stage chart (spray dates based primarily on the Jersey Mac cultivar):

4/7/2019 – GT (BBCH 53)
4/11/2019 – HIG (BBCH 54)
4/17/2019 – TC (BBCH 55)
4/25/2019 – PK (BBCH 57)
4/29/2019 – EB i.e. early BL (BBCH 62)
5/3/2019 – MB i.e. mid bloom (BBCH 64)
5/6/2019 – Full bloom (BBCH 65)
5/13/2019 – PF aka fruit set (BBCH 69)
5/23/2019 – ½ inch fruit size (BBCH 71)
5/25/2019 – 1C (BBCH 71)
6/4/2019 – 2C (BBCH 72)
6/19/2019 – 3C (BBCH 72)
7/14/2019 – 4C (BBCH 74)
7/25/2019 – 5C (BBCH 75)

Spur Leaf Scab Rating: July 2 – 7, 2019

Fruit Scab Rating: July 12 – 19, 2019

Spray Program Lineup: (Note: A19649[B] or A19649[H] - adepidyn aka pydiflumetofen; BAS 750 is Revysol® - mefentrifluconazole, proposed FRAC 3, DMI - demethylation inhibitor):

1- Check - UTC

2 - Vanguard 75WG @ 5oz/A (GT)

Mancozeb 75 WG @ 3lb/A (TC)

Mancozeb 75 WG @ 3lb/A + Captan 80 WDG 2.5 lb/A (PK, EB)

A19649[B] @ 3.42 FL/A (FB, PF)

Inspire Super @12 fl. Oz./A (1C)

Captan 80 WDG @ 3 lb/A (2-5C)

3 - Vanguard 75WG @ 5oz/A (GT)

Mancozeb 75 WG @ 3lb/A (TC)

Mancozeb 75 WG @ 3lb/A + Captan 80 WDG 2.5 lb/A (PK, EB)

A19649[H] @ 3.42 FL/A (FB, PF)

Inspire Super @12 fl. Oz./A (1C)

Captan 80 WDG @ 3 lb/A (2-5C)

4 - Vanguard 75WG @ 5oz/A (GT)

Mancozeb 75 WG @ 3lb/A (TC)

Mancozeb 75 WG @ 3lb/A + Captan 80 WDG 2.5 lb/A (PK, EB)

Aprovia @ 5.5 FL/A (FB, PF)

Inspire Super @12 fl. Oz./A (1C)

Captan 80 WDG @ 3 lb/A (2-5C)

5 - Vanguard 75WG @ 5oz/A

Mancozeb 75 WG @ 3lb/A (TC)

Mancozeb 75 WG @ 3lb/A + Captan 80 WDG 2.5 lb/A (PK, EB)

Luna Sensation 4.17 SC @ 5 fl oz/A (FB, PF)

Inspire Super @12 fl. Oz./A (1C)

Captan 80 WDG @ 3 lb/A (2-5C)

6 - Mancozeb 75 WG @ 3lb/A (HIG)

BAS 750 @ 4.0 fl oz/acre & LI-700 @ 16 fl oz/acre + Mancozeb 75 WG @ 3lb/A (TC, EB, MB, PF)

Captan 80 WDG 3 lb/A (1-5C)

7 - Mancozeb 75 WG @ 3lb/A (HIG)

BAS 750 @ 5.0 fl oz/acre & LI-700 @ 16 fl oz/acre + Mancozeb 75 WG @ 3lb/A (TC, EB, MB, PF)

Captan 80 WDG 3 lb/A (1-5C)

8 - Mancozeb 75 WG @ 3lb/A (HIG)

Inspire Super @ 12 fl oz/acre & LI-700 @ 16 fl oz/acre + Mancozeb 75 WG @ 3lb/A (TC, EB, MB, PF)

Captan 80 WDG 3 lb/A (1-5C)

9 - Pyraziflumid @3.1 fl oz/A + Mancozeb 75 WG @ 3lb/A + Silwet @ 16 fl oz/100 gal (HIG, PK, FB, PF, ½ inch fruit size, 1C)

Captan 80 WDG 2.5 lb/A (2-5C)

10 - Pyraziflumid @ 3.1 fl oz/A + Mancozeb 75 WG 3lb/A (HIG, PK, FB, PF, ½ inch fruit size, 1C)

Captan 80 WDG 2.5 lb/A (2-5C)

11 - Pyraziflumid @ 4.65 fl oz/A + Mancozeb 75 WG 3lb/A (HIG, PK, FB, PF, ½ inch fruit size, 1C)

Captan 80 WDG 2.5 lb/A (2-5C)

12 - Indar @ 6 fl oz/acre + Mancozeb 75WG @ 3 lbs/acre (HIG, TC)

Mancozeb 75WG @ 3 lbs/acre + Rally 5 oz/A (PK)

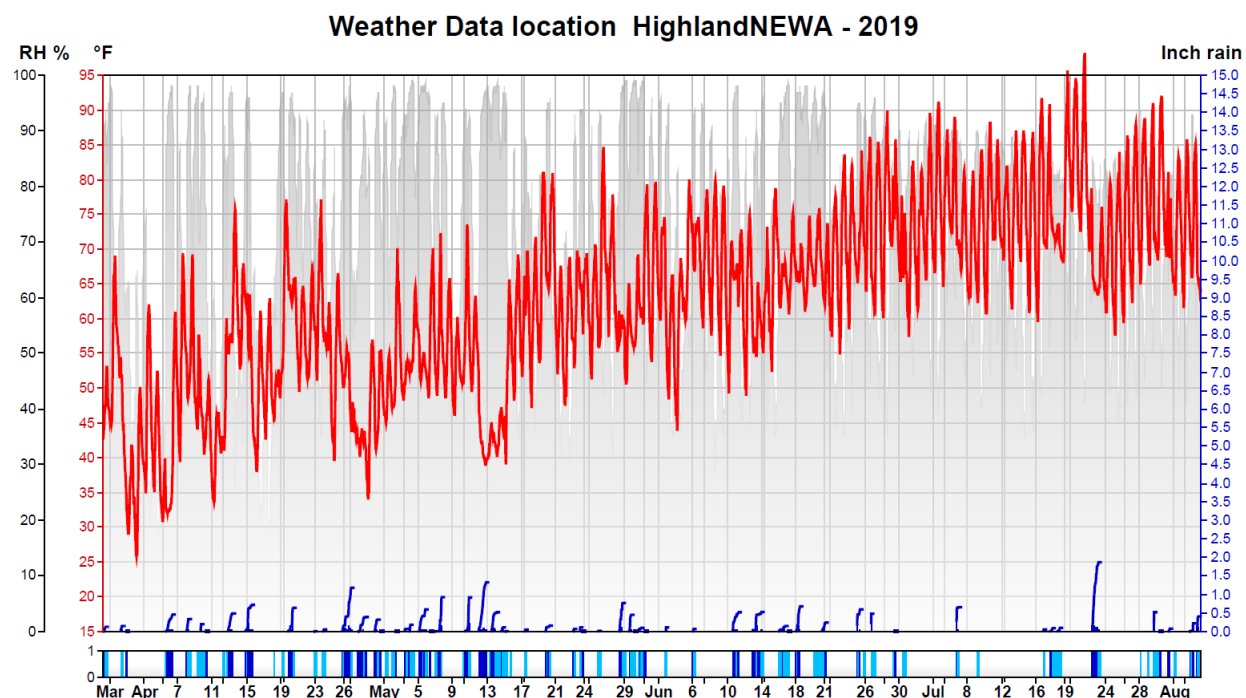
Luna Sensation @ 5 oz/A + Mancozeb 75 WG @ 3 lb/A (MB, PF)

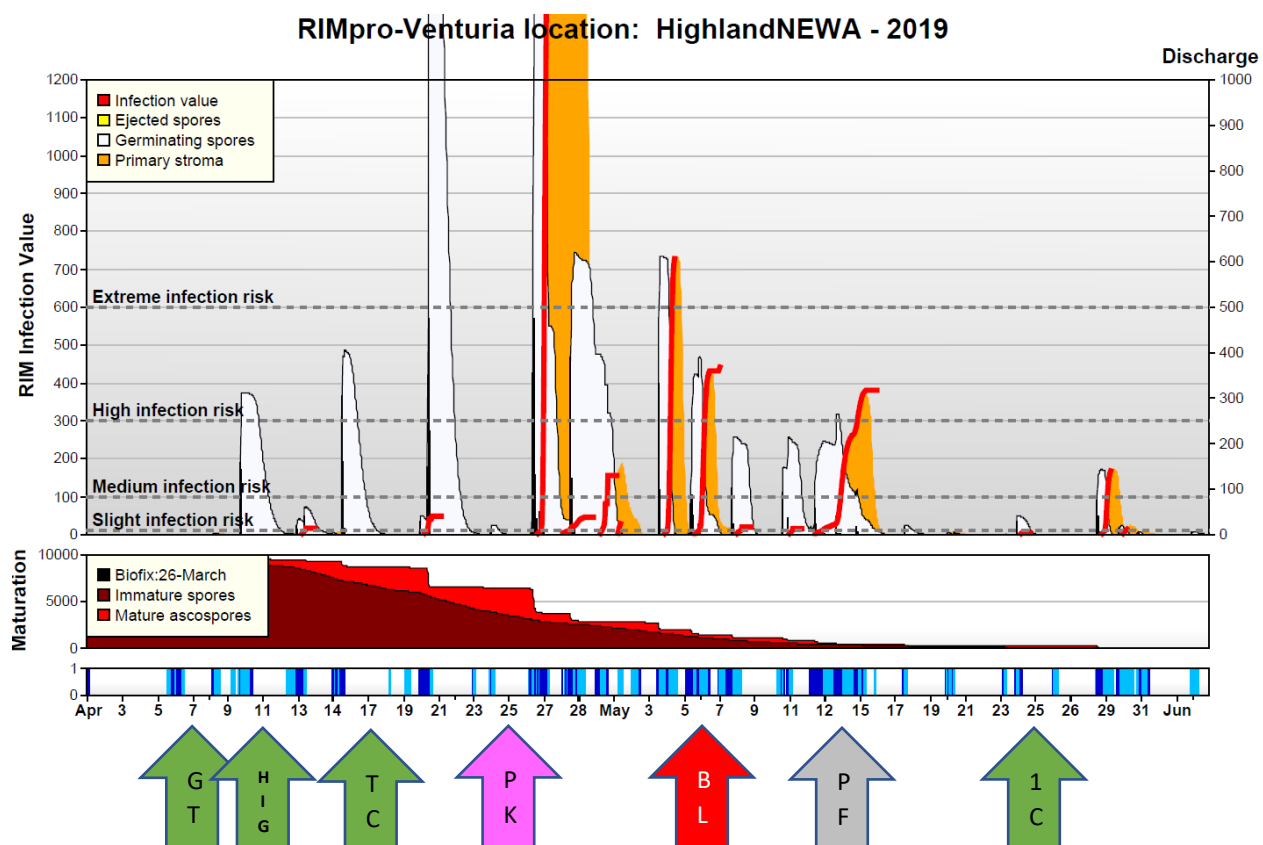
Captan 80 WDG 3 lb/A (1-5C)

13 - Fontelis @ 16 fl oz + Indar @ 8 fl oz (TC, PK, MB, PF)

Captan 80 WDG 3 lb/A (1-5C)

Summaries of weather conditions and apple scab infection periods in 2019, respectively:

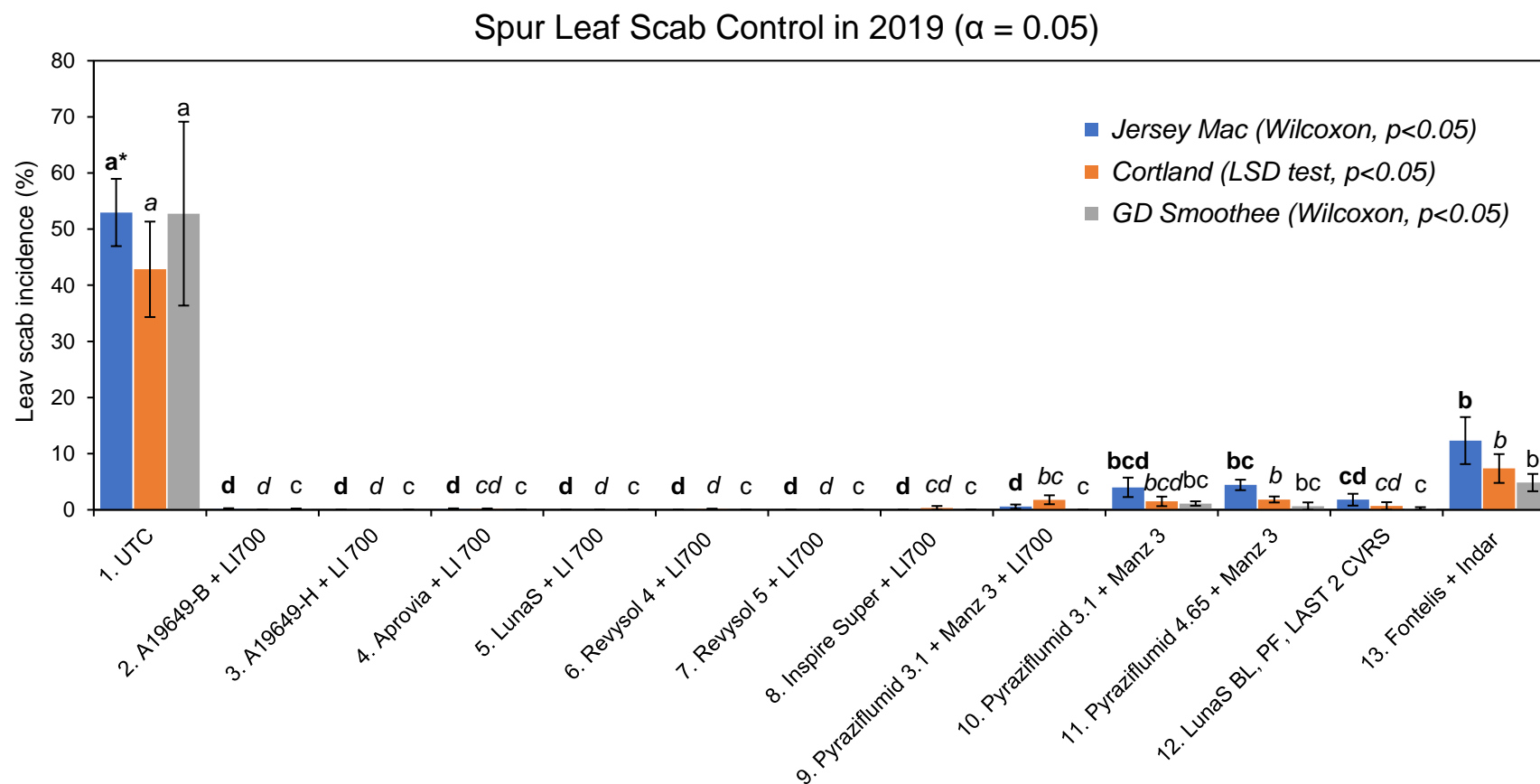




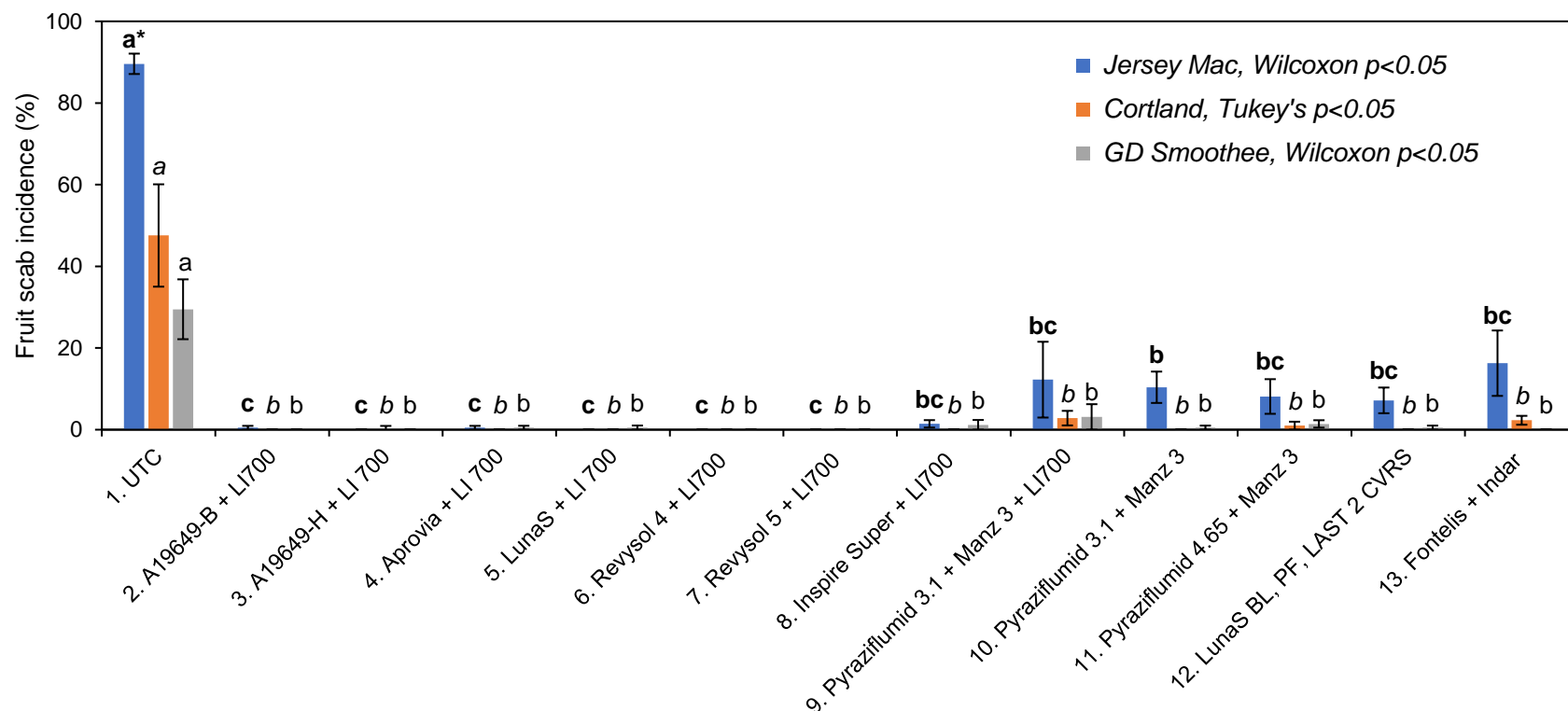
Note: Graphs above are used by permission from RIMpro B.V., Netherlands. Both graphs are formatted by RIMpro Cloud Service, an interactive Decision Support System for pest and disease prediction and management in fruit and grape production: <https://www.rimpro.eu/>

Results:

All cultivars:



*Incidence means followed by different type of letters within the same cultivar i.e. bar color are significantly different ($p < 0.05$). Error bars represent standard error of the mean (SEM). Each mean consists of 4 replicate trees.

Fruit Scab Control in 2019 ($\alpha = 0.05$)

*Incidence means followed by different type of letters within the same cultivar i.e. bar color are significantly different ($p < 0.05$). Error bars represent standard error of the mean (SEM). Each mean consists of 4 replicate trees.

2. PRELIMINARY REPORT ON 2019 APPLE SCAB EFFICACY TRIAL #2 IN HIGHLAND NY

Apple scab inoculum. *V. inaequalis* ascospores in leaf litter from natural infections in 2018 season.

Apple varieties, experiment design, disease rating. McIntosh, Gala, Honeycrisp as fourth leaf apple trees on M.9 rootstock planted in completely randomized plot at 14 ft. between rows and 6 ft. between trees within rows. Treatments were replicated four times using a complete randomized design (CRD). Each replicate plot consisted of all three cultivars listed above. The percent scab infection incidence on spur leaves was calculated from the number of leaves with scab lesions versus the leaves without lesions on 20 randomly selected spur leaf clusters per tree. The percent incidence on fruit was calculated from the number of fruit with scab lesions versus the fruit without lesions on 25 randomly selected fruit clusters per tree, for a total of up to 50 fruits per tree replicate. Disease incidences on leaves and fruit were subjected to Wilcoxon Rank Sum Test, LSD or Tukey's tests, respectively ($\alpha=0.05$) for a completely randomized design.

Apple scab fungus ascospore release detected in Highland NY with spore tower in HVRL available online at: [3/28/2019: First Apple Scab Ascospores Detected in Vacuum Spore Trap in Leaf Litter from Highland NY – Farms in Lower Hudson Valley Set your Scab Biofix!](#)

Equipment. Treatments were sprayed dilute (300 gal/A) to drip using a tractor-carried handgun sprayer (Rear's Pak-Tank 100-gal sprayer, 250 PSI) to secure good coverage with the spray solution.

Maintenance sprays. Various insecticides according to entomologist Peter Jentsch's recommendations for 2019 season: <https://blogs.cornell.edu/jentsch/>. Standard herbicides and fertilizers.

Spray dates. Dates of the spray treatments according to the protocol from Valent (spray dates based primarily on the McIntosh cultivar):

4/7/2019 – GT
4/17/2019 – HIG
4/25/2019 – late TC
4/29/2019 – PK
5/3/2019 – BL
5/8/2019 – PF
5/25/2019 – 1C
6/19/2019 – 2C
7/14/2019 – 3C
7/25/2019 – 4C

Spur Leaf Scab Rating: July 2 – 7, 2019\

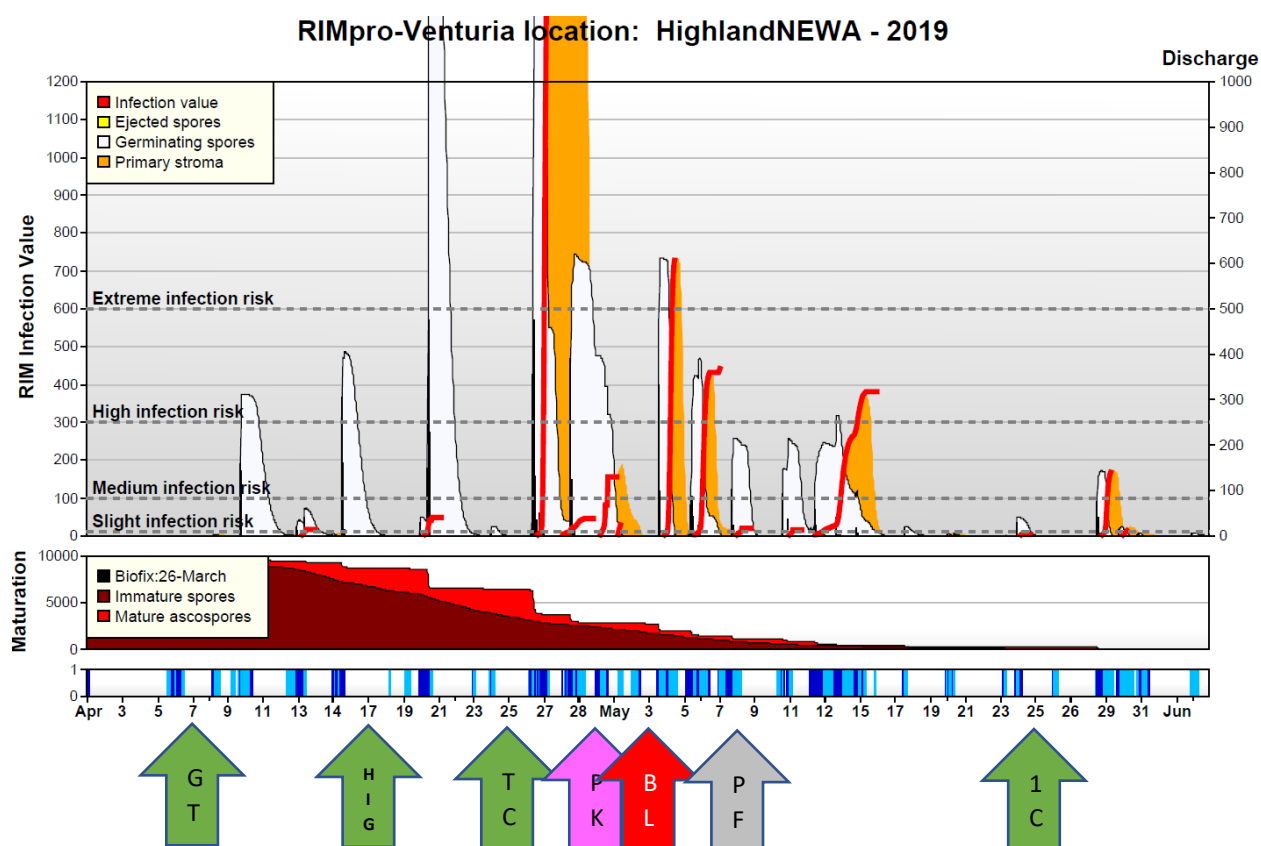
Fruit Scab Rating: July 12 – 19, 2019

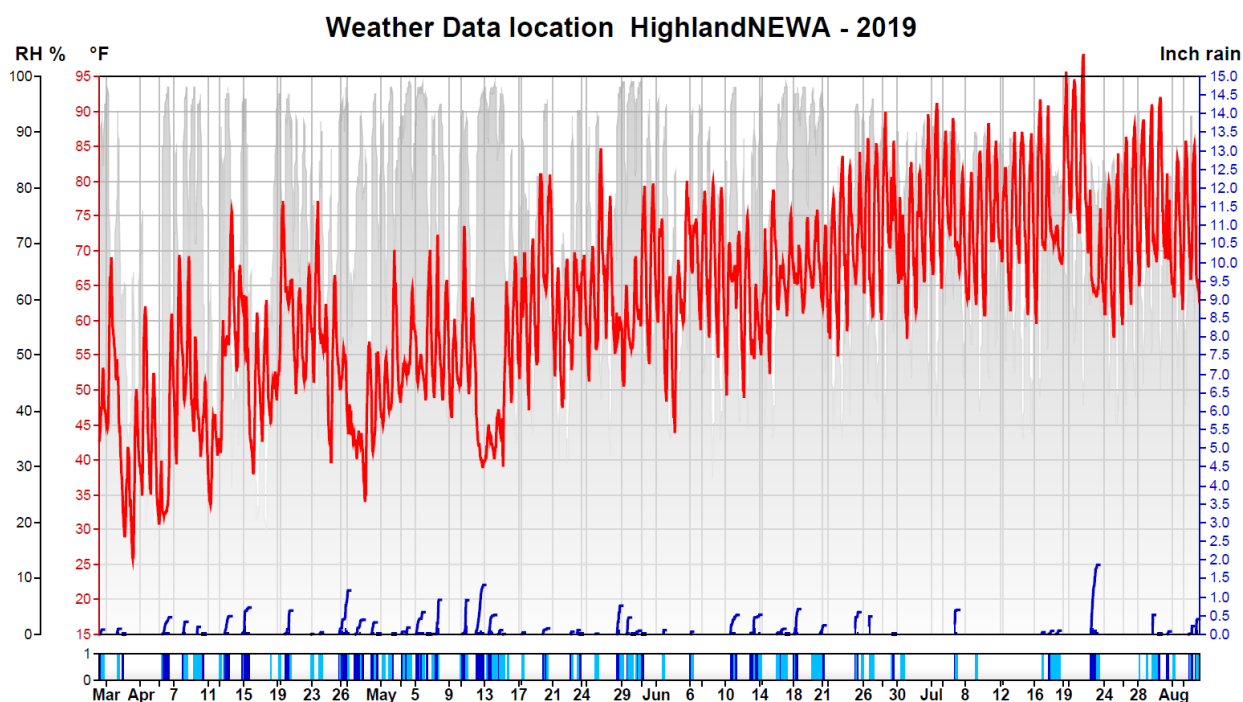
Spray Program Lineup: (Note: Excalia is a new SDHI fungicide which contains active ingredient indiflin):

- 1 - GT: Vanguard @ 5 oz /A + Manzate Pro-Stick 75 WG @ 3 lb/A
 HIG: Inspire Super 12 FL OZ/A + Manzate Pro-Stick 75 WG @ 3 lb/A
 TC (late): Merivon 5.5 fl oz/A + Manzate Pro-Stick 75 WG @ 3 lb/A
 PK: Excalia 3 FL OZ /A + Syl-Coat 0.062% v/v (8 fl oz/100 gal)
 BL: Inspire Super 12 FL OZ/A
 PF: Excalia 3 FL OZ /A + Syl-Coat 0.062% v/v (8 fl oz/100 gal)
 1-4C: Captan 80 WDG 3 lb/A

2 - Untreated Control

Summaries of apple scab infection periods and weather conditions in 2019, respectively:



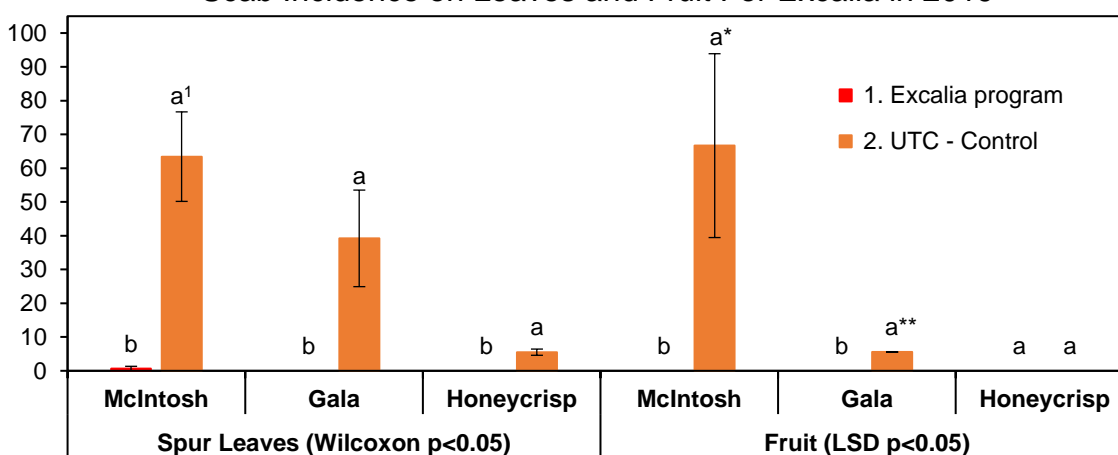


Note: Graphs above are used by permission from RIMpro B.V., Netherlands. Both graphs are formatted by RIMpro Cloud Service, an interactive Decision Support System for pest and disease prediction and management in fruit and grape production: <https://www.rimpro.eu/>

Results

All Cultivars:

Scab Incidence on Leaves and Fruit For Excalia in 2019



*Test did not pass equality of residual variances

**Test did not pass equality of variances and normal distribution for residuals

¹Incidence means followed by different letters within the same cultivar i.e. bar color and apple organ are significantly different ($p < 0.05$). Error bars represent standard error of the mean (SEM). Each mean consists of 4 replicate trees.

3. PRELIMINARY REPORT ON 2019 PEAR FIRE BLIGHT EFFICACY TRIAL IN HIGHLAND NY

Shoot inoculations with *Erwinia amylovora*: (1) Cut leaf inoculation with 2.34×10^8 CFU on 5/11/2019 but failed; (2) Cut-shoot inoculation with 1.94×10^8 CFU on 5/26/2019 using 40 μ L of suspension per shoot.

Cultivar, experiment design, disease rating: Bartlett, 4th leaf, planted in 14 ft. between rows and 6 ft. between trees within rows. Each spray program (treatment) consisted of three tree replicates assigned in a completely randomized design. The first shoot inoculation involved horizontally cutting and removing the upper one-third of the leaf blade of the second or third youngest unfolded leaf on succulent shoot tip using sterile scissors dipped into the *E. amylovora* cell suspension (Koczan et al. 2009; McGhee and Sundin 2011). A visible droplet of cell suspension was left across the central vein cut. A total of 10 selected shoots per each pear tree in each treatment were inoculated with *E. amylovora*. For each inoculated shoot, we calculated shoot blight severity percent by multiplying the ratio of necrotic shoot length i.e. fire blight lesion length (cm) to the total shoot length (cm) by 100. The shoot length and necrosis measurements and canker lengths were taken on 6/23/2019. Measurements also included recording fire blight canker initiation and length on perennial wood. Mean shoot blight severity percent and mean percent of initiated cankers on perennial pear wood per each replicate tree was calculated from 10 shoot replicates. Mean shoot blight severity and the mean percent of initiated cankers on perennial apple wood for each program was calculated from the three replicate tree means.

Spray/injection dates:

10/10/2018 – FALL - BEFORE LEAF DROP
 4/23/2019 – BUD BURST (treatment 2 and 3)
 4/29/2019 – GREEN CLUSTER (treatment 2)
 5/5/2019 – WHITE BUD (treatment 2)
 5/9/2019 – BLOOM, before shoot inoculation by leaf-cut (treatment 4 and 5)
 5/15/2019 – PETAL FALL (treatment 2)
 5/23/2019 – FRUIT SET (treatment 2)
 5/25/2019 – applied treatment 4 and 5 at 24 before cut-shoot inoculation

Equipment. Spray treatments were sprayed dilute (100 gal/A) to drip using a tractor-carried handgun sprayer (Rear's Pak-Tank 100-gal sprayer, 250 PSI) to secure good coverage with the spray solution. Trunk injections were conducted using Quik-jet microinjection system (Arborjet Inc.) operating at hand-generated hydraulic pressure to deliver low volumes of liquid for injection, thus enabling faster application times.

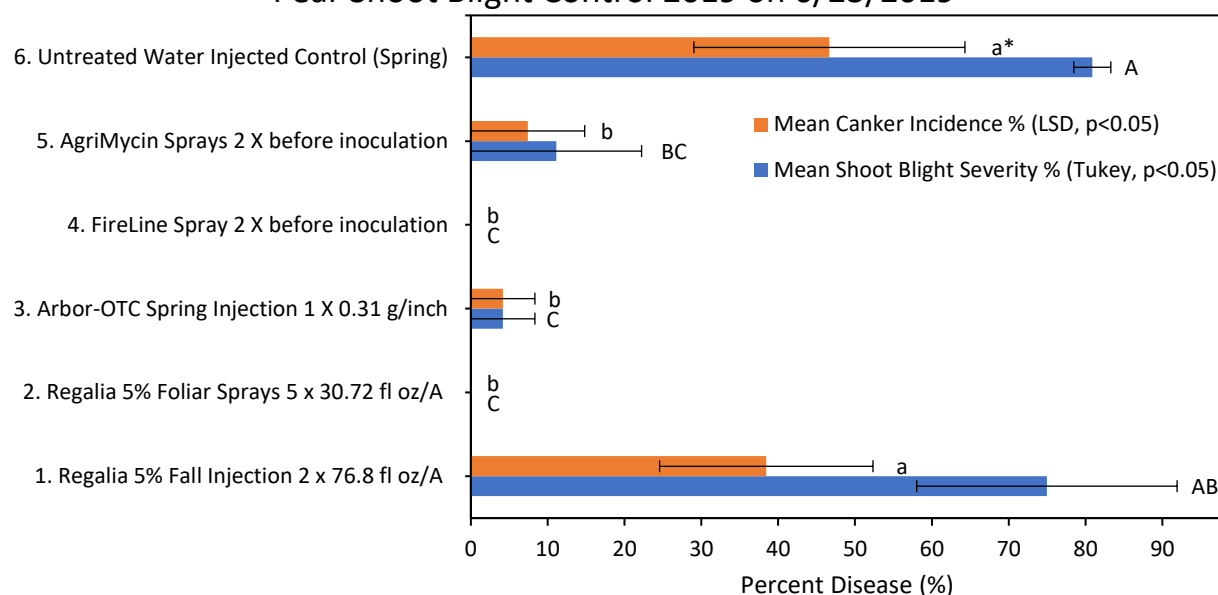
Trunk injection and/or spray program lineup:

1. Regalia @ 2 X 76.8 fl oz/A – Trunk Injection in fall 2018, injection of both doses of 76.8 fl oz/A done on 10 October 2018 (Regalia 5%).
2. Regalia @ 5 X 30.72 fl oz/A – five foliar sprays in Spring, Regalia 5% used, starting first spray at Bud burst, then second at Green cluster, third at White bud, fourth at Petal fall, and fifth at Fruit set (each spray will deliver 30.72 oz/A).
3. Arbor-OTC (36.7% oxytetracycline) as a single injection per tree at bud burst using 0.31 g of product per 1-inch trunk diameter of a tree in a 10% water solution.

4. FireLine (17% oxytetracycline) @16 oz/A + Regulaid @32 fl oz/100 gal applied first at bloom as sprays in spring 2019, then continue until the rate per acre equals A.I. amount in treatment #3.
5. Agri-mycin/FireWall (17% streptomycin) @16 oz/A + Regulaid @32 fl oz/100 gal sprays during bloom, at least two sprays before inoculation is done with *Erwinia amylovora*.
6. Untreated control trunk-injected with Water in Spring 2019

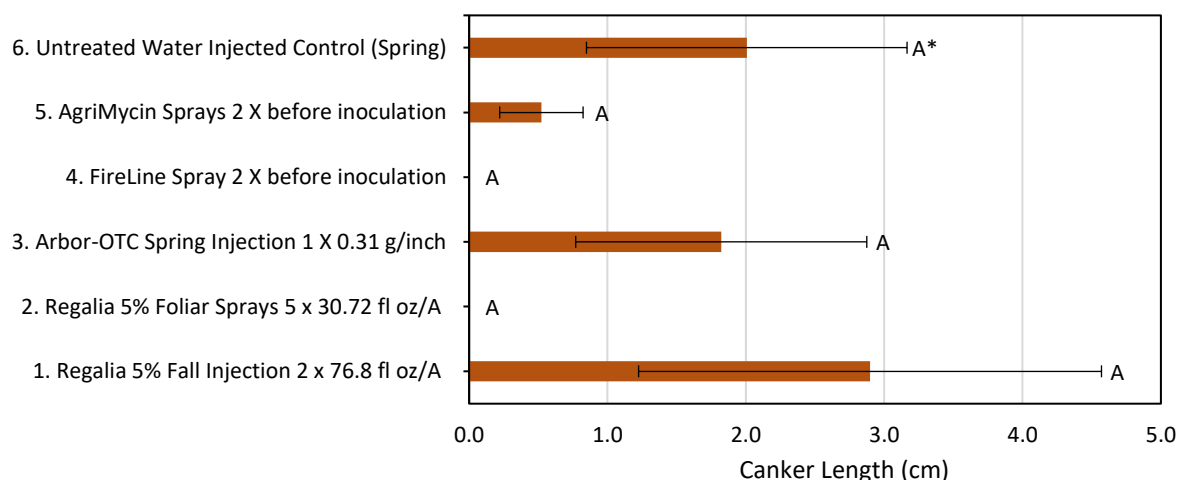
Results

Pear Shoot Blight Control 2019 on 6/23/2019



*Incidence means followed by different type of letters within the same disease parameter i.e. bar color are significantly different ($p < 0.05$). Error bars represent standard error of the mean (SEM). Each mean consists of 3 replicate trees.

Mean Canker Length on Wood From Shoots on 6/23/2019 (cm)



*Incidence means followed the same letters are not significantly different ($p < 0.05$). Error bars represent standard error of the mean (SEM). Each mean consists of 3 replicate trees.

Report compiled by Dr. Srdjan G. Acimovic, plant pathologist at Cornell University's Hudson Valley Research Laboratory. Weather data for Highland NY during 2019 can be provided upon request. This report is available from November 2019 on this link: <http://blogs.cornell.edu/acimoviclab/pesticide-efficacy-trials/>

From: 7/10/2019 – 11/4/2019