2017 ARDP Hudson Valley Fruit School
February 14, 2017

Multiple Strategies to Control Bitter Pit in Honeycrisp

Principle Researchers
Dan Donahue & Anna Wallis
CCE Eastern NY Commercial Horticulture Program

Collaborators
Dr. Chris Watkins
Dr. Lailiang Cheng
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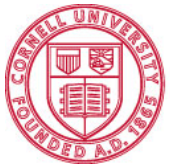

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Objectives

1. **Orchard Survey**
   Survey ENY orchards to determine if relationships exist between certain horticultural, nutritional, and micro-climate parameters and the expression of Bitter Pit in Honeycrisp
2. **Prediction Tool – apple peel nutrient analysis**
   Evaluate the value of pre-harvest apple peel analysis as a Bitter Pit prediction tool
3. **Foliar Calcium Efficacy Trial**
   Evaluate commercially available sprayable calcium formulations for Bitter Pit mitigation.
4. **Competition for Ca, How to Tip the Balance?**
   Evaluate strategies deployable during the cell mitosis phase of fruit development to mitigate the expression of Bitter Pit

Soil Water Status Monitoring - HC BP Survey

- 35 blocks
  - 19 Hudson Valley
  - 16 Champlain Valley
- Six contiguous trees
- Variables
  - Horticultural
  - Nutritional
  - Micro-climate
  - Fruit quality and BP

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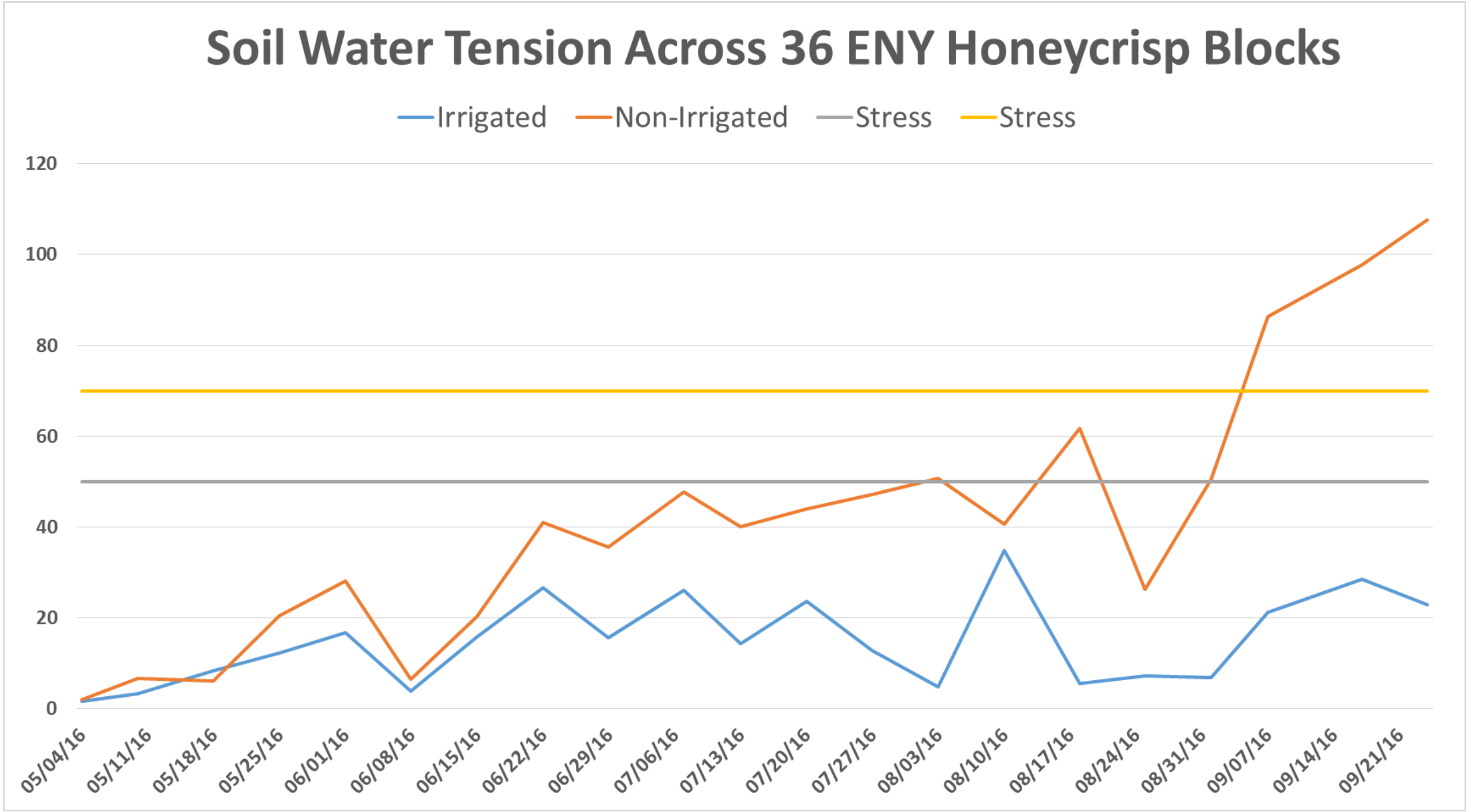

Soil Water Tension Across 36 ENY Honeycrisp Blocks
Irrigated
Non-Irrigated
Stress
Stress
120
100
80
60
40
20
0
05/04/16
05/11/16
05/18/16
05/25/16
06/01/16
06/08/16
06/15/16
06/22/16
06/29/16
07/06/16
07/13/16
07/20/16
07/27/16
08/03/16
08/10/16
08/17/16
08/24/16
08/31/16
09/07/16
09/14/16
09/21/16

September 19, 2017: Empty Irrigation Pond

Have Irrigation? Selected observations across 35 ENY Honeycrisp Blocks in 2016

Irrigation status was not a statistically significant factor for the parameters below:

Irrigation Status	Blocks Sampled	Fruit Size (gm)	Fruit Load (#/CM^2 TCSA)	Bitter Pit @ Harvest (% Incidence)	Bitter Pit @ 60 days (% Incidence)
N	23	222	2.6	13.8	29.1
Y	12	215	3.1	13.3	23.1

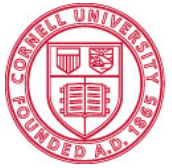
Irrigation Scheduling Considerations

- Many (most?) growers do not have an unlimited supply of irrigation water
- 2016 in ENY was a dry year, but not officially a drought
- 2016 in WNY suffered a serious drought, it could happen here as well
- Use the NEWA irrigation model to assist in efficiently scheduling your irrigation
- Excess water is not necessarily better, or needed to produce a quality crop

Bitter pit in Honeycrisp on G-41 vs M9-337: Field observations from an orchard visit.

Dan Donahue

Extension Associate
CCE Eastern NY Commercial Horticulture Program
Cornell Cooperative Extension
Hudson Valley Research Laboratory
Highland, New York



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Bitter pit in Honeycrisp on G-41 vs M9-337

HC / G-41

HC / M9-337

Bitter pit in Honeycrisp on G-41 vs M9-337

% of Sampled Apples w/Bitter Pit			
Rootstock	**Chi Sq /AMP**		**% BP Incidence**
M9-337	lower	n=144	**59.7**
G-41	upper	n=171	**81.9**
JMP Contingency Analysis of Means			
by Treatment, w/Chi-Square and Analysis of			
Means by Proportion			

Bitter Pit in Honeycrisp on G-41 vs M9-337

Average # BP Spots/CM^2 SA			
Rootstock	**t-Test**	**#/CM^2 SA**	**Std. Error**
M9-337	A	**0.8**	0.28
G-41	B	**2.3**	0.27
JMP LSM/Student's t-Test p = 0.05			

Read all the details of the study in the upcoming Spring 2017 issue of the New York Fruit Quarterly

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Apple Orchard Decline in the Hudson Valley

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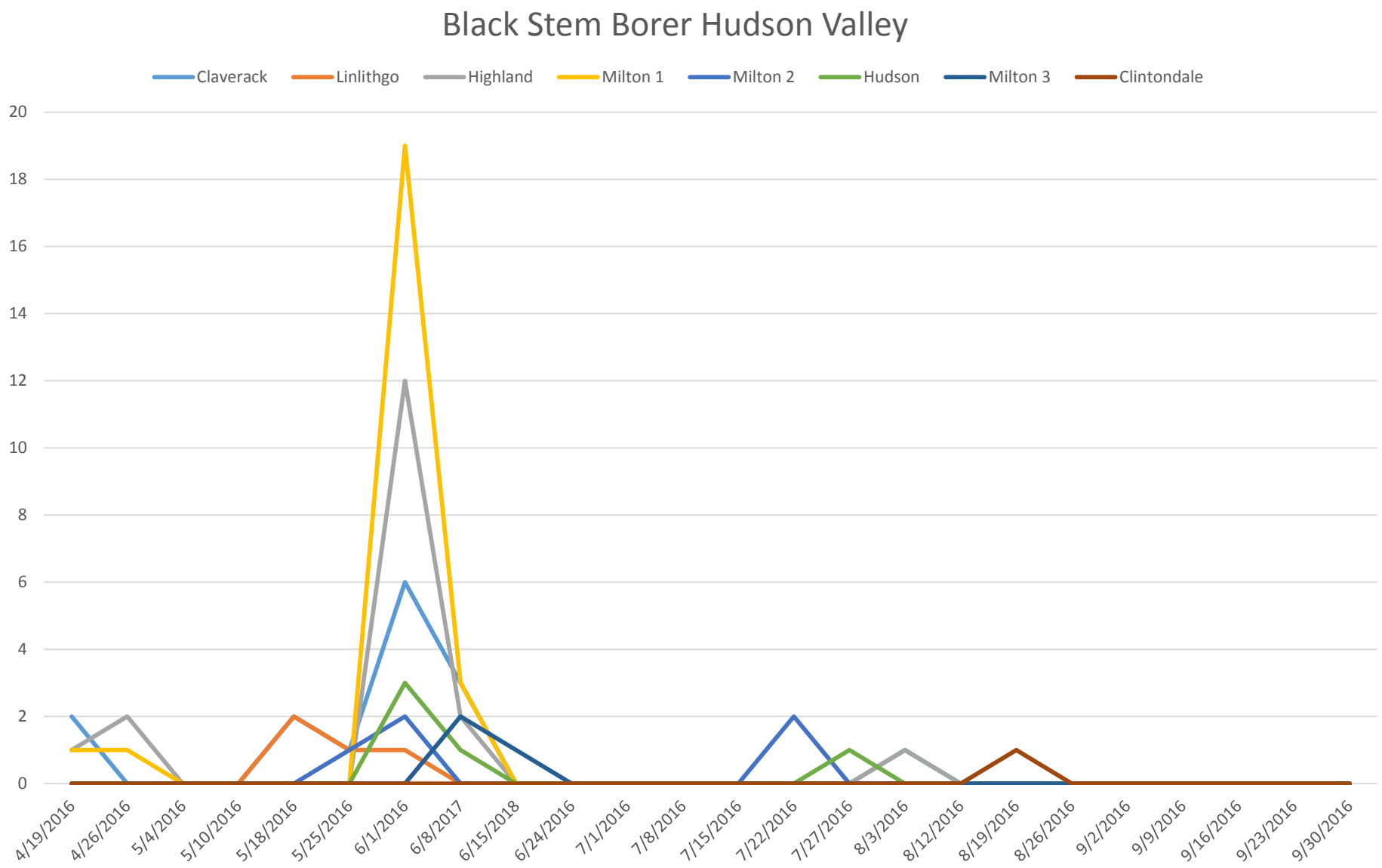
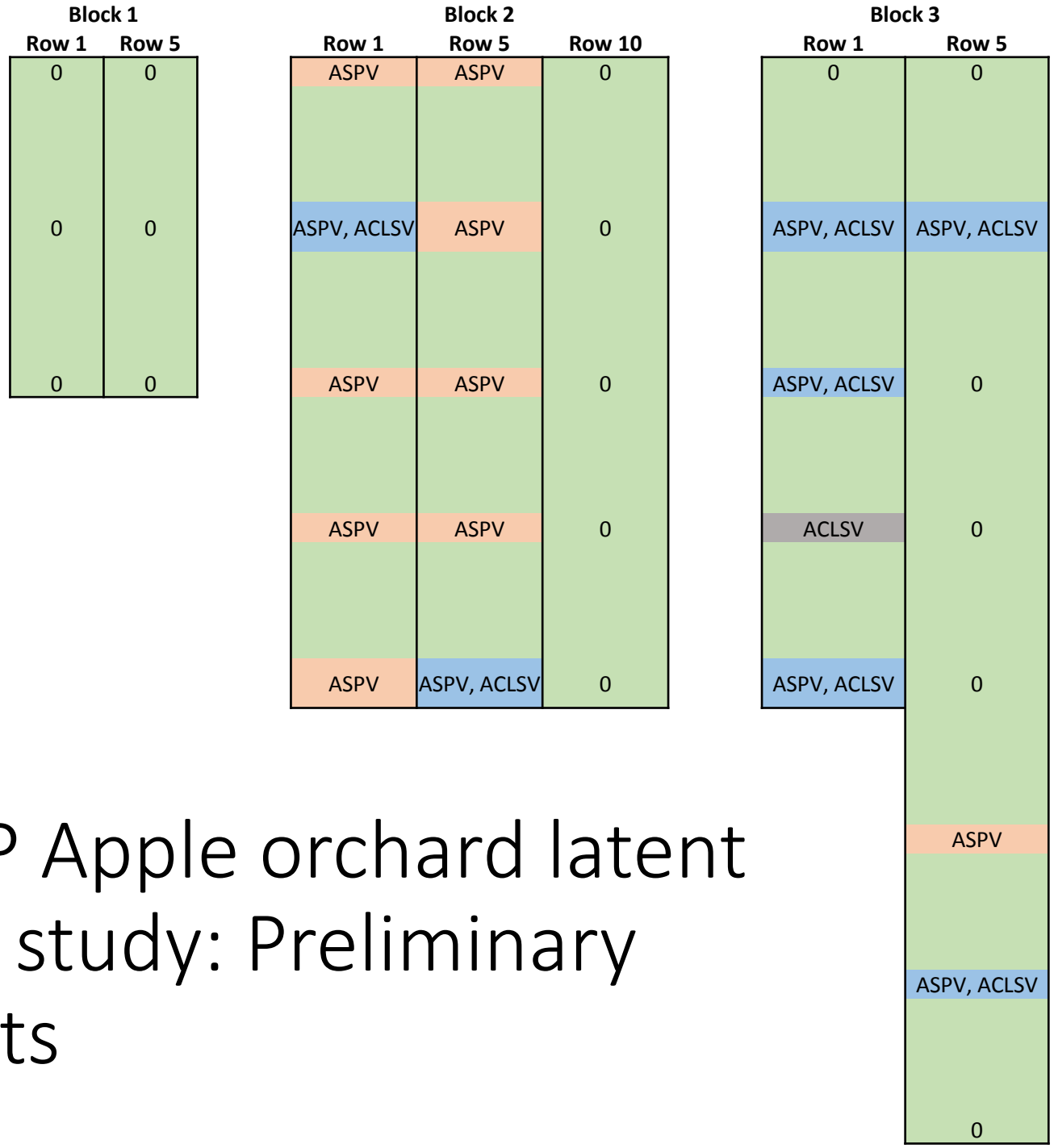
Dan Donahue

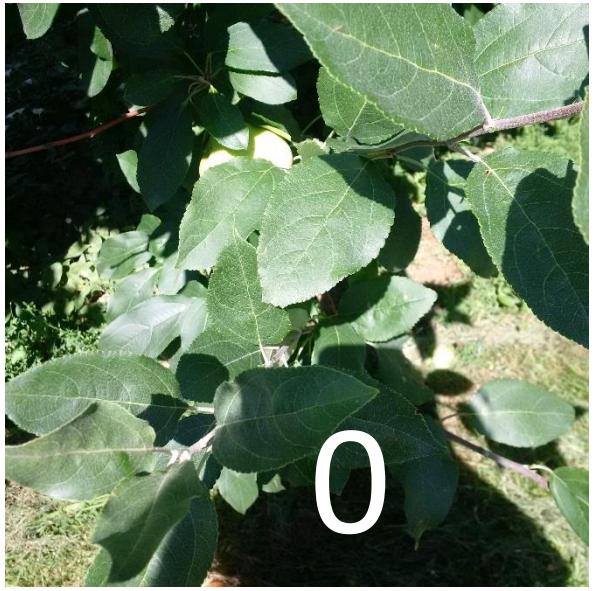
ARDP Black Stem Borer Biology and Impact





ARDP Apple orchard latent virus study: Preliminary results

Color Rating Zestar! Trees



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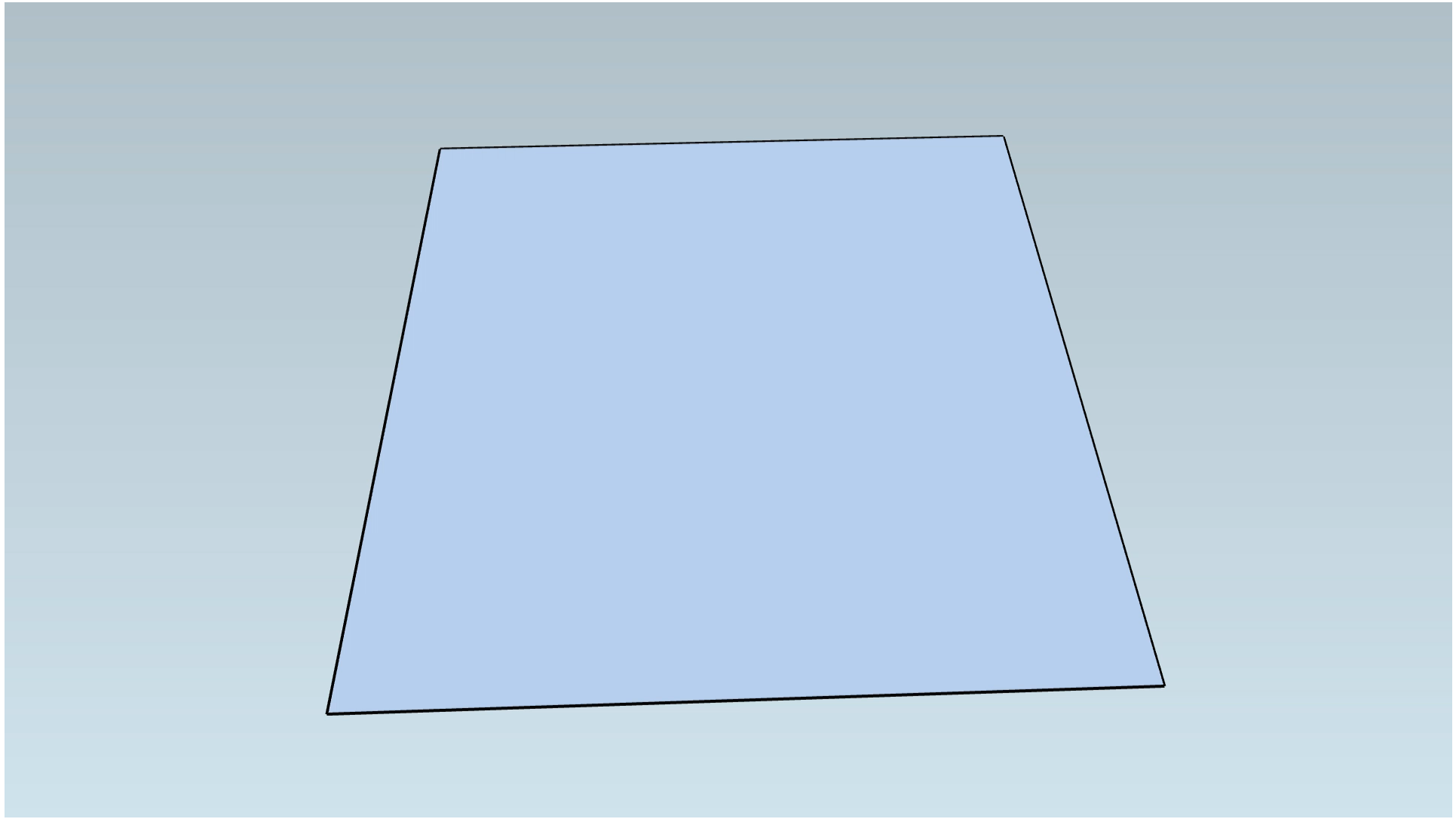
Block 1



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Apple Tree Decline: Bark Injury

Possible Causes of, or Contributors to, Apple Tree Decline

Black Stem Borer & Associated Pathogens

Dogwood Borer

Phytophtora

Secondary Wood Decay Fungi

Fire Blight

Nutrient Imbalances

Rootstock/Scion Incompatibilities

Winter Injury

Drought Stress

Latent virus Infections

Herbicide Injury

A new insect pest or pathogen?

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Summer Internship Available for 2017

Located at the Hudson Valley Laboratory in Highland, NY

Position supervisors are Dan Donahue and Dr. Kerik Cox

Project is to work on our Apple Orchard Decline Survey

The successful candidate must be current Cornell undergraduate, have a driver's license and reliable transportation, and some biology coursework.

Salary is $4,000 for the period June 1 – August 18, 2017

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NYS DEC Special Permit Training for 2017

- The newly published Federal Pesticide Applicator Certification Regulations, among other changes, eliminate Special Permit Training Programs.
- It may be 5 years before NYSDEC can fully implement the changes.
- Until then, SPT will continue, relatively unchanged, for 2017 and very likely, 2018.
- The new regulations will require some form of annual training for non-certified applicators to legally apply FRUP's while under **DIRECT** supervision.

- **Direct Supervision in NYS means: "my voice to your ear" (no electronic assistance allowed)**

- **A solution in a change in NYS regulations to allow a broader definition of "Direct Supervision". The Tree Fruit industry has about two years to get this done.**

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Pesticide Applicator Exam Coaching for 2017

- SPT is specifically intended for farm employees who cannot read English.
- NYSDEC officials monitor our trainings across the state, and suspect that some of our students can read English well enough to sit for the **Private Applicator Certification Exam.**

Pesticide Applicator Pre-Exam Coaching Sessions
CCE ENYCHP Agriculture Specialists will be offering a training to review core concepts and commodity specific items in preparation for the exam.

PRE-REGISTRATION is REQUIRED by Friday, March 10th
Workshop cost is: $50.00 per person
(Additional costs for manuals and exam)

Hudson Valley Pre-Exam Coaching Sessions
Hudson Valley Research Lab, 3357 US 9W, Highland, NY
***Training Classes*: Monday 3/20 & Wednesday 3/22, 9AM-12Noon**
***Exam*: Friday 3/24, 9AM-1PM**
Registration: http://enych.cce.cornell.edu/event.php?id=686

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Fall Weed Control Efficacy Studies

2014 – 2015 in the Hudson Valley

6’ X 20’ plots with 3 replicates, cultivar Honeycrisp

Application Date: 12-November, 2014

Application made at 59^0F, 0.21” rain within 48 hours, with a 5-day total of 1.04” at an average temperature of 37^oF

2015 – 2016 in the Champlain Valley

9’x4’ plots with 3 replicated, cultivar NY-1

Application made on 28-October, 2015.

Application made at 40°F, 1.02” rain within 24hrs, and a 5-day total of 1.12” at an average temperature of 43°F

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Table 1. HVRL Fall 2014 Weed Control in Honeycrisp, Summer 2015 Evaluations

	Tank Mix Combinations					% Weed Cover				Weed Species Breakthrough
Material #1*	Rate	Material #2	Rate	Material #3	Rate	25-May	8-Jun	29-Jun	2-Oct	
Control	na	na	na	na	na	60	90	100	100	see full list
Gramoxone	3.5 pts/A	na	na	na	na	27	70	100	100	LQ PS CT
Gramoxone	3.5 pts/A	Matrix 25 DF	4 oz/A	na	na	3	17	87	97	LQ PS CT BG
Gramoxone	3.5 pts/A	Alion 1.67	6 oz/A	na	na	0	0	13	23	N/A
Gramoxone	3.5 pts/A	Simazine 90 DF	1.1 lbs/A	Diuron 80 DF	1.25 lbs/A	13	30	90	97	LQ PS BP
Gramoxone	3.5 pts/A	Chateau 51 SW	10 oz/A	na	na	0	3	20	67	RC BG
Gramoxone	3.5 pts/A	GoalTender	3 pts/A	na	na	3	7	23	67	CC PR LQ PS
Gramoxone	3.5 pts/A	Sandea 0.75	0.8 oz/A	na	na	13	50	90	93	LQ PS RC
Gramoxone	3.5 pts/A	Casoron 1.4 CS	2.3 gal/A	na	na	0	13	83	97	PR LQ BG

* LI-700 at 0.125% added to all spray treatments

Key: LQ: Lambsquarters; PS: Pennsyvania Smartweed; CT: Canada Thistle; BG: Bermudagrass; BP: Broadleaf Plantain
RC: Red Clover; CC: Common Chickweed; PR: Perennial Ryegrass

Additional species found in the control plots: Buckhorn Plantain, Common Groundsel, Common Mallow
Dandelion, Mare's Tail, Mouse Ear Chickweed, Orchardgrass, Redroot Pigweed, Yellow Wood Sorrel

Results from the 2014-2015 Hudson Valley Efficacy Trial

- The combination of Gramoxone and Alion resulted in near season-long control, producing 77% control as late as 2-October.
- Second best was Gramoxone/Chateau and Gramoxone/Goaltender at 33% control as late as 2-October.
- The ratings of these three treatments on 29-June were statistically identical, and significantly better than the other six treatments.
- With the exception of the above, all other treatment combinations would have required the follow-up application of a burn-down material such as Gramoxone, Rely, or Roundup sometime in June.

Table 2. Champlain Valley Fall 2015 Weed Control, Evaluation 17-May, 2016

Material #1	Rate	Material #2	Rate	% Weed Cover	Weed Species Breakthrough
Control	na	na	na	92	See complete list
2,4-D	3 pt/A	na	na	85	OX, V, G
Glyphosate	3 qt/A	na	na	65	OX, V, M, LQ
Glyphosate	3 qt/A	2,4-D	3 pt/A	62	OX, V, M, LQ
Alion	5 oz/A	na	na	22	OX, V, G, HW
Casoron	2.8 gal/A	na	na	70	OX, V, G, M
Chateau	12 oz/A	na	na	36	OX, V, D, G, LT
GoalTender	4 pt/A	na	na	67	OX, V, G, HW
Matrix	4 oz/A	na	na	8	OX, V, G
ProwlH2O	4 pt/A	na	na	68	V, G, M, HW
Sandea	1 oz/A	na	na	18	OX, V, D, G
Stinger	0.67 pt/A	na	na	73	V, G, M

* no surfactants or Gramoxone used. Sprayed onto nearly bare ground.

KEY: OX: Oxalis, V: Vetch, D: Dandelion, G: Orchard Grass, M: Mustard, LQ: Lambs Quarters, LT: Lady's Thumbprint, HW: Horseweed

Results from the 2015-2016 Champlain Valley Efficacy Trial

- The best control in terms of ground cover was provided by Matrix, Sandea, and Alion, with 92%, 82% and 78% control respectively.
- Chateau provided moderate control (64%), but with considerable variability between plots.
- The remaining treatments provided on average less than 40% control, requiring a burndown material in the spring.

Read all the details of this study in the October 2016 issue of ***ENYCHP Tree Fruit News***.

And

Managing Apple Orchard Weeds in the Fall

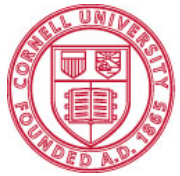
New York Fruit Quarterly, Winter 2016

Deborah Breth, Sr. Ext. Assoc. (retired), Cornell Cooperative Extension – LOF

Anna Wallis, Area Extension Specialist, Cornell Cooperative Extension – ENYCHP

Dan Donahue, Area Extension Specialist, Cornell Cooperative Extension – ENYCHP

Elizabeth Tee, Program Aide, Cornell Cooperative Extension – Lake Ontario Fruit Program



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Effective Orchard Spraying Workshop

with Dr. Andrew Landers

February 22, 2017

8:30 am - 3:15 pm

Cornell Hudson Valley Research Laboratory

3357 RT 9W

Highland, NY

Pre-Registration is required, $15 fee (covers lunch)

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Workshop: NEWA and Orchard Pest Scouting

Instructors:

Dan Olmstead

Peter Jentsch

Dan Donahue

Dr. Srdjan Acimovic

March 30th, 2017 10:00 am - 3:00 pm

Cornell Hudson Valley Research Laboratory

3357 RT 9W Highland, NY

Pre-Registration is required,

$20 fee (covers lunch)

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Example of E-Alert

Cornell ENYCHP Tree Fruit E-Alert for May 23rd, 2016 @ 7:00 pm

In this E-Alert

Champlain Valley Thinning Meeting
An Apple Thinning Editorial
How Can the Current Thinners be Classified?
How to De-Fruit Young Apple Trees
For Crop Insurance Purposes, You Must Maintain the Orchard According to Best Practices
Registration is Open for the 2016 IFTA Summer Tour of Western New York
Tree, Post & Trellis Exchange
Meeting & Workshop Announcements

Out and About

Dan and Anna will be available by email and phone all of next week.

Tree Fruit News

Cornell University Cooperative Extension
Eastern NY Commercial Horticulture Program

Vol. 4 Issue 7
October, 25 2016

Tree Fruit News

Apple Harvest Summaries– Season to Date

In this issue of Tree Fruit News:

Hudson Valley, *Dan Donahue*

The early accumulation of heat units led to McIntosh green tip at the Cornell Hudson Valley Research Lab on March 16th, three weeks earlier than average. Development continued at a faster than normal pace, reaching ½" green to early tight cluster, depending on the variety, by April 5th. Disaster struck on the evenings of April 5th and 6th as temperatures dipped into the single digits in Columbia County, and the low teens in Ulster. According to published cold injury charts, flower bud mortality should have been close to 100%. The reality was that a substantial number of buds survived and development resumed. At pink stage, the weather cooled, with the bloom period being cold, wet, and much longer than normal. The period from pink to petal fall was as long as three weeks for some varieties. The quality of pollination appeared questionable. Viable blooms did emerge, the quality of fruit set was thought by many to be uncertain, at best. Concern over poor pollination conditions, cold injury to spur tissue, and what unseen damage lurked within the tree caused pomologists to be very cautious with thinning recommendations at our regional thinning meetings on May 12th. As the days progressed, the crop began to look stronger. Early season efforts at chemical thinning were ineffectual due to growers choosing low rates, and the cool conditions. Some grower decided to forgo chemical thinning entirely, implementing a hand thinning strategy later in the season.

By May 23rd it became clearer that surviving flowers, with viable pistils (most flowers) that set fruit, weren't going to drop off on their own. CCE ENYCHP issued an E-Alert suggesting that chemical thinners should be used at normal rates based on the NEWA carbohydrate model. The resulting crop had a "clumped" distribution on the tree, reflecting the loss of the king bloom, along with a high degree of set of the side bloom, and poor thinning performance. In late June, growers and industry professionals estimated the Hudson Valley crop to be 70% of the 2015 crop. Maturity estimates calculated in early August resulted in a prediction of Gala, Mac's, and Honeycrisp running three days earlier than 2015.

August turned out to be much warmer than average for the Hudson Valley. A local media outlet reported that we experienced more 90+ days this past August than any other August on record. However, the high temperatures did not result in an increase in the rate of maturity development. In comparing harvest maturity data from 2015 with 2016, Gala maturity was slightly ahead, McIntosh roughly the same, and Honeycrisp a few days behind. For later varieties such as Empire, Red Delicious, Fuji and Rome, maturity approximated general calendar dates. In general, flesh firmness and Brix were up this year, and color was down. For Gala, McIntosh, and Honeycrisp, retailers lowered color standards to accommodate. The Bitter Pit disorder was rampant in Honeycrisp this year, with incidence ranging from 2 – 60+ percent in sampled blocks. September and October were very dry, with growers continuing trickle irrigation when available, and re-deploying their solid-set equipment. Even with the short crop, fruit size was disappointing. As

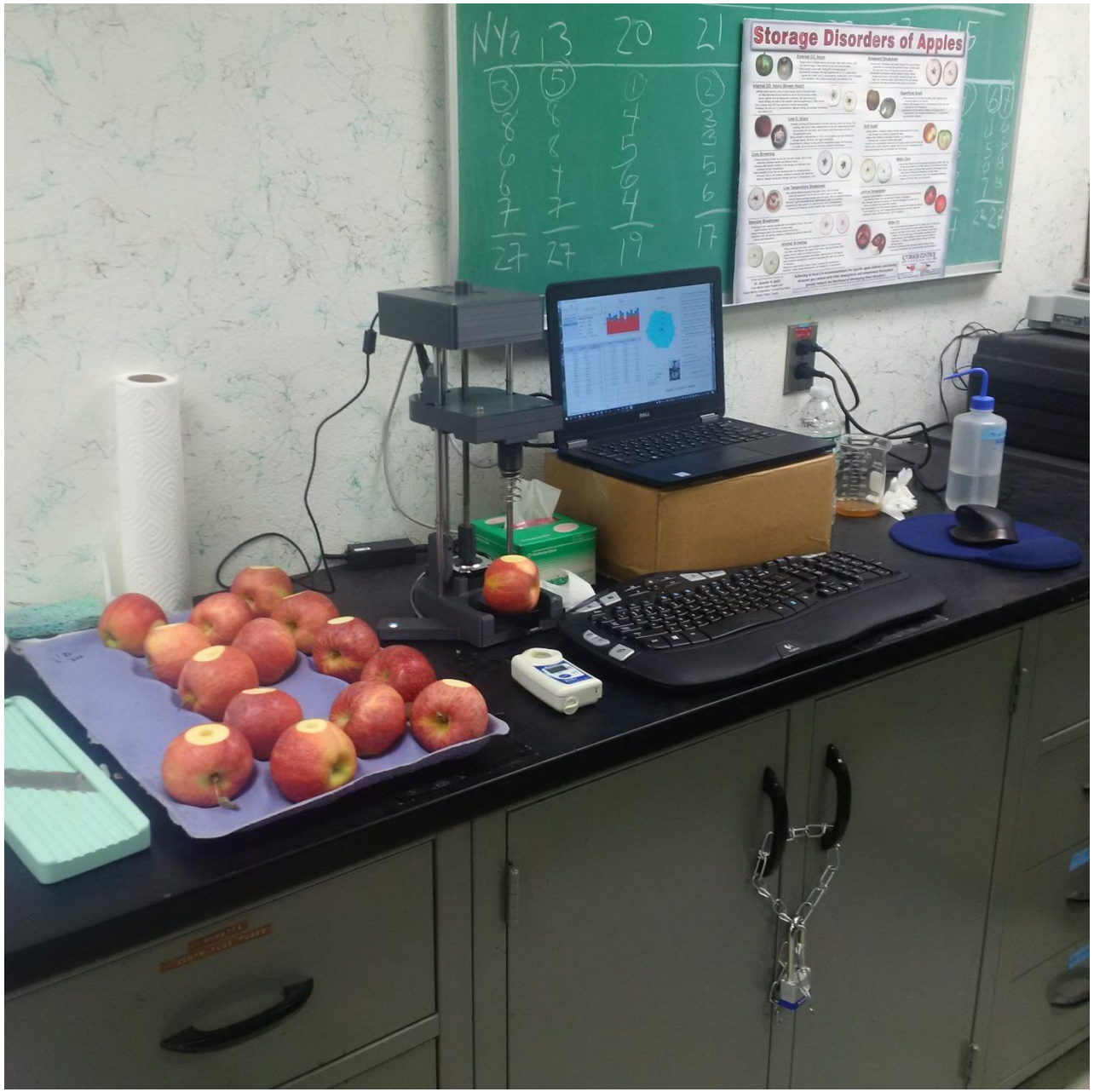
continued on next

Temperature and Rain 9/17/16 - 10/17/16

Locations	Avg Temp (F)	Max Temp (F)	Min Temp (F)	Total Rain (in)
Chazy	56.9	80.2	33.4	1.74
Peru	57.4	83.8	29.4	1.14
Crown Point	56.9	83.5	28.9	0.03
Clifton Park	58.6	88.2	29.9	1.32
Hudson	59.1	87	29	2.57
Highland HVRL	59.8	84.8	32.8	1.13
Marlboro	58.8	82.9	31.9	1.09
Riverhead	62.7	83	41	4.22

Capacity Building

- Agrosta fruit quality analyzer and supporting equipment
- Macro Camera
- Future needs: Gas Chromatograph for Ethylene Analysis



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