

Summary of Research and Extension Activities at Cornell's Hudson Valley Laboratory for 2011 and 2012

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Highland, NY

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Support Staff, 2011-2012

Without the focused efforts of those listed below, very little would have been accomplished!
Without the diversity and humor they brought to the lab, life would have been dull!

Albert Woelfersheim, Orchard and Facilities Manager (1992 to present)
Donna Clark, Administrative Assistant (1984 to present)
Anne Rugh, Technician, Plant Pathology (2004 to present)
Joe Whalen, Technician, Horticulture, (2008 to present)
Jeffrey DiMetro, Seasonal Field Worker, (2009-2012)
Lindsay Sudol, Seasonal Research Support, Plant Pathology (2009-2012)
Tina Hyatt, Seasonal Research Support, Plant Pathology (2012)
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Leonel Rosario, CALS/CCE Summer Research Intern, Plant Pathology, 2011
Allen Clayton, Technical Assistant, Entomology, Entomology, 2011-2012
Alex Olsen, Technical Assistant, Entomology, Entomology, 2010-2011
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Horticulture Program

2011 and 2012

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Apple Planting Systems Trials

We are currently taking data from 2 established apple planting systems trials in the Hudson Valley. We collect yield and pruning data on an annual basis for economic comparisons. The Dressel Trial, New Paltz, NY, compares the Gala and Early Fuji varieties on Slender Pyramid, Vertical Axis, and Tall Spindle systems all propagated on important new Geneva rootstocks including G.41, G.16, G.11, and G.210 compared to standards such as B.9, M.9, M.26 and M.7.

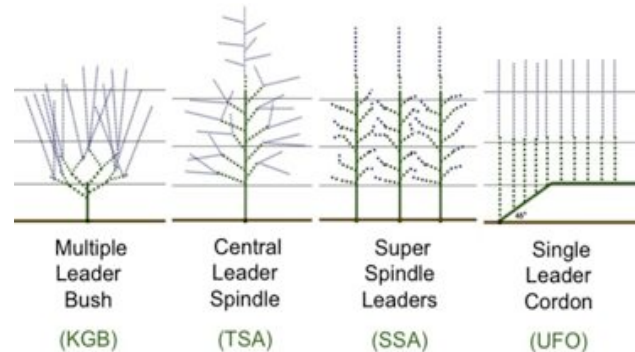


Figure 1. Dressel Fruit Farms Planting Systems Trial at bloom

The Chiaro Red Delicious trial was established near Hudson, NY, in 2007 in response to the continuing need to produce more local Red Delicious apples more profitably. Since Red Delicious is a slow growing and low yielding variety it might benefit from higher planting densities and the use of very precocious rootstocks. However, lower returns for this variety may make this difficult. This trial was established to try innovative planting systems and some of the new rootstocks to find the best combination for profitability with this variety.

Sweet Cherry Planting Systems, Rootstocks, and Protected Culture

The NC140 regional research project on sweet cherry systems and rootstock established at Crist Farms in Walden, NY, was established in 2010 to study the influence of training system, rootstock vigor, and growing conditions (site) on annual fruiting unit growth, yield, and



fruit quality. This trial (planted in 2010) is comprised of 4 tree architectures at high

densities using the SSA and UFO, the TSA, and the SB and 3 of the Gisela rootstocks (3,5,6) with varying vigor levels. Several of the canopy system X rootstock combinations finished filling their orchard space in 2012.

In May, 2012 we erected a 2-bay high tunnel over this trial. The research objective was to establish a “Best management practices” demonstration and research to evaluate the economic significance of protected culture for a high value crop. Yield and cracking data will be collected this year. This project was partially funded through an AFRI grant.

We have also started a trial at Mead Farms to look at the “Voen” Covering System for Sweet Cherries. This system from the Vohringer GmbH Co in Germany uses a covering system with moveable panels to reduce the strain on the covers and prevent damage caused by high winds. We expect to erect the cover spring in spring of 2013.



Figure 2. NC-140 Sweet Cherry Systems Trial under Haygrove Tunnel.

Rootstock Trials

We also have 2 large comparative rootstock trials in the Hudson Valley in addition to those associated with the planting systems trials at Chiaro's and Dressel's. The oldest, established in 2006, has 25 different rootstocks from all over the world all on Fuji. We divided these into 2 classes, rootstocks purported to be dwarfing and the rest semi-dwarf. They are in separate sections within the block and analyzed separately.

The second trial is a NC-140 sponsored trial located at the Hudson Valley Lab (Table 1). The identical planting plan is copied in 6 other states with Fuji and a similar one with Honeycrisp on top in 15 other states. There are five complete rows of Aztec Fuji with as many as 3 trees per rep per rootstock. This planting has a very large number of untested Budogovsky roots (Russia), as well as new Cornell/Geneva, PiAu (Germany), P (Poland), and M. (England) rootstocks.



Figure 5. NC-140 Regional Rootstock Trial with Aztec Fuji at the HVL

Spray Efficiency Trials

In 2012 with Dr. Andrew Landers, I looked at models to better estimate dosages required for effective pest control. This project was funded in 2012 by ARDP under the title, "The Application Rate Debate". One model of interest was the "DosaFrut" model developed in Spain that uses dimensions of the tree, canopy density, sprayer performance, pests to be controlled, and weather

conditions to adjust spray volume applied while keeping pesticide concentration constant. The DosaFrut model was compared directly to the standard method, Tree-Row Volume. Results indicated that the TRV method applied from 1.7 to 4.5 times more pesticide per acre than DosaFrut depending on application conditions and approximately 1.5 times as much material was deposited on the tree. TRV was more effective controlling pests than DosaFrut with up to 8% more damage caused by Plum curculio and 5% additional damage caused by apple scab (Table 2). We will continue looking at the efficacy of available models in 2013.



Figure 3. Canopy fill measured for DosaFrut estimation.

Variety Trials

In 2011 and 2012 we continued evaluation of fifteen 2nd test apple varieties provided by Dr. Susan Brown in 2007. These varieties have been harvested annually with basic yield and fruit quality parameters measured. In 2011 we started public taste testing at a local U-Pick farm, at a



Figure 4. An interesting new variety from the Cornell apple breeding program.

CCE dinner, and at a variety of local "Green Markets" for acceptance by the public and to compare to popular standard apple varieties. This will continue until these varieties are eliminated from the program or commercialized (Table 3).

We also have been interested in the 2 new varieties that are being commercialized by the New York Apple Growers Inc. from the Geneva breeding program. Trees were established in 2008 and 2009 at the HVL and are now beginning to bear. We are following these varieties for tree growth and fruit quality, using them in the previously mentioned tasting trials, and using similar methods to assess harvest dates. Preliminary results indicate that NY1 is widely accepted by the public, surpassing acceptance of some of the standard varieties such as Fuji, Honeycrisp and Empire. NY2 is acceptable but does not rate as well as NY1 at the public tastings.



Figure 6. The public tasted new apple varieties from Cornell University at Prospect Hill Farms

Harvest date testing was conducted in 2012. Master Gardeners training, the Great Lakes Fruit Workers group meeting, and the NYAG meeting participants tasted fruit picked at intervals and ranked the date with the highest quality fruit. Results were interesting in that these 2 varieties were acceptable to these participants over a wide range of harvest dates. Scores indicated that fruit could be harvested anytime during a 3 week period and still be acceptable to this group (Table 4).

We also assess the 28 grape varieties we have in our 1 acre vineyard on an annual basis. Data is taken on pruning weights, total yield, and fruit size.

We also participate in the statewide “Veraison to Harvest” program by providing data from the Hudson Valley region. Veraison to Harvest is a weekly electronic newsletter put out by viticulture and enology extension personnel from Lake Erie, Long Island, the Hudson Valley and the Finger Lakes. Each issue provides accurate and up-to-date regional harvest maturity data while giving a statewide perspective as well. Veraison to Harvest begins in late August and concludes in late October and can be accessed through a website at grapesandwine.cals.cornell.edu. Historical data is also

available. Data includes Brix, fruit size, YAN, TA, and pH. There are also brief regional updates and articles that relate to harvest.

Mechanization for Labor Saving

In 2012 Terence Robinson and Mario Sazo started a project looking at new methods for labor savings for growers using the Tall Spindle Planting system. The use of commercially made platforms to reduce labor has been successfully implemented on many farms in NY and used for pruning and training and has the potential for harvesting as well in some cases. Our data shows that pruning will cost approximately \$486/yr/acre at maturity for the Tall Spindle System. Pruning continues to be one of the most important contributors to expense for this planting system. In Europe, similar systems called “Fruiting Wall systems” use hedging to reduce pruning costs, so a hedger was obtained and a trial started entitled, “Sidewall Shearing Tall Spindle Apples and Sweet Cherries for growth control in NY”. In 2012 one Tall Spindle Apple block for shearing was identified in the Hudson Valley and other blocks upstate. The trial was replicated complete block sheared June 1, July 1, and August 1 to assess the proper time for shearing, the labor savings involved, the cost of shearing compared to pruning, and the effect on fruit quality as well as actual loss from shearing fruit already on the tree. Preliminary results indicate that shearing significantly reduces the cost of pruning labor the 1st year of shearing, crop loss due to damage from the hedging process is very low, and tree response with increased vegetative growth is less the later the hedging is performed, with insignificant growth when done in August. Data on improvement in fruit quality has not yet been analyzed.



Figure 7. Hedging Tall Spindle Plantings in the Hudson Valley.

Delay of Fruit Tree and Grape Development

The 2010 growing season was nearly the earliest on record. In 2012, it was evident by late February that trees would start to grow well before normal and that the risk of freeze and frost damage would be significant. In the end, the 2012 growing season was the earliest on record. After reviewing the literature on methods for delaying growth, we found that Dami and Beam (2004) had used a twice refined plant oil mix (Amigo™) to delay development in apple and in grape. We obtained “Amigo” from Loveland and applied it on several varieties of apple and grapes to test for phenological delays. The material was marginally effective, delaying growth 2-3 days at the most. This delay turned out to not be significant this growing season since bloom occurred 21 days ahead of normal and the 2 day delay was not enough to protect against early frosts. Fruit size, SS, starch development, harvest date was not affected. We intend to continue testing this material since it shows it could be effective in “normal” seasons when a delay up to one week could be significant.

Growth Regulators – Thinning, Return Bloom, and Drop Control

“Improved Chemical Thinning efficacy, Return Bloom, and Pre-Harvest Drop Control” Robinson, Hoying, and Lakso.

This statewide project, with many separate tests, looked at various growth regulators to control management aspects of the crop including fruit crop load, harvest management, and drop control. In the Hudson Valley, we concentrated on drop control of McIntosh. This test compared rates and timings of Retain to control fruit drop. Five treatments were compared. An early treatment using the full rate of Retain applied 28 days before expected harvest, a full rate of Retain plus NAA 14 days before harvest, ½ rate of Retain applied 28 days before harvest followed by another ½ rate of Retain plus NAA 14 days before harvest, and finally NAA applied 7 days before expected harvest. The combination of NAA and Retain resulted in superior drop control.

In 2011, another trial was run with Retain combined with a material to reduce sunburn. Drop is thought to be exacerbated when sunburn causes stem abscission layer formation. Our preliminary results showed that the addition of the sunburn material did not improve drop control.

Thinning trials were not run in 2012 due to the early season and risk of over-thinning due to the great potential for frost damage. Multiple frosts occurred in 2012, which would have complicated interpreting the results of thinning trials.



Figure 8. McIntosh for evaluation from the Retain plus NAA trial.

Nutrition and Fertility

In cooperation with Prospect Hill Farms and Mike Fargione, we have started a trial on pear fertility. Fertility levels for pears frequently fall below recommended levels for optimum growth of pears in the Hudson Valley because of the fear of stimulating fireblight (*Erwinia amylovora*) epidemics. The results of lower fertility levels can result in weaker overwintering fruit buds subject to winter injury and consequently lower fruit set and yield, smaller fruit, and/or open canopies with increased levels of sunburn and other physiologically important issues.

The typical spring applications of fertilizers likely do not reach the developing fruit bud in time to help with fruit set. Spring nitrogen applications in particular can stimulate increased shoot growth susceptible to trauma blight. We believe that the application of fall fertilizers would help to solve this problem by providing the tree with increased carbohydrate levels in overwintering fruit buds. This will help to stimulate stronger buds and result in reduced winter injury to buds and improved fruit set the following spring, which should result in increased yield. The trial was established in October 2012 with 7 treatments: No treatment, Spring ground applied nitrogen and potassium (15.5-0-0 and 0-0-22-11) @ 2.2#’s Calcium Nitrate/tree and 3#’s SulpoMag/tree, Fall ground applied nitrogen and potassium (15.5-0-0 and 0-0-22-11) 2.2#s/tree Ca2NO3 and 3#’s/tree SulpoMag/tree, Fall ground applied nitrogen alone (15.5-0-0) 2.2 lbs Ca2NO3 per tree, Fall foliar applied nitrogen 25#’s Urea/100 gallons and potassium ground (0-0-22-11) K2SO4 @ 3 lbs per tree, Fall foliar nitrogen application alone @ 25 #’s/100 gallons. Fall ground applied potassium application K2SO4 @ 3 lbs/tree. Fruit set, shoot growth,

fruit yield, and fruit quality (firmness, SS, starch) data will be collected in 2013.

Bitter pit control continues to be a major emphasis of the Horticulture program. Honeycrisp is a high value apple variety that contributes significantly to on-farm income. Currently, pack outs are significantly affected by bitter pit. A small reduction in sort outs caused by bitter pit could result in significant economic gains. In 2012 we initiated a trial funded by ARDP to assess whether calcium applied through the trickle irrigation system could further reduce the incidence of bitter pit and other storage disorders on Honeycrisp and significantly improve pack out, storability, and profitability. Even a small reduction in bitter pit and the ability to extend storage life through decreased senescent breakdown would result in significant increase in profits. The treatments included: check – no water, water alone, calcium foliar applications alone, calcium nitrate through the trickle system alone, calcium chloride foliar applications plus calcium nitrate through the trickle, calcium chloride through the trickle system alone, and calcium chloride foliar plus calcium chloride through the trickle.



Figure 9. "Chemilizer" used to inject liquid calcium chloride into the trickle irrigation system.

Preliminary work in 2012 in one commercial orchard and at the HVL showed the effectiveness of foliar applications of calcium but not through the fertigation. Rates will be increased in the 2013 growing season to elicit a response.

Sensitivity to Winter Cold

Since 2009 we have been testing grape and peach buds at the lab for sensitivity to winter cold using a "Differential Thermal Analyzer". These data have given us a prediction of bud mortality so that the severity of spring

pruning can be estimated depending on bud mortality. With funding from Viticulture Consortium-East, the Lake Erie Regional Grape Program, Inc., and the New York Wine and Grape Foundation, we are posting bud cold-hardiness information for four representative varieties in New York, measured at commercial and Cornell vineyards in the Lake Erie, Finger Lakes, and Hudson Valley regions. We have chosen Riesling, Cabernet Franc, Cayuga White, and Concord as representative varieties exhibiting a broad range of bud hardiness under NY conditions. Vineyards are sampled every two weeks from December 1 through March.

Most recent LT50 (Median Bud Freezing Temperature) values for each region are listed in separate tables on the <grapesandwine.cals.cornell.edu> website. Clicking on a variety name will bring up individual graphs of minimum/maximum temperatures and seasonal change in bud freezing temperatures.

We are also continuing with a self-funded project looking at various mulching materials available for winter protection of grape vines. Hilled-up soil, straw, and wood chips are compared to non-hilling over replacement canes for winter protection. Temperature sensors are buried with the canes and read in the spring to assess temperatures. Bud viability and mortality are also assessed. Since the beginning of the project we have not had a killing freeze where the canes needed to be used as replacements so economic loss and potential crop could not be assessed.

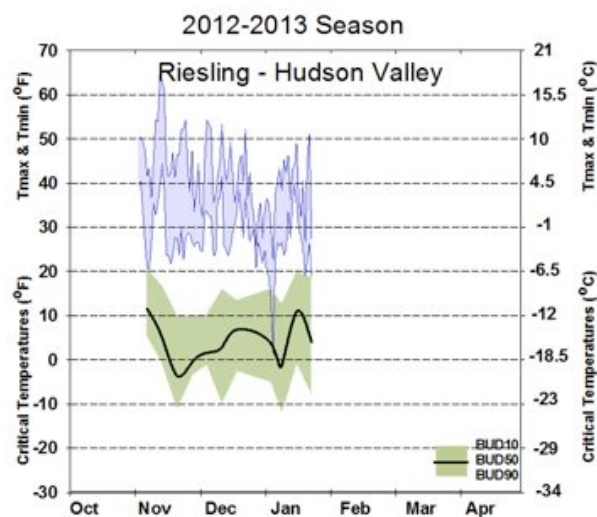


Figure 10. 2012/2013 Riesling cold hardiness compared to actual temperatures.

Table 1. NC140 2010 Rootstock Trial

NC140 2010 Rootstock Trial HVL -			Cumulative 2012 Data					
Cultivar	Rootstock		2012 Avg Trunk Circumference	Cumulative Yield (kg) 2010-2012	Average Fruit Size (g) 2010-2012		Yield Efficiency	
Fuji Aztec	G.11		104.3	16.6	243		1.59	
Fuji Aztec	CG.4003		98.5	15.5	212		1.57	
Fuji Aztec	CG.3001		136.3	18.1	250		1.33	
Fuji Aztec	CG.2034		93.5	12.1	220		1.30	
Fuji Aztec	G.202 Tissue Cultured		109.2	13.7	208		1.26	
Fuji Aztec	CG.4004		132.3	15.8	272		1.20	
Fuji Aztec	M.9T337		106	12.1	239		1.14	
Fuji Aztec	G.935 Normal		121.2	13.7	202		1.13	
Fuji Aztec	G.41 Normal		105.5	11.9	225		1.13	
Fuji Aztec	B.10		97.8	10.5	186		1.07	
Fuji Aztec	B.9		75.3	7.8	185		1.03	
Fuji Aztec	B.7-3-150		128.5	13.3	227		1.03	
Fuji Aztec	CG.5222		131.1	13.5	220		1.03	
Fuji Aztec	M.26EMLA		127	12.6	241		0.99	
Fuji Aztec	CG.4214		78	7.7	246		0.98	
Fuji Aztec	G.41 Tissue Cultured		107	10.4	271		0.97	
Fuji Aztec	G.935 Tissue Cultured		117	10.8	198		0.92	
Fuji Aztec	B.71-7-22		53.8	4.8	192		0.90	
Fuji Aztec	B.70-6-8		133.3	11.1	245		0.83	
Fuji Aztec	CG.4814		100	7.9	221		0.79	
Fuji Aztec	M.9PAJAM2		113.6	8.1	255		0.71	
Fuji Aztec	PIAu51-11		128.5	8.3	252		0.64	
Fuji Aztec	PIAu9-90		97.2	5.3	139		0.55	
Fuji Aztec	Supp.3		98	5.1	259		0.52	
Fuji Aztec	B.7-20-21		49.6	2.4	139		0.48	
Fuji Aztec	G.202 Normal		151.2	7.2	237		0.47	
Fuji Aztec	B.67-5-32		123.1	4.9	243		0.40	
Fuji Aztec	B.64-194		98	3.9	244		0.40	
Fuji Aztec	CG.4013		56	1.8	184		0.33	
Fuji Aztec	B.70-20-20		191.6	4.8	237		0.25	

Table 2. Insect damage comparison between DosaFrut and Tree

Row Volume methods for determining pesticide dosage

Variety	Application	%P. Curculio	%Apple Scab	%Stinkbug
McIntosh	TRV	0.7	3.2	0.0
McIntosh	Dosa	8.0	6.1	0.0
NY2	TRV	3.4	0.7	14.5
NY2	Dosa	1.4	3.3	13.2
Fuji	TRV	1.0	0.0	3.0
Fuji	Dosa	1.4	5.0	5.0
G. Delicious	TRV	0.0	0.0	12.3
G. Delicious	Dosa	12.2	0.0	10.2

Table 3. Tasting Comparison of apple test varieties by U-Pick customers October 2012.

Variety	Perfect	Great	Good	Average	Poor	Overall Score
NY1	5	7	11	3		1.8
BRXGG		6	7	6	2	0.9
Royal Empire		6	6	8		1
NY2		6	11	5		1.3
BRX674		2	6	8	5	0.3
GAX463	1	2	9	9	3	0.8
GAXHC1		4	7	7	3	0.7
GAXHC2	5	5	11	1	1	2.2
RS Early Fuji	1	2	9	7	3	0.8
HCX752	3	7	10	1	1	1.9

Table 4. Best harvest date ratings for NY2 – 2012 Master Gardeners Evaluation

Harvest Date	Avg. Rating (1-5)	Range	# of Best Rating
9/28/2012	2.6	1-5	5
10/1/2012	2.8	1-5	7
10/5/2012	3.3	1.5-5	10
10/9/2012	3.2	2-5	9
10/15/2012	2.8	2-4	8

Table 5. ReTain/NAA Stop Drop Trial – 2011. Fruit evaluation after Hurricane Irene. Notice the number of fruit still on the tree despite high winds and rains immediately before expected harvest!

Treatment	Avg. Ethylene ppm	Color Rating 25 apples (1-10 scale)	Fruit Wt. (gms)	Total yield bu/tree	Firmness (lbs)	BRIX %	Starch Rating Cornell Scale	% drop
Retain 333g/acre 28 DBAH	0.03	4.64	165.3	5.37	16.1	10.9	5.1	25.2
Retain 333g/acre plus 20ppm NAA 14 DBAH	0.09	6.52	172.5	3.94	15.5	10.3	6.9	32.1
Retain 167g/acre + 10ppm NAA 28 and 14 DBAH	0.00	6.28	161.6	4.72	14.1	11.6	7.3	39.4
NAA 20ppm 7d	0.00	6.6	163.4	4.80	13	10.5	6.2	33.8
Untreated	0.09	7.08	158.0	2.53	15	10.8	6.5	50.0

Plant Pathology Program 2011 and 2012

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Tree fruit disease monitoring

Plant disease models that assist in spray timing are available for managing fire blight, apple scab, and sooty blotch/flyspeck (see <http://newa.cornell.edu>), but the models are constantly being assessed and improved. In 2012, exceptionally dry weather during the prebloom period for apples did not allow for normal maturation and discharge of apple scab ascospores, but the model on the NEWA website did not fully compensate for the impact of the dry weather. Because we suspected the model outputs were incorrect, we conducted a microscopic assessment of ascospore maturity at petal fall, verified that the leaf litter still contained large quantities of ascospores despite contrary output from the model, and alerted Hudson Valley apple growers that they should maintain fungicide coverage for scab ascospores beyond the period indicated by the model so as to prevent scab from becoming established in their orchards. Had scab developed in Hudson Valley orchards due to faulty model outputs, losses would have been magnified by the unusually high prices that Hudson Valley apple growers received in 2012 due to the fact that spring frosts destroyed the apple crop in many other parts of the northeast.

Our real-time intervention and correction of model outputs was feasible only because we are constantly monitoring model outputs and local conditions so as to detect model errors before they can cause economic losses. The apple scab model is now being corrected to better compensate for dry weather, something that would not have occurred had we failed to recognize the problem as it developed in 2012, and that correction should prevent similar miscalculations from occurring when dry weather occurs in areas of the northeastern United States where NEWA models are utilized.

Hudson Valley apple growers still trust microscopic assessments of scab more than model outputs, so we continue to provide ascospore maturity assessments during the early part of each growing season. When our local assessments indicate that scab ascospore maturity is lagging behind model predictions, many Hudson Valley growers will omit one or two early-season fungicide sprays, thereby saving at least \$25/A for each application omitted, or \$200,000 if applied across all of the Hudson Valley's apple acreage.

The models for timing streptomycin sprays during bloom can be directly accessed by fruit growers on the NEWA website, but Hudson Valley growers benefit from nuanced explanations of model outputs that are provided via Mike Fargione's daily email alerts after Mike and I review local risk factors. Growers also receive alerts concerning other unusual disease risks (e.g., bitter rot associated with hot humid weather) as we see them developing based on weather predictions or observations in our own orchards.

During August of 2012, based on an alert from Dr. Keith Yoder, plant pathologist with Virginia Tech's Winchester Fruit Research Station, we scrutinized leaf necrosis on Golden Delicious and a few other cultivars that had previously been attributed to necrotic leaf blotch, a presumed physiological disease that frequently appears on Golden Delicious in midsummer. We verified that many of the lesions are actually attributable to *Colletotrichum* species, a fungal genus that includes a pathotype capable of causing rapid defoliation of Gala trees along with a troublesome fruit rot. Dr. Alan Biggs at the University of West Virginia's Kearneysville Fruit Lab analyzed representative isolates that were sent to him and verified that the pathogen present in our leaves was *C. acutatum* and not the defoliating species/pathovar that had been reported in North Carolina. Further research is needed to determine the role of *C. acutatum* in the necrotic leaf blotch outbreaks that were noted throughout New York and New England in 2012.



Figure 11. Typical leaf yellowing from necrotic leaf blotch showing banded lesions from which *C. acutatum* was isolated.

Tree fruit disease diagnosis

The plant pathology program at the Hudson Valley Lab assists extension staff with disease diagnosis. In 2012, we provided diagnoses for more than 100 specific inquiries from extension educators, private consultants, and commercial producers. Most of these inquiries were submitted via e-mail along with digital photographs that allowed for a visual diagnosis. However, more than 30 of the inquiries required lab procedures to identify the pathogens involved. In many cases, our ability to provide a rapid diagnosis and response allowed growers to take corrective action before they incurred additional losses.

Alternative Management Systems for Apples

Evaluation of Scab Resistant Apples

A Super Spindle planting consisting of 10 scab-resistant cultivars and totaling 1500 trees was established on 1.25A at the Hudson Valley Lab in spring of 2010. Trees were spaced at 3 ft X 11 ft and are supported by a 4-wire trellis. Cultivars included in replicated plots within the planting are Pixie Crunch, Winecrisp, Nova EasyGro, Crimson Crisp, Liberty, Florina Querina, Topaz, Goldrush, Enterprise, a Geneva selection, and Honeycrisp. (Honeycrisp is not technically scab-resistant, but it often develops very little scab when left unsprayed.) Other trees included in smaller numbers include Pristine, Redfree, Scarlet O'Hara, and Novamac.

Trees in this block are being used for the two experiments described below. The trees fruited for the first time in 2012. Goldrush trees yielded between 600 and 700 bushels per acre, but nearly 30% of the Goldrush fruit cracked prior to harvest, presumably because of the heavy rains that occurred shortly before harvest. Other



Figure 2. Cracking on Goldrush at harvest.

cultivars had lower yields because trees grew more slowly than the Goldrush and/or because the trees were over thinned.

Among the less-known cultivars, we believe that Pixie Crunch could be the most valuable “sleepers” cultivar for U-pick and direct market farms because of its exquisite flavor and

crispness. The small size of Pixie Crunch

fruit will limit its usefulness in the wholesale trade.

Effects of insecticide/fungicide programs on productivity and fruit quality

Ten treatments involving various combinations of fungicides and insecticides appropriate for conventional or organic apple farms were applied in the high-density planting of scab-resistant cultivars throughout the 2011 and 2012 seasons. The objective is to determine how different agrichemicals (or their absence) may influence the long-term productivity of trees. The same treatments are being applied to the same plots each year to determine cumulative effects of pest control products on fruit quality, yield, and tree health. All of the plots receive commercial herbicide and fertility treatments, so any differences in yield and fruit quality will be attributable only to the impacts of fungicides and insecticides that are applied. Each of the 10 treatment regimes is being replicated six times using panels of trees that contain 11 different apple cultivars. Data from our first harvest in the fall of 2012 is still being analyzed.



Figure 3. Honeycrisp plot with white landscape fabric.

Weed control via removable landscape cloths

Weed control is a challenge for organic apple growers because all of the existing options (flaming, tilling, burn-down with acidic sprays, organic mulches) have negative attributes that make them expensive, difficult to manage, or potentially destructive to the trees. We decided to investigate reusable landscape fabrics that would be installed in spring and removed in autumn so as to avoid the vole problems that occur if landscape fabrics are permanently installed. Several of the initial designs we attempted for installing removable landscape fabrics proved impractical, but we eventually settled on a

functional design. Using strips on each side of the tree row, the outside edge of each strip was held in place with a nylon cord sewn into the landscape cloth and tensioned to metal posts at the end of each row. The corded edge was secured at roughly 15-ft intervals down the row using inexpensive 6-in aluminum tent stakes that could be quickly installed by just pushing them into the soil. The fabric strips from the opposite sides of the row were overlapped slightly and fastened between each tree using another aluminum stake. Because the edges were tensioned down against the ground, we could mow the row middles without being concerned that the mower might tangle with the landscape cloth. Weeds such as quack grass that grew along the outer edges of the landscape fabric were mowed off when the ground covers were removed before harvest.

Tree growth and productivity are being compared in plots where weeds are being controlled with a black landscape fabric, white landscape fabric, or regular applications of gramoxone, glyphosate, or glufosinate (Rely). The herbicide treatments will allow us to evaluate the long-term effects of these products on development of trunk cankers as compared to trees in plots with landscape fabric where no herbicides are being applied.

Data on yield and fruit quality from the 2012 harvest are currently being analyzed.

Evaluating fungicides for controlling apple diseases

New SDHI fungicides for apple scab and mildew

New fungicide chemistry groups are introduced at roughly 10-yr intervals. Each fungicide chemistry group has unique capabilities and limitations that can be discerned only after many years of field testing. The fungal pathogens that cause apple scab and mildew are widely resistant to the benzimidazole fungicides that were introduced in the 1970's, and they are gradually becoming resistant to DMI fungicides that were introduced in the 1980's and to the QoI fungicides that were introduced in the late 1990's.



Figure 4. Apple scab (left) and powdery mildew (right) are apple diseases that must be controlled with fungicides.

The newest fungicides are in the SDHI chemistry group, and at least three different fungicides that contain this chemistry (Fontelis, Luna Sensation, and Merivon) will be registered in NY within the next year. More than 50 treatment regimes involving SDHI fungicides were evaluated in field plots at the Hudson Valley Lab over the past two years. Results from these treatments provided insights into how the new SDHI fungicide group can be integrated into apple disease control programs to enhance both disease control and to minimize selection pressure for resistance to fungicides. We found that the SDHI fungicides used alone do not control rust diseases very well, but they are very effective for controlling apple scab and powdery mildew. Results from our field trials have been published in technical reports and are being incorporated into extension recommendations on how best to apply these new products.

Using Inspire Super to control summer diseases on apples

In 2012, a trial aimed at controlling diseases that appear on apples during summer showed that Inspire Super, a fungicide previously targeted for early-season applications, controls sooty blotch and flyspeck as well as or better than any of the other fungicides that are currently being used during summer. Although Inspire Super used alone has limited activity against fruit rots, combining Inspire Super with captan should ensure adequate control of summer fruit rots and exceptional control of sooty blotch and flyspeck. The proven usefulness of Inspire Super during summer provides growers with a new tool for managing summer diseases on apples while avoiding some of the previously used summer fungicides that buyers in some markets consider unacceptable even though they have EPA-approved labels.

Factors impacting Apple Tree Health

The role of glyphosate in apple tree decline

Glyphosate herbicide (Roundup and generics) is widely used in apple orchards to control woody perennial weeds such as poison ivy, sumac, Asian bittersweet, and Canada thistle. Apple trees can absorb sublethal doses of glyphosate via drift to foliage on low limbs, via uptake through leaves on root suckers or through bark on the lower trunk. Sublethal concentrations of glyphosate in plants can interfere with the shikimic acid pathway in plant metabolism, a pathway that is important in fruit ripening, host plant defense mechanisms, and many other physiological processes.

Starting about 2003, we began seeing trees with basal trunk cankers that appeared to develop where herbicide applied via boom sprayers was hitting the lower portions

of the trunks. The damage was especially severe on Macoun trees, although other cultivars were also affected. Observations in numerous orchards led to the hypothesis that glyphosate exposure predisposed the trunks to infection by *Botryosphaeria dothidea*, a canker fungus that could girdle the trunks. Over the past decade, apple growers in the northeastern United States have lost thousands of Macoun trees to basal trunk cankers. Similar injury has been observed on other cultivars including Honeycrisp, but the cankers on other cultivars rarely cause the tree deaths that have occurred with Macoun.



Figure 5: Basal trunk canker ostensibly caused by glyphosate being absorbed into the bark.

The link between basal trunk cankers and glyphosate remains unproven but is generally accepted based on observational evidence. However, glyphosate is an important management tool, and we have therefore focused on educating growers (via extension newsletters and meeting presentations) about the best approaches for minimizing damage to trees when applying glyphosate.

Does glyphosate impact susceptibility to fire blight?

Because glyphosate can interfere with host defense mechanisms, we initiated research to determine if trees with sublethal exposure to glyphosate might be more susceptible than non-exposed trees to the shoot blight phase of fire blight. We conducted trials in 2011 and 2012 in a meadow orchard of Lady Apple trees where the spread of fire blight to new shoots and the extension of fire blight cankers were evaluated in replicated treatments involving controlled exposure to glyphosate. All trees were given controlled inoculations with the fire blight pathogen, and trees with no glyphosate exposure were kept as controls.

After two years of work, we found no evidence that glyphosate exposure had any significant impact on either spread of fire blight to new shoots during summer or on the extension of fire blight cankers that formed on

inoculated shoots. Given that the highest glyphosate exposure level that we tested actually caused visible damage to the test trees, we can conclude that the range of glyphosate exposures in our tests encompassed the highest dose that would occur as a result of glyphosate drift in commercial orchards. Even those high doses had no impact

on the spread of fire blight. Results of these trials are currently being summarized for publication in a refereed journal.



Figure 6: Fire blight in the Lady Apple trees used to study the impacts of glyphosate on spread of fire blight during summer.

Preserving apple quality during storage

Is internal browning during CA storage exacerbated by glyphosate herbicide?

The shikimic acid pathway that is blocked by glyphosate is also known to play critical roles in fruit ripening processes. We therefore conducted research to determine if glyphosate exposure might affect the incidence and severity of internal browning in Empire apples. Internal browning is a disorder that can appear during long-term controlled atmosphere (CA) storage. Even mild cases of internal browning make fruit unacceptable for use as fresh-cut slices. Incidence and severity of internal browning vary from block to block and year to year, but the underlying factors that contribute to these differences have not been determined.

Over the past three years, in collaboration with Dr.

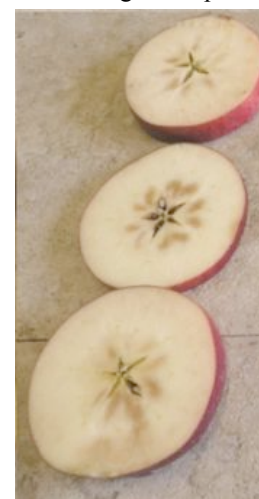


Figure 7: Internal browning in Empire apples.

Chris Watkins and Jackie Nock in Cornell's postharvest physiology lab and with extension educators Mario Miranda Sazo and Craig Kahlke on the Lake Ontario Fruit Team, we conducted 10 trials to determine if glyphosate drift onto apple foliage would impact the incidence and severity of internal browning. In each of the three years, Empire trees in three different commercial orchards in western New York were exposed to a low dose of glyphosate by spraying a single lower limb on mature apple trees to simulate the effects of drift from an August application of glyphosate. Fruit from treated trees and from control trees were then harvested at normal maturity, were stored in CA chambers in Dr. Watkins' lab for 8 months, and finally were evaluated for internal browning. One additional trial was conducted in a similar manner using Empire trees at the Hudson Valley Lab for treatments applied during summer of 2011.

In the nine trials in commercial orchards in western NY (three orchards in each of three years), the simulated glyphosate drift caused significant increases in the incidence of both flesh browning and core browning in two years in one orchard and an increase in core browning in one other orchard in one year. However, in the same orchard where glyphosate exposure caused an increase in internal browning in two of three years, it caused a significant reduction in browning in one of the three years. In the plots at the Hudson Valley Lab where treatments were replicated 10 times, none of the six glyphosate treatments had any impact on internal browning when compared with the control trees. Taken all together, after completing trials in 10 location-years, glyphosate exposure caused increased flesh and/or core browning in three trials, decreased flesh browning in one trial, and no effect in six trials.

Thus, although glyphosate may exacerbate browning in some years and under some conditions, it is clear that glyphosate is not the primary cause of internal browning. The inconsistent effects of glyphosate exposure in our trials might be attributable to the timing of exposures during the fruit ripening processes. The unpredictable effects of glyphosate on internal browning suggest that exposure of trees via drift should be avoided as much as possible, especially in late summer.

Bin-top treatments

Postharvest treatments used to prevent decays and physiological disorders on apples have been applied using cascades of recycling treatment solutions since these treatments were introduced in the 1950s. However, recycling of treatment solutions over any fresh produce is increasingly viewed as unacceptable because of the potential for redistributing human pathogens over huge quantities of produce. Risks could be eliminated if a



Figure 8. Minibins being filled for postharvest evaluation of bin-top treatments.

biocide (e.g., sodium hypochlorite) could be included in the treatment solution, but this is not possible with apple postharvest treatments because one of the required products, diphenylamine (DPA), is not compatible with any of the biocides. DPA treatment is needed to prevent two physiological disorders, superficial scald and carbon dioxide injury, both of which can make stored fruit unmarketable. DPA can be introduced to filled storage rooms via aerosol treatments, but the less expensive option involves application of DPA via bin-top sprays. Earlier research showed that bin-top sprays of DPA were effective for controlling scald, but in those trials the treated bins were enclosed in poly bags that ensured that DPA vapors would be retained within the area occupied by the treated bins.

In 2011, we conducted trials to determine if bin-top treatments with diphenylamine (DPA) would control storage scald even when bins were not enclosed in poly bags. DPA was applied via bin-top sprays to fruit stored in minibins that held a column of fruit equal in height to that in a full size apple bin. In the 2011-12 storage season, some minibins were enclosed in poly bags after treatments had been applied so as to retain the DPA volatiles whereas other fruit were moved into the same large storage room without poly bags. Another factor in this experiment was that some fruit were dried rapidly via forced air before they were bagged and other fruit were still wet when placed in poly bags so as to determine if fruit could be moved to storages on an open truck bed after they had been treated without fear of losing the DPA

activity due to the rapid drying and loss of volatiles that might occur during transport.

In the 2011-12 trial, scald was lower in bagged fruit than in non-bagged fruit, just as in the previous year's trial, but DPA still suppressed storage scald even in the absence of the poly bags. Nevertheless, the reduced control observed when only a small amount of treated fruit was placed into a large storage room with mostly untreated fruit demonstrated that growers who wish to treat only a small amount of fruit with DPA will get more reliable scald control if they put treated bins into poly bags. There was no effect from drying DPA-treated fruit with forced air prior to refrigeration, so fruit can be transported on flatbed trucks after treatment without fear of negating the effectiveness of treatments applied via bin-top sprays (which might have occurred if forced air removed all of the DPA volatiles). Although DPA was effective when applied via bin-top sprays, fungicides applied via bin-top sprays consistently failed to control fruit decays on inoculated fruit in the middle and bottoms of bins due to incomplete coverage and the non-volatile nature of the fungicides. Where fungicides are needed, they must therefore be applied either via preharvest sprays, via line sprays on pre-size lines, or via aerosol injection into filled storage rooms. However, if apples are moved to storage without any exposure to the recycling drenches that also carried decay spores, then most NY growers will find that no postharvest fungicide treatment will be needed.

Many storage operators have adopted bin-top sprays because it avoids the food safety risk associated with recycling drenches and it costs less than fogging DPA into filled storage rooms.

New fungicides

Postharvest fungicide trials were conducted in both 2011 and 2012 to compare the effectiveness of Penbotec (pyrimethanil), Scholar (fludioxonil), and difenoconazole when applied as conventional postharvest drenches for controlling *Penicillium expansum* and *Botrytis cinerea* in stored apples. Various combinations of fludioxonil and difenoconazole were evaluated because using these products in combination could prove useful for managing fungicide resistance in *Penicillium* species in apple storages where fungicides are still deemed necessary. Difenoconazole is not very effective against *Botrytis*, but using a combination of difenoconazole and fludioxonil should be an effective way to delay fungicide resistance in *P. expansum*.

Effective Fungicide Programs for Controlling *Fabraea* leaf spot on pears.

Fabraea leaf spot is a fungal disease that can cause rapid defoliation of pear trees in midsummer as well as a fruit spot that can make pears unmarketable even on trees where the foliar disease was suppressed with fungicides. A replicated fungicide trial was conducted at the Hudson Valley Lab in 2012 to compare the



Figure 9. Seckel pear with *Fabraea* (left) and pear trees defoliated by *Fabraea* in late summer (right), with unmarketable fruit remaining on the trees.

effectiveness of several newer fungicides. Neither Merivon nor the combination of Fontelis plus Flint performed better than Flint applied alone. Thus, the SDHI fungicides (Merivon, Fontelis) provided no better control than the strobilurin fungicide (Flint) used alone. Inspire Super was less effective for protection of foliage than Flint or Syllit (dodine). Syllit, an older chemistry with a new label that allows use on pears, was as effective as Flint. Mancozeb fungicides are still the key to early-season control, but Syllit provides a different chemistry group that can be used in rotations with Flint or Pristine to control *Fabraea* leaf spot during summer.

Growing stone fruits in the Hudson Valley

X-disease

A research project was initiated in 2009 to determine the susceptibility and host responses of new *Prunus* germplasm to the X-disease phytoplasma. X-disease is caused by a leafhopper-transmitted phytoplasma that lives in the phloem of infected *Prunus* species. The pathogen is endemic in wild chokecherry (*Prunus virginiana*) in southern New England and southeastern New York. The wild host provides inoculum for infecting orchards. The pathogen causes a rapid decline of peaches and a slow decline of sweet cherries. Infected trees must be removed because there is no economic treatment for restoring productivity of infected trees and also because infected sweet and tart cherry trees provide inoculum for further dissemination of the disease. Older literature indicates that some plum cultivars may be symptomless hosts.

Impacts of X-disease in cherries vary by rootstock and cultivar. New *Prunus* rootstocks have been introduced in recent years or are being evaluated in experimental plots,

and the new cherry cultivars are being planted in commercial orchards. This project was established to determine if any of the new germplasm might be resistant to X-disease or might produce unique disease symptoms.

The test plots planted at the Hudson Valley Lab in 2009 included 30 cherry cultivars and seven cherry rootstocks. Other stone fruit cultivars and rootstocks in the test plantings include Redhaven peach, Hargrand apricot, and Orangered apricot, all on Cadaman, HBOK10, Istara, and Krymsk-1 rootstocks; Redhaven on Bailey and Controller-5 rootstocks; the plum cultivars Stanley, Early Golden, Long John, and President on Myrobalan rootstock; Stanley and Shiro plums on Cadaman, HBOK10, Istara, and Controller-5 rootstocks, and Shiro on Krymsk-1 rootstock. X-disease inoculations were made during July of 2009 and again in June of 2010 by using the T-budding technique to insert two bark patches from a naturally infected X-diseased chokecherry into the scion of each of the designated test trees. Symptoms of X-disease have been recorded during each of the last two seasons, and trees will be tested using PCR during the 2013 growing season.

This project has been conducted in collaboration with Steve Hoying, who provides pruning and training of trees in our high-density orchards, and with Mark Fuchs, virologist at the New York Ag Experiment Station in Geneva, who will be providing the PCR testing to verify X-disease infections. The project has been supported with Federal Hatch funds.



Figure 10. High-density cherry orchard that is being used to test new cultivars and rootstocks for susceptibility to X-disease and tomato ringspot virus.



Figure 11. Peach trees dying from stem pitting disease caused by tomato ringspot virus.

Tomato Ringspot Virus

Stone fruit plantings were established in 2009 to study susceptibility of *Prunus* germplasm to tomato ringspot virus. Tomato ringspot virus (ToRSV) causes stem pitting in peaches, apricots, and cherries and constriction disease in European plum cultivars on some rootstocks. The virus is endemic in broadleaf weeds (especially dandelion) in southern New England, southeastern New York and the Cumberland-Shenandoah production areas of Pennsylvania, Virginia, and West Virginia. The virus is transmitted from weeds to fruit trees by *Xiphimema* species of nematodes. Trees infected with the virus become unthrifty and often die when orchards are 6 to 10 years old.

The same *Prunus* cultivars and rootstocks that are being evaluated for susceptibility to X-disease are also being evaluated for susceptibility to ToRSV, albeit using separate trees in separate plantings. Test trees were inoculated in June of 2010 by placing two bark patches from a naturally infected 15-year-old Myrobalan rootstock into the rootstock of each test tree. Other trees of each cultivar/rootstock combination are being maintained as controls. External symptoms of ToRSV have been recorded during each of the last two seasons, and all of the inoculated and control trees will be tested using ELISA during the 2013 growing season. As with the X-disease work, Steve Hoying and Mark Fuchs are collaborators on this project. The project has been supported with Federal Hatch funds.

Entomology Program 2011 and 2012

Peter Jentsch (pjj5@cornell.edu), Sr. Extension Associate, Department of Entomology

Studies on Brown Marmorated Stink Bug

Project: Monitoring, Damage Assessment and Program Evaluation for Management of Brown Marmorated Stink Bug *Halyomorpha halys* (BMSB) in the Hudson Valley of New York.

Funding: Hatch; NYS Ag & Mkts; USDA SCRI; ARDP

In the fall of 2010 brown marmorated stink bug caused extensive damage to many crops, including fruit crops, in the mid-Atlantic region. Traditional IPM-based insect pest management programs were ineffective for managing this pest on tree fruit. By summer of 2011, the entomology group at the Hudson Valley Lab had initiated a Citizen Science Project to map the presence of BMSB throughout New York State. Early results showed increased spread of the insect throughout much of the Hudson Valley.

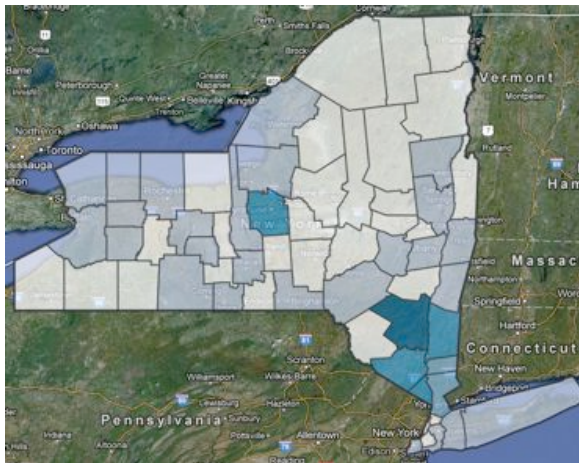


Figure 1. Urban spread of BMSB in NYS; Darker counties indicate higher Citizen Science Project submissions of BMSB specimens.

Beginning in early May of 2011, statewide trapping for the BMSB was initiated at 72 sites in the major growing regions using methyl (E,E,Z)-2,4,6-decatrienolate (MDT), the male-produced pheromone of another pentatomid common in eastern Asia, *Plautia stali* Scott. During the season we were unsuccessful in capturing the BMSB using this lure, with only a single site in Marlboro capturing them in September. However, in 2012 a newly developed lure distributed by USDA proved more effective, capturing the adults as they emerged from overwintering sites. BMSB were captured in traps using the USDA #10 lures well before they were otherwise noted in survey observations.

Field observations included crop monitoring both for live insects and for BMSB damage, as well as surveys for the insect in bordering deciduous host plants and other agricultural commodities such as vegetables (tomato and pepper), sweet corn, and stone fruit. In orchards where economic feeding injury was observed on tree fruit, high intensity light and insecticide treated netting were employed to survey the stink bug complex to determine the proportion of BMSB to the native insect complex.

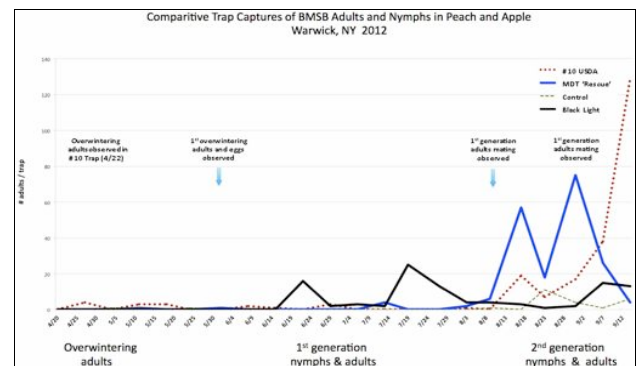


Figure 2. Results from weekly trapping with black light, USDA#10 lure, MDT and untreated controls in Tedders traps, Warwick, NY. 2012.

We employed 24-hour night surveys for rapid population assessment, using sticky Tack Traps applied to high-density polyethylene sheeting and 4-fixture 4000kW halogen lighting to attract and monitor BMSB in organic vegetable systems. During this evaluation, we captured 338 adults over a 48-hour period. This method may allow trap-out of damaging BMSB populations when a non-insecticide management program is needed, especially during preharvest intervals when BMSB is most detrimental and insecticides cannot be applied due to label restrictions.



Figure 3. Tower halogen lights and poly sheeting used to trap BMSB in organic tomatoes.

Project: Assessment of Late Season Damage to Tree Fruit Caused by Brown Marmorated Stink Bug.

Funding: SCRI USDA/ARS

Cooperators: Multi-state project with 54 cooperators.

In 2012 we observed late-season stink bug feeding injury in Hudson Valley orchards. Light traps employed on the 8th of September captured the native green stink bug and the invasive BMSB both inside and along the perimeter of affected orchards. This provided the first record of a stink bug complex involving both native and invasive stink bugs causing economic damage in NY.



Figure 4. Trapping stink bugs in orchards.

A tower light and insecticide-treated netting were employed both along the edge and in the interior of a Red Delicious block to trap BMSB on the night of 8 September. The perimeter placement along the wooded edge produced 30 BMSB and 37 GSB whereas only 3 BMSB and 10 GSB were trapped in the orchard interior. Captures of nymphs and adults from 22 September to late October in Tedders traps using a combination of MDT and the new USDA #10 pheromone lure showed continuing BMSB presence in the interior of the orchard well after Red Delicious harvest.

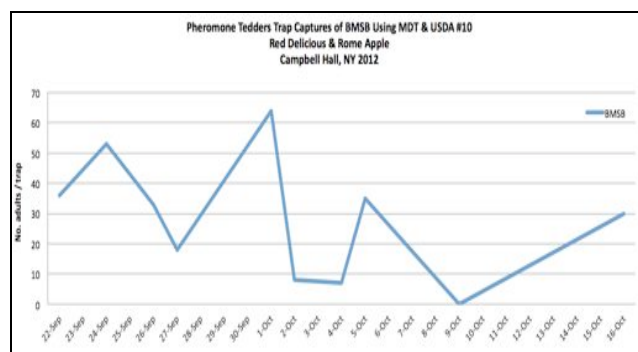


Figure 5. Late-season BMSB captures. Campbell Hall, NY. 2012.

Three late season varieties, Golden Delicious, Red Delicious and Pink Lady, sustained the greatest damage

from stink bug feeding. In our first evaluation of BMSB injury, Golden Delicious harvested on 5 October in Milton, NY, were examined to determine the extent of BMSB injury. One thousand fruit were randomly selected from each of three representative field bins, and the selected fruit were rated for BMSB damage. The samples had 24%, 54% and 68% of fruit with feeding injury for an average of 48.7% fruit loss.



Figure 6. BMSB feeding damage evaluations of field-run Golden Delicious, 5 October, Milton, NY 2012.

In our second evaluation of BMSB fruit injury, field evaluations of 'Pink Lady' from trees flanking BMSB pheromone traps were made on 16 October. The orchard consisted of 5th leaf trees on M.9 rootstocks spaced 3 ft by 11 ft and averaging 9.5 ft in height. Fruit were assessed in 2 center rows and 2 border rows. Beginning along the wooded edge of the block, 100 fruit from 10 trees toward the center of the block were evaluated, thereby providing a total sample of 3600 fruit.

Fruit was considered injured by stink bug if darkened depressions contained one or more feeding sites or 'holes' from the insertion of the insect rostrum or evidence of a 'feeding tube' in conjunction with internal corking, which is symptomatic of pentatomid feeding. Fruit loss to stink bug in this block averaged 21.4%.

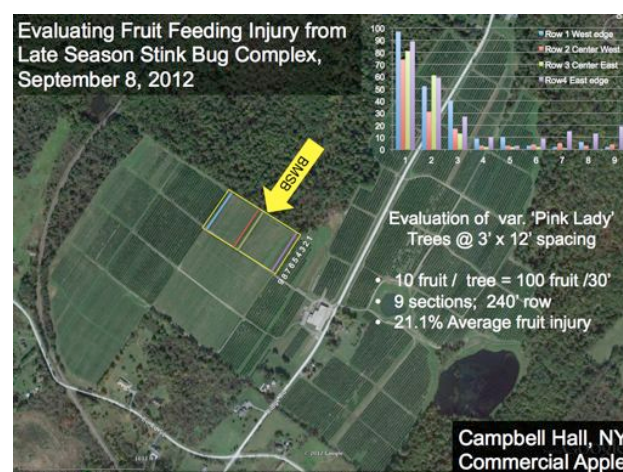


Figure 7. Aerial photo of the farm with the Pink Lady orchard where on-the-tree BMSB damage assessments were conducted in 2012.

In our third evaluation of BMSB fruit injury, pack-out data for Red Delicious fruit was collected at a packing-

house in Walden, NY for fruit packed on 30 October. A total of 100,556 fruit were graded using GeoSort software in a Greefa packing line using iQS (intelligent quality sorter) for external imaging that allowed detection of defects as small as one square mm. From this lot, a total of 31,300 fruit or 31.1% were sorted as damaged by the grader software.

One hundred fruit from each of three representative bins of cull fruit from the grader were further evaluated to determine the extent of BMSB feeding. From these samples, we determined that 97%, 90% and 93% of the fruit had stink bug injury, indicating that 29.1% of the harvested fruit were lost specifically because of stink bug feeding.

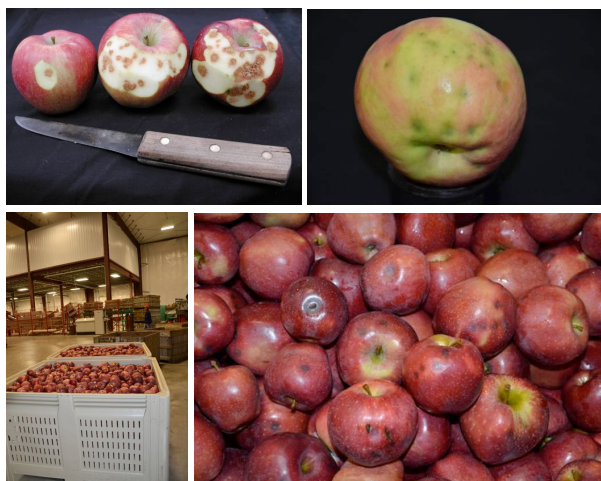


Figure 8. Late season feeding damage to apple (top) and BMSB-damaged fruit in cull bins (below).

Project: Tree Host Survey, Monitoring And Trap Tree Management Strategies For The Invasive Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): (Pentatomidae), Along Borders Of NY Tree Fruit.

Funding: ARDP

The invasive deciduous tree species, *Ailanthus altissima*, is present throughout the state, existing as both male and female trees, and is capable of harboring very high populations of BMSB throughout the growing season.

In 2012, we noted that BMSB completed two generations in the mid-Hudson Valley. The highest numbers of BMSB were found in orchard perimeter surveys where they were frequently observed feeding and developing on the fruiting clusters of female *A. altissima*. In monitored orchards where the BMSB was found to exist on *A. altissima*, it did not migrate into orchards to feed on tree fruit even though it was observed in pheromone and light traps along the orchard perimeter throughout the season. Conversely, on farms where *A. altissima* was not found in

deciduous woodlands or in hedgerows bordering tree fruit, BMSB emerged from the arboreal habitat late in the growing season to move into and feed intensively on tree fruit.

The insecticide Acephate was introduced into *A. altissima* trap trees via either injections or implants shortly after fruit set or at the onset of 2nd generation BMSB. Significant mortality of BMSB adults was observed in laboratory bioassays with BMSB placed on seed and foliage of treated trees. This preliminary study provides evidence to support the concept that *A. altissima* might be used as a trap tree to reduce BMSB damage to agricultural commodities if populations in *A. altissima* can be managed using insecticide injections or implants.



Figure 9. A 50-ft lift is used to collect samples from 'Tree of Heaven' along orchard borders.



Figure 10. Vacuuming canopy cone traps for removal of insect detritus were used to survey BMSB.



Figure 11. Injection of *Ailanthus altissima* and subsequent use of treated foliage and seed for adult BMSB bioassay.

Project: Determining the capacity for Brown Marmorated Stink Bug Voltinism Development in New York State.

Grant: SCRI USDA/ARS

Cooperator: Art Agnello

Insect pests of tree fruit that have multiple generations each season often show increased population densities and cause increasing amounts of injury to crops with each successive generation. It was initially believed that BMSB had only one generation in NY, PA, NJ, MD and DE. This project was conducted to determine the number of generations the insect has in NY.

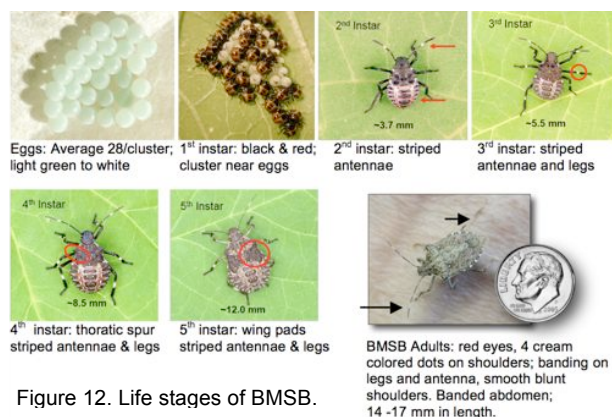


Figure 12. Life stages of BMSB.

Three sets of BMSB eggs were placed into an outdoor screened cage on 4 May (14 hours of light / 10 hours of dark) based on the reported insect response to a 14/10 L/D day-length. The caged samples were monitored to determine dates for egg hatch (10-15th May), larval development sequences (10 May-16 July), first generation adult emergence (23 July), adult egg-laying (13 August) and subsequent nymph to adult development throughout the remainder of the season.

This project confirmed the presence of two generations of BMSB in NYS.

Studies on Pear Psylla and Fabraea Leaf Spot

Project: Use Of Surround WP ® And Horticultural Oil To Manage Pear Psylla & Fabraea Leaf Spot.

Funding: Partnership Grant NOFA NY, 2010-11.

This two-year project incorporated the use of OMRI certified insecticide tools to manage pear psylla and *Fabraea maculata* in a comparison study with conventional management programs. Research plots at the HVL and a 5-acre commercial orchard were employed to evaluate the kaolin clay barrier film insecticide Surround

WP. It was used in a single application during the onset of pear psylla egg laying during the pre-bloom period and a single petal fall application, followed with bi-weekly 1% horticultural oil applications from first cover to the end of the season to manage pear psylla and *Fabraea* leaf spot. Drift reduction and deposition from applications with an airblast sprayer fitted with standard hollow cone nozzles were compared to applications made with air-induction nozzles. Application speeds and dilution rates were evaluated to determine how they affected insecticide efficacy and application efficiency. The OMRI program required 5 applications while the conventional program used 3 applications.

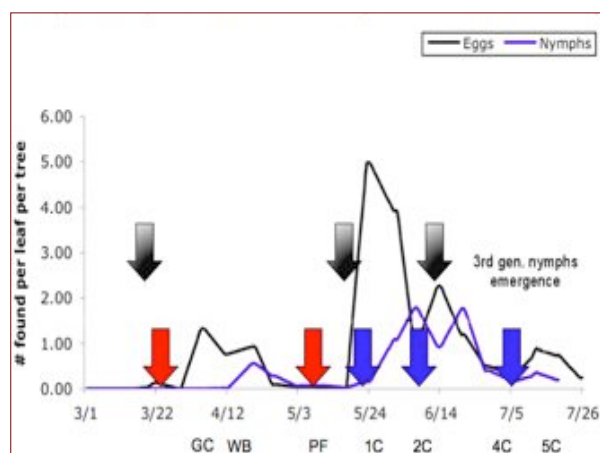


Figure 13. Application schedule for conventional and organic insect pest management: standard conventional applications (black) were compared with applications of OMRI-approved Surround (Red) and 1% oil (blue).

Biweekly foliar assessments and fruit harvest evaluations were made to assess damage from psylla, *Fabraea*, and rust mite in 2011. When compared to the conventional program, the Surround / horticultural oil program was comparable or superior to the conventional program for control of pear psylla.

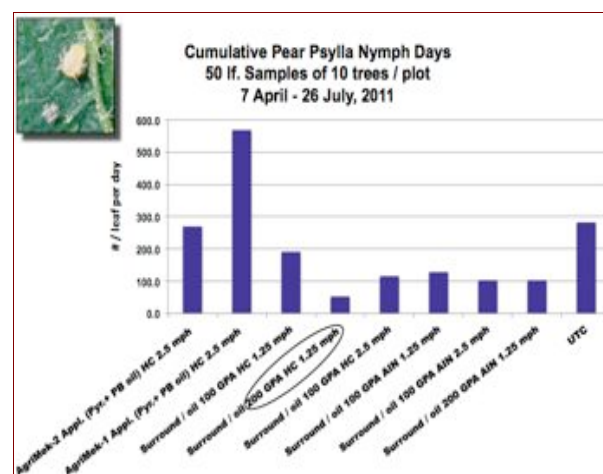


Figure 14. Impact of treatments on pear psylla.

Apple and Pear Efficacy Trials (2011-2012)

Funding: Industry Support from Bayer Crop Science, Dow AgroSciences, E.I. DuPont De Nemours & Co., Nichino America Inc. Syngenta Crop Protection, United Phosphorus Inc., New York State Apple Research and Development Program (ARDP).

Forty treatments involving season-long applications of experimental and registered insecticides were evaluated in replicated plots of apple, pear and small fruit varieties in 2012. Applications were made either with airblast sprayers or via handguns. Foliar and fruit feeding insect presence and injury were assessed throughout the season with 1600 fruit assayed at harvest. Yearly reports were submitted to industry representatives. Those reports include statistically analyzed field data demonstrating degrees of efficacy relative to commercial standards and untreated control plots.



Figure 12. Handgun application of test products to apples.

Contributions to Scaffolds Fruit Journal

Cooperators: Art Agnello, Mike Fargione

Beginning in March, insect pest monitoring data from the Hudson Valley Laboratory research orchard is submitted weekly for publication in *Scaffolds Fruit Journal*. Based on visual observations of foliage and fruit plus pheromone trapping in combination with degree-day predictive modeling, we submit timely articles on insect occurrence and anticipated pest events, including pest management recommendations based on labeled insecticide use.

Sweet Corn Insect Pest Monitoring, Reporting And Recommendations.

Cooperators: Teresa Rusinek, Maire Ullrich, Abby Seaman

Weekly results from pheromone-baited traps and from scouting for sweet corn pests are collected and posted to a

web based regional trapping database. Weekly 'Pest Alerts' that include insect pest presence, PESTWATCH update link, and action recommendations are delivered to regional sweet corn producers via email list serve.



Figure 13. Pestwatch map showing reports for corn ear worm.

Integrated Management Of Spotted Wing Drosophila On Small Fruit And Grapes

Cooperators: Greg Loeb, Laura McDermott, Mike Fargione

Spotted wing drosophila (SWD), *Drosophila suzukii*, were first observed in NY in late August of 2011. We monitored SWD in 10 locations throughout the lower to mid-Hudson Valley in 2012 using traps baited with apple cider vinegar. The first SWD trap captures were found in Warwick, NY on 3 August followed by Tivoli on 6 August and Highland on 23 August. Blackberries harvested on a commercial farm in Marlboro on 31 July showed 100% ovipositional injury and we confirmed SWD adult emergence. By late August, many blackberry and raspberry growers had abandoned their berry patches because attempts to control the SWD were ineffective using commercial insecticide materials, rates and timings.

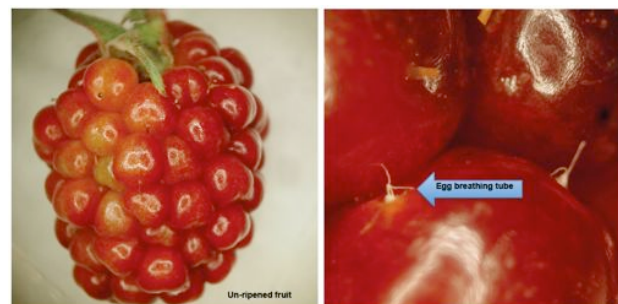


Figure 14. Immature blackberry infested with SWD eggs. 2012

Growers who harvested berries daily and applied insecticides at 5-7 day intervals were able to keep infestations levels down to 18-20%. During weeks in which applications could not be made, levels of injury increased to over 50%.

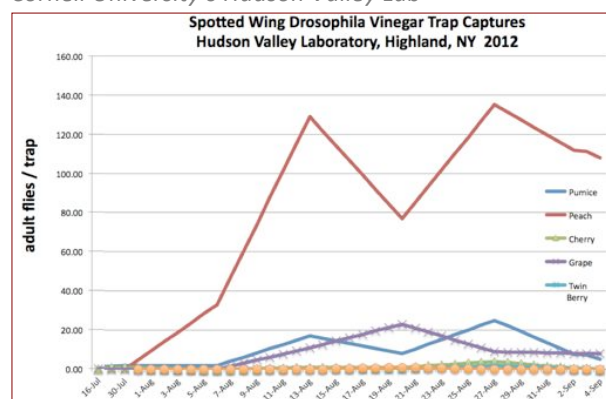


Figure 15. Highest SWD trap captures were observed in peach, but larva of SWD were not found infesting sound peach in 2012.

On-farm raspberry insecticide efficacy trials for SWD management showed replicated field trials of cyazypyr, spinetoram and bifenthrin at a 7-day schedule were ineffective at reducing damage to below 30%.

Treatment	oz./A	% of raspberries with drosophila breathing tube observed			
		30 Aug.	5 Sept.	20 Sept.	24 Sept.
1. Exirel + Li700	20.5 32.0	58.3 ab	96.7 c	56.7 a	30.0 a
2. Bifenthrin + Li700	16.0 32.0	81.7 b	86.7 bc	60.0 a	31.7 a
3. Delegate + Li700	6.0 32.0	48.3 a	66.7 a	73.3 b	30.0 a
4. Untreated	-	70.0 ab	100c	86.7 b	58.3 b
P value for transformed data		0.083	0.003	0.001	0.006

* Evaluation made on 30 August, 5, 20, 24 September on Caroline cultivar. Percent data were transformed using $\log_{10}(x+1)$ conducted prior to analysis. Untransformed data are presented in each table. Mean separation by Fishers Protected LSD ($P \leq 0.05$). Treatment means followed by the same letter are not significantly different. All treatments received Elevate 50WDG to control botrytis fruit rot.

Figure 16. Control of SWD achieved with several different insecticides.

Berry treatments were made to determine the effects temperature and oil have on egg hatch and larval survival. Two submersion treatments were applied to berries of Caroline, a red fall-bearing raspberry, on 24 September, using a split plot design with four treatments replicated five times. We treated berries by immersing them in 1% vegetable oil (MSO) for 1, 5 or 10 minutes. Berries were then dried and exposed to 1.1 °C or 2.2 °C for 48 or 72 hours and were compared to berries held at 22.2 °C, (room temperature) for 72 hours. The berries given 48-hour exposures were then held at room temperature for the remaining 72 hour period. Treatments were compared to untreated controls (UTC) held at room temperature with and without oil treatments. After 72 hours berries were teased apart to tally larval presence.

Reduced larval numbers were observed in both 48 and 72-hour cold temperature treatments. High numbers of live larvae were found in all control samples. The lowest egg hatch was observed in berries held at room temperature, treated with 1% oil for 5 or 10 minutes. The data suggests 1% oil applications alone may reduce egg viability if used in field applications prior to harvest.

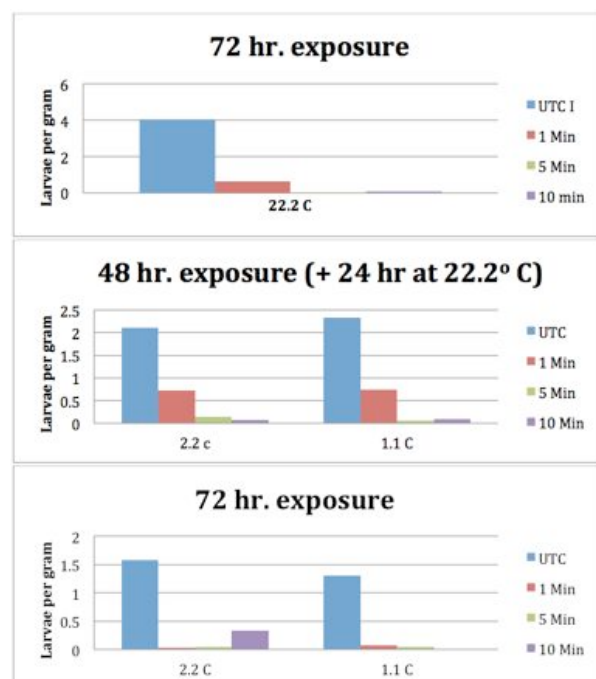


Figure 17. All berries treated with 1% oil (red, green & purple bars) showed nearly 100% larval mortality.

Invasive Insect Trapping 2011-2012

Funding: NYS Ag. & Markets (CAPS)

Cooperators: Juliet Carroll, NYS IPM

Weekly trapping for invasive pome fruit, grape and small fruit insects was conducted in Hudson Valley orchards including Warwick and Tivoli, NY. Insects of interest included spotted wing drosophila (SWD), brown marmorated stink bug (BMSB), summer fruit tortrix (SFT), false codling moth, light brown apple moth (LBAM), and Asian gypsy moth (AGM).

Traps baited with apple cider that were used to capture SWD, *Drosophila suzukii* (Matsumura), also captured 10 flies of the species *Zaprionus indianus* Gupta, the fig fruit fly, in Milton, NY on 4 September, 2012. The fig fruit fly is native to tropical Africa, but it has been found in South America, including Brazil, where it was recorded for the first time in the Western Hemisphere in 1999. The first U.S. detection occurred in a survey of fruit fly hosts in Central Florida on 26 July, 2005. Detections of the fig fruit fly were recorded in Virginia, Mississippi and Connecticut in 2012.



Figure 18. *Zaprionus indianus* Gupta found in Milton, NY on 4 September, 2012.

Extension: Tree Fruit Insect Pest Monitoring, Modeling & Recommendations.

Many of the major tree fruit insect pests can be monitored using pheromone lures, various attractants and traps, or scouting procedures. Tree phenology and temperature-based degree-day models have been incorporated into models available on the NEWA weather network, and these models are useful for tracking regional insect development. The expected time of appearance for the most susceptible and/or damaging life stage of the insect can be predicted with these models, and the pest can then be targeted with effective and species-specific reduced risk insecticides. However, definitive action recommendations must constantly be adjusted to accommodate new insecticide chemistries, current insect developmental stages, weather factors that impact insecticide efficacy, and when applicable, insecticide resistance management strategies. With these factors in mind, the recommendations that we send out to growers through Mike Fargione's regional extension program and *Scaffolds Fruit Journal* are primarily based on predictive modeling at early insect emergence with less emphasis on economic thresholds that rely on feeding injury levels and insect presence.

Over the past few years, a complex of invasive insect pests have moved into the region for which monitoring tools and controls have yet to be developed. The two insects that dominate the agricultural stage in the Mid-Hudson Valley are the brown marmorated stink bug (BMSB), *Halyomorpha halys*, and the spotted wing drosophila (SWD), *Drosophila suzukii*. In 2012 both pests caused severe economic losses to fruit growers in New York State. As illustrated by their repeated mention within our preceding list of projects, these insects have cast a long shadow over regional fruit production, requiring an intense research focus to answer basic questions of insect biology, effective monitoring techniques, insecticide efficacy, and management strategies.

'Invasive Insect Pest Alerts' sent to regional growers during the latter part of the 2012 season informed growers of the pest presence in the region and injury levels observed in the field. Despite having an effective extension communication mechanism to keep our producer audience informed of the latest developments, we observed significant losses in tree fruit, in part due to inadequate tools and protocols for managing these insects.

Monitoring for both brown marmorated stink bug and spotted wing drosophila over the past three years has been hampered by ineffective trapping and monitoring tools. To best monitor BMSB, we resorted to using high intensity halogen lighting to assess the stink bug complex and population density on three farms where severe injury was occurring near harvest. From these studies we learned that BMSB damage does not appear for nearly three weeks after the onset of feeding, making damage thresholds as determined via scouting ineffective for

assessing the progress of economic losses.

Secondly, we found that this elusive insect is more active during the evening and otherwise resides predominately in the tops of trees. These habits make the insect difficult to observe in the field during daytime scouting. Consequently, even the best scouts found very few BMSB in the field until after high damage levels began to surface.

In 2013 we plan to evaluate a variety of monitoring and trapping methods on commercial fruit farms where we will be experimenting with

border row, alternate row and whole orchard applications of various insecticide programs. The new lures that effectively attract the BMSB have not proven useful for timing pest management applications because lures can attract the insects from wooded habitat before they are actually present in the orchard. It's likely that the use of a passive trap, such as insecticide treated netting placed along the wooded edge in border rows of tree fruit, will provide us with a BMSB monitoring tool better suited for determining when the insect has actually moved into the orchard.

The spotted wing drosophila is also an elusive pest that is very difficult to capture at low population levels, and it often causes significant injury to cherry, raspberry, blackberry and blueberry even before the first trap captures are recorded. In 2012 we trapped this insect on six sites throughout the Hudson Valley and posted trap and fruit damage levels on the Hudson Valley Tree Fruit website for on-demand viewing. We found SWD had infested fruit before adult flies were captured in traps at 20% of the monitored sites, and fruit infestation levels above 40% were observed at the time of the first adult captures in traps baited with apple cider vinegar.

Results from field trials in 2012 indicate that the best insecticides labeled for SWD (including bifenthrin, lambda-cyhalothrin, spinetoram, spinosad, malathion, fenpropathrin) had to be applied on a 3-4 day spray interval to maintain effective control. In 2013 we will continue to monitor orchards for SWD in the Hudson Valley with emphasis on sweet cherry. Since we did not have a sweet cherry crop in 2012, we don't know what level of damage might occur with cherries in 2013. Growers will be alerted of first SWD captures and percent injury of fruit as the season progresses using CCE List Serve email.



Figure 19. Entomologist Peter Jentsch collects stink bugs from the exterior of the garage at the Hudson Valley Lab in autumn of 2012.

2012 Extension Activity Report for Cornell Cooperative Extension (CCE) Educators housed at the Hudson Valley Laboratory

Michael J. Fargione (mjf22@cornell.edu), Eastern NY Commercial Horticulture Program, CCE Ulster County
James M. O'Connell (jmo98@cornell.edu), Eastern NY Commercial Horticulture Program, CCE Ulster County
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Justin K. O'Dea (jko32@cornell.edu), CCE Ulster County

Cornell Cooperative Extension of Ulster County (CCE-Ulster) expanded its agricultural educator staffing at the Hudson Valley Lab during 2012. Educators responsible for organic fruit and vegetable production (Cook CCE-Ulster), berry and grape production (O'Connell), and vegetable production (O'Dea) moved into offices at the Hudson Valley Lab. Previously, only the tree fruit educator (Fargione) was housed at the lab.

Another new development involved the formation of the Eastern New York Commercial Horticulture Program, which was established January 2, 2013 to serve the educational needs of commercial growers of horticultural crops in eastern NY. Participating counties included Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Montgomery, Orange, Otsego, Rensselaer, Saratoga, Schenectady, Schoharie, Sullivan, Ulster, Warren, and Washington. Team members included county educators and area educators assembled from those that previously served growers in this area. Plans are to hire 2-3 more educators in the future. Steve Hoying serves as the Team Leader and department liaison for specialists serving tree fruit, small fruit and grapes for this program. Mike Fargione and Kevin Iungerman are tree fruit educators on the ENY-Hort team. Jim O'Connell has assumed a half-time position with ENY-Hort, with responsibilities for covering grapes and small fruit, while the other half of his appointment remains with CCE-Ulster.

Grower contacts:

Direct Contacts – CCE-Ulster ag staff housed at the HV Lab recorded over 1,500 direct contacts with individual growers, research and extension staff, elected officials, agency, non-profit and media staff, and the general public during 2012. The expanded

staffing for CCE-Ulster enabled the program to reach out to more growers and provide increasing support for pest, weed, soil, and fertility management in vegetable and fruit production systems. Programming to support field crops and select agroforestry systems, including maple syrup and forest-grown mushroom production, were begun. Relationships were initiated with other ag-related organizations that previously had limited association with Cornell and CCE-Ulster. These included local groups involved in organic agriculture such as the Northeast Organic Farming Association, Glynnwood, and Mid-Hudson CRAFT Program.

Farm Visits - CCE-Ulster HV Lab staff conducted more than 200 visits in 2012. Fargione continued to provide on-farm visits for fruit growers in 4 regional counties as part of the Hudson Valley Regional Fruit program. These visits, made alone or in conjunction with Cornell faculty, provided fruit growers with hands-on training in pest scouting, insect and disease



Figure 12. CCE Educator Mike Fargione examines fruit set in a Hudson Valley orchard before making fruit thinning recommendations.

control practices and horticultural techniques. With expanded staff capacity, new CCE-Ulster educators increased field activities on grower farms. Cook identified 26 organic/alternative systems (Certified Naturally Grown, Organic Farmer's Pledge) in Ulster County and visited farms to establish relationships with growers, identify diseases/pests and develop management strategies. O'Connell educated berry growers on how to collect soil and tissue samples for nutrient analysis, and scouted for pests and diseases of small fruits and grapes including spotted wing *Drosophila* (*Drosophila suzukii*), an important new invasive pest of fruits. O'Dea visits focused on pest and disease identification/management consultation, agronomy, and increasing support for weed, soil, and fertility management in vegetable and field crop production systems; O'Dea also helped with several agricultural land use assessments, and made first time visits with area maple producers.

Grower Alert E-mail Messages – 107 messages were prepared and delivered by Cook, O'Connell and Fargione to 319 commercial fruit growers and extension/research staff in 5 northeast states. Messages were prepared with input from Cornell faculty including A. Agnello, S. Hoying, P. Jentsch,

T. Robinson, D. Rosenberger and C. Watkins. During the growing season, these messages were delivered 2-6 times per week, and kept growers informed of pest management, horticulture, harvest, storage and other production issues at critical times to enhance their decision-making capabilities. Messages often included web links to additional resources such as web sites, photographs, integrated pest management data, scouting summaries and video clips produced in collaboration with Cornell staff.

Vegetable and Small Fruit Newsletter – A new weekly newsletter was created and 20 issues were distributed to 210 vegetable and berry growers in the Hudson Valley region during the growing season. The newsletter provided horticultural, nutritional and pest management recommendations based on field scouting and IPM trapping efforts. Cook, O'Connell, O'Dea, T. Rusinek and M. Ullrich produced the newsletter, with collaboration from the CCE Capitol District Vegetable and Small Fruit Team.

Apple Harvest Maturity Evaluation Program – Fargione lead this research and extension program that helped growers optimize the timing of apple and pear harvests to improve fruit quality and storability. From August through October, 279 fruit samples were collected from grower blocks within the Hudson Valley Regional Fruit Program area. Samples were evaluated in consultation with S. Hoying, P. Jentsch, D. Rosenberger and C. Watkins, and 9 reports on fruit maturity and optimal harvest timing were distributed via e-mail to 319 growers, extension staff and research faculty.

Berry Nutrient Management Project – Cook and O'Connell participated in a Nutrient Management Project to educate berry growers on soil nutrient health in collaboration with Cornell faculty (C. Heidenreich and M. Pritts) and CCE's L. McDermott. Cook and O'Connell held a training workshop at the HV Lab open to all growers, and provided on-farm assistance with soil sampling and test result interpretation for 2 conventional and 2 organic producers.

Training Program for New/Young Fruit Growers Fargione helped the Hudson Valley chapter of the "Future NY Fruit Growers" continue to implement training programs for inexperienced fruit growers.



Figure 2. Extension educator Emily Cook examines organically grown sweet cherries on a local farm.

This project was started in 2010 in collaboration with CCE Lake Ontario Fruit Team to “kick-start” educational training for the next generation of growers who will someday take over the management of NY’s fruit industries. In 2012, grower participants took the lead in organizing training meetings. CCE helped facilitate 2 of these meetings held on January 9 (apple storage and packing facilities) and February 22 (food safety practices, record-keeping, self and third-party audits).

Website Resources– Fargione is webmaster of the Hudson Valley Regional Fruit Program site at: <http://hudsonvf.cce.cornell.edu/>. It provides on-demand access to resources for commercial growers and others interested in Hudson Valley fruit production. Additions in 2011 and 2012 included a revamped framework allowing posting of additional educational materials, and additional resources on invasive pests for “Brown Marmorated Stink Bug” (<http://hudsonvf.cce.cornell.edu/bmsb1.html>) and “Spotted wing Drosophila” (<http://hudsonvf.cce.cornell.edu/SWD1.html>) with updated NYS distribution maps. The Regional Program website received 8,857 visits from 6,961 different individuals during 2012. O’Dea has developed a CCE-Ulster County Ag team website that is currently in beta testing and is expected to be launched in 2013.

Audio-enhanced Power Point Flash Movies: With funding provided by the NE IPM Program, Fargione prepared 22 Flash movies during 2011-2012 using audio recordings and PowerPoint presentations captured at meetings such as our annual Fruit Growers’ Schools. These movies were placed on our Regional Fruit Program website (<http://hudsonvf.cce.cornell.edu/resources.html>) in an accessible format, giving growers the timely access needed when making critical growing season spray decisions. The movies provide an opportunity for increased understanding and adoption of critical IPM practices for growers with different learning styles, for those who want to review information months after they heard it at the trainings, and for those who could not attend the original meetings.

Grower Assistance with Grant Proposals: Cook assisted 2 organic growers in applying for SARE farmer grants.

Grower meetings:

Empire State Fruit & Vegetable Expo – Fargione organized and facilitated one session on Tree Fruit at this statewide meeting held January 26-27, 2012 in Syracuse, NY. There were approximately 100 growers in attendance who learned about enhancing tree fruit quality.

The Hudson Valley Commercial Fruit Growers’ School – This was a 4-day event held February 14-17, 2012 in Kingston, NY. The program included 34 topics and focused on tree fruit, berry and grape commodities. Fargione organized and facilitated the 2 days devoted to tree fruit production, and the 35-vendor trade show. During the 4-day event, more than 300 attendees learned about production, marketing, cultivar development and pest management strategies.

NY State Dept. of Labor Meeting on Changes in the Rural Employment Labor & Rural Outreach Worker Program. This meeting was held on February 22, 2012 at the HV Lab and was attended by individuals interested in the H-2A guest-worker program. Representatives from the Division of Immigrant Affairs and Policy were on hand to answer questions about program changes.

Improving and Sustaining the NEWA System – e-NEWA Alerts - On February 28, 2012, 6 attendees participated in a workshop held by J. Carroll and M. Fargione at the HV Lab to learn about new e-NEWA daily email alert messages for plum curculio and apple scab models. Several agreed to serve as field testers for beta versions of these products during 2012.

Apple Horticultural Training Workshop for Spanish-speaking Farm Workers – This event was held March 2, 2012 at the HV Lab, Highland. T. Robinson (Cornell Geneva) and M. Miranda Sazo (Cornell LOFT) trained 35 Spanish-speaking workers in their native language.

On-Farm Apple Pruning Demonstration Workshops – Workshops were held February 6, 2012 at Crist Bros. Orchard in Plattekill, NY and Fix Bros. Orchard in Hudson, NY. These trainings, in collaboration with S. Hoying and S. McKay, demonstrated high-density pruning techniques to more than 100 farm owners, managers and workers in both English and Spanish languages. On March

2, a demonstration of the use of a motorized pruning platform was conducted at the Crist Bros. farm in Milton, NY in collaboration with T. Robinson and M. Miranda Sazo.

Apple In-Depth Fruit Workshop: Managing Fire Blight and Apple Scab under Difficult Conditions – Pathogen Resistance and Conducive Weather –

This in-depth workshop was held March 14 & 15, 2012 at NYSAES, Geneva, NY and by teleconference at the HV Lab. Six attendees learned about responding to streptomycin resistant fire blight and managing apple scab in a world with fungicide resistance.

Special Permit Training Sessions – Three trainings were held March 20 (NYS DEC Region 3 Office, New Paltz, NY), March 21 (CCE Columbia Office, Hudson, NY) and April 16, (Cornell HV Lab, Highland, NY) to help farm operators and farm workers comply with DEC requirements for on-site supervision of workers handling and making applications of restricted use pesticides. Trainings were conducted by Fargione and McKay in English and Spanish and helped 25 farm operations and 140 farm workers comply with DEC pesticide application requirements while promoting the safe handling and application of pesticides.

Petal Fall and Cropload Management Field Meetings – These annual field meetings were held on April 3 in Hudson, NY (Fix Bros. Orchard) and Highland, NY (Cornell HV Lab). Insect, disease, horticultural and cropload recommendations were provided to 50 growers during this earliest spring season in 50 years by collaborators M. Fargione, S. Hoying, P. Jentsch, T. Robinson and D. Rosenberger.

Spotted wing *Drosophila* Workshops – Two workshops were organized to update growers on this new invasive pest. One was held on 8/15 at the HV Lab while the second took place on 8/21 at the CCE Rensselaer County office in Troy, NY. Both meetings provided information to growers about the biology of this pest, its origin and the crops affected. Collaborators included P. Jentsch, Cook, O'Connell and L. McDermott.

***Phytophthora* Webinars** - The Hudson Valley Lab served as a host site for viewing 3 webinars by Cornell faculty Drs. C. Smart, M. Mazourek, and M.

McGrath on identification, management and current research efforts on the crop pathogen *Phytophthora capsici* in vegetable production systems.

Seed Summit Workshop – Cook, O'Dea and T. Rusinek held this workshop in collaboration with the Hudson Valley Seed Library on 12/10/12 at the HV Lab. Varietal information, breeding for late blight and *Phytophthora* resistance, and seed-borne disease management information was presented by Cook, O'Dea, and Rusinek of CCE-Ulster, and Ken Greene of the Hudson Valley Seed Library. Hot-water seed sterilization treatment was demonstrated and local efforts in regional seed production were discussed.

Hudson Valley Harvest Festival – CCE-Ulster and Family of Woodstock orchestrated a family festival held September 22-23 to promote and celebrate agriculture in the Hudson Valley. CCE-Ulster educators Cook, Colon, Fargione, O'Connell, O'Dea and Rusinek managed a farm stand with produce from area growers and interacted with representatives of the 1,000+ festival attendees.

Cornell Organic Program Working Team Meeting, Dec. 12, 2012 - The HV Lab served as a host location for growers, state Ag and Markets reps, and extension personnel to participate in the web-based PWT meeting to learn about current organic research efforts and to prioritize research needs.



Figure 3. Extension Educators Justin O'Dea and Jim O'Connell man the CCE fruit and vegetable stand at the Farmers Market during the first annual Hudson Valley Harvest Festival.

On-Farm Research Projects

Apple Rootstock Demonstration Trials. Two field trial/demonstration plantings are being evaluated with collaboration between Fargione, S. Hoying, T. Robinson and Hudson Valley grower cooperators. The planting at Crist Bros. Orchards (Milton, NY) investigates the field efficiency of Geneva apple rootstocks against other industry rootstock standards. The planting at Minard Farms (Clintondale, NY) is part of the NC140 rootstock trial and superimposes fumigation treatments to look at replant disease impacts. These trials have helped determine differences in rootstock suitability for NY orchards and have provided field sites for grower tours where rootstock impacts on tree growth and fruit production were visible.

Apple High-density Planting System Trials. Two field trial/demonstration plantings are being evaluated with collaboration between Fargione, S. Hoying, T. Robinson and grower cooperators. The planting at Dressel Farms (New Paltz, NY) has provided data on orchard productivity and profitability of the Tall Spindle planting system compared with 3 other systems. The planting at Yonder Farms (Hudson, NY) has provided orchard performance data for several planting systems for use with 'Red Delicious'. Both sites have been destinations for several grower tours where planting systems and tree management were demonstrated.

Evaluation of New Cornell-Geneva Apple Cultivars – Fargione participated in demonstration plantings of several apple selections from S. Brown's Cornell breeding program previously established in the Hudson Valley in collaboration with S. Brown, K. Maloney and S. Hoying. Grower cooperators on this project include Yonder Farms (Hudson, NY), Fix Bros Orchards (Hudson, NY), Mead Orchards (Tivoli, NY), W. G. Minard & Sons (Clintondale, NY), Breezy Hill Orchards (Stone Ridge, NY), Prospect Hill Orchard (Gardiner, NY), Crist Bros. Orchards (Milton, NY), and Ochs Orchards (Warwick, NY). Efforts in 2012 included evaluation of fruit maturity and quality, collection of samples from the first 2 selections scheduled for release ("NY1" and "NY2") for evaluations at harvest and after regular and controlled atmosphere storage, and taste-test evaluations of new Cornell selections (10/14/12 at Prospect Hill U-Pick) and harvest timing taste evaluations (10/18/12 at CCE Dutchess and 11/19/12 at CCE Albany). Maturity

evaluations and taste tests will assist growers in understanding when to best harvest these selections for optimal profitability.

Web-based Extension Outreach on Apple Tree Irrigation Needs – Fargione collaborated with T. Robinson, A. Lakso and Art DeGaetano (NE Climate Center) to continue efforts to better track and disseminate apple tree water needs. A web-based model was developed and is being tested to help calculate irrigation needs for individual orchards.

Brown Marmorated Stink Bug (*Halyomorpha halys*) Research and Outreach – Efforts continue to investigate current and future distribution and depredations by the invasive Brown Marmorated Stink Bug in eastern NY. Web resources (<http://hudsonvf.cce.cornell.edu/bmsb1.html>) with a citizen science-based insect distribution map were maintained by Fargione. Field monitoring and damage assessments were conducted in fruit and vegetables with collaboration between Cook, Fargione, O'Connell, P. Jentsch and many others in a multi-state SCRI project.

Spotted Wing Drosophila Research – CCE-Ulster and HVL staff joined collaborative efforts in 2012 to document the distribution, impacts and control of a new invasive pest, the Spotted wing Drosophila (*Drosophila suzukii*) (SWD). This work was done with P. Jentsch and other Cornell faculty and CCE ag specialists across NY. CCE-Ulster HVL field efforts were conducted in Ulster County, NY. Cook monitored SWD traps and fruit

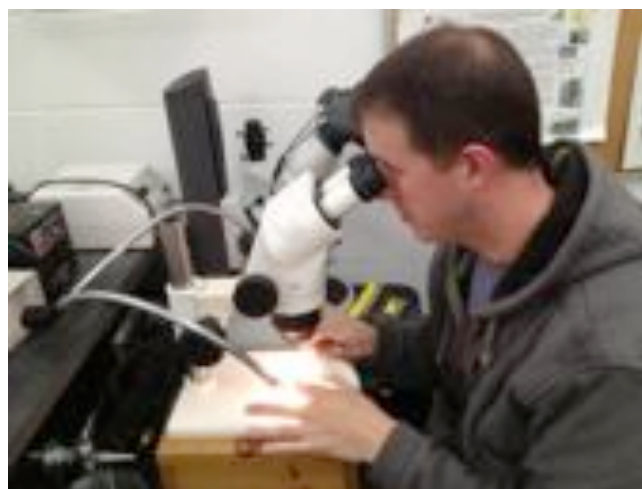


Figure 4. Jim O'Connell counts SWD from a cider-vinegar trap.

infestations in 2 organic raspberry operations, and collaborated with the HV Lab Entomology Dept. in lab trials of the use of insect net exclusion. O'Connell monitored SWD trapping and fruit infestations in berries and grapes on multiple farms. In addition, O'Connell assisted the HV Lab Entomology Dept. with a field trial evaluating possible treatments to reduce SWD damage in raspberries. Fargione developed and published weekly distribution maps that showed the spread of captures and fruit losses across NY State (<http://hudsonvf.cce.cornell.edu/SWD1.html>).

Hudson Valley Small Grains Initiative - O'Dea began assessing the feasibility of small grain production in the Hudson Valley Region, following inquiries and encouragement from Greenmarkets-NYC and several local growers/stakeholders. As part of this initiative, O'Dea recruited Cornell small grains breeder Dr. Mark Sorrells to establish a regional small grains trial in the Hudson Valley, as part of the USDA-OREI research project, *Value-added grains for local and regional food systems*. An on-farm wheat and barley variety trial was planted in September in Dutchess County, NY. Ongoing research efforts in 2012 include literature reviews, two field days on small grains, and visits to two different small grain trials in the Champlain Valley region, and correspondence with Greenmarkets-NYC and a local milling operation.

Overwintering Lepidoptera in Reduced Tillage Sweet Corn Production - Rusinek, O'Dea and Cook conducted a field trial to determine if Lepidoptera pest pressure increases could be expected in sweet corn following adoption of reduced tillage practices. This project was funded through NE SARE.

Development of Disease Management, Fertility, and Weed Control Best Practices for Northeast Garlic Production - Cook, O'Dea and Rusinek collaborated with C. Stewart of the Capitol District Vegetable Program on a NE SARE-funded on-farm trial aimed at improving select practices to enhance northeastern garlic production. The efforts in 2012 assessed post-harvest garlic treatments.

Other IPM Monitoring & Data Collection - Cook monitored tree fruit pests on 2 Ulster organic apple farms and results from these activities, along with control recommendations, were distributed through

grower alert messages. Fargione monitored tree fruit and berry pests in Dutchess and Columbia Counties, and results and control recommendations were shared with regional growers in timely grower alert messages. O'Dea monitored Lepidoptera pests in sweet corn throughout the 2012 growing season. Weekly data reports were shared with growers in a weekly newsletter, the resident entomologist at the Hudson Valley Lab, and data were uploaded to Penn State's sweet corn PestWatch website (http://www.pestwatch.psu.edu/sweet_corn.htm) for regional collaborative online IPM monitoring and analysis.

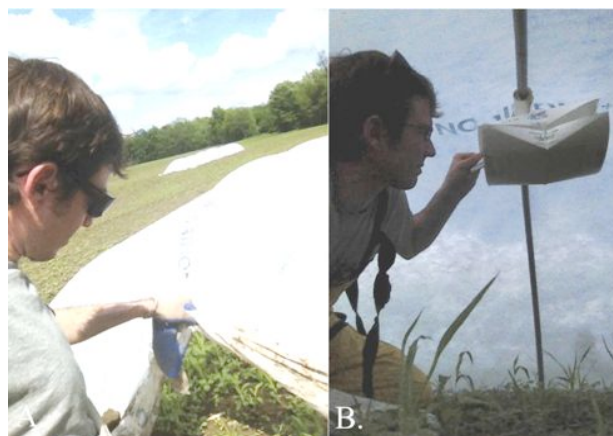


Figure 13. Left: CCE-Ulster Vegetable Educator Justin O'Dea prepares to enter a low tunnel used in a NE SARE-funded research project in sweet corn fields. Right: Checking pheromone wing-traps for Lepidoptera pests inside the tunnel.

Publications from Scientists at the Hudson Valley Lab 2011-2012

Journal Articles

- Autio, W., T. Robinson, B. Black, T. Bradshaw, J. Cline, R. Crassweller, C. Embree, E. Hoover, **S. Hoying**, K. Iungerman, R. Johnson, G. Lang, M. Parker, G. Reighard, J. Schupp, M. Stasiak, M. Warmund, and D. Wolfe. 2011. Performance of Fuji and McIntosh apple trees after 10 years as affected by several dwarf rootstocks in the 1999 NC-140 Apple Rootstock Trial. *J. Amer. Pomol. Soc.* 65(2):2-20.
- Autio, W.R., Robinson, T.L., Bradshaw, T., Cline, J.A., Crassweller, R.M., Embree, C.G., Hoover, E.E., **Hoying, S.A.**, Iungerman, K.A., Johnson, R.S., Lang, G., Parker, M.L., Perry, R.L., Reighard, G.L., Schupp, J.R., Stasiak, M., Warmund, M., Wolfe, D. 2011. Performance of Fuji and McIntosh Apple Trees after 10 Years as Affected by Several Dwarf Rootstocks – Final Report of the 1999 NC-140 Dwarf Apple Rootstock Trial. *Compact Fruit Tree* 44(2):18-21.
- Cooley, D. R., **Rosenberger, D. A.**, Gleason, M. L., Koehler, G., Cox, K., Clements, J. M., Sutton, T. B., Madeiras, A., and Hartman, J. R. 2011. Variability among forecast models for the apple sooty blotch/flyspeck disease complex. *Plant Dis.* 95:1179-1186.
- Lang, G.A., Robinson, T., Einhorn, T., Embree, C., Grant, J., Ingels, C., Neilsen, G., Pokharel, R., Hirst, P., Kushad, M., **Hoying, S.**, Raesko, J., and Parra-Quezada, R. 2011. Establishment of 12 Regional Pedestrian Cherry Orchard Systems Trials – 2010 Progress Report. *Compact Fruit Tree* 44(3):5-6.
- Robinson, T., Fazio, G., Aldwinckle, H., **Hoying, S.** 2011. Intermediate Stage Evaluation of the Cornell-Geneva Apple Rootstocks and Other Promising Apple rootstocks. *Compact Fruit Tree* 44(2):10-11.
- Robinson, T., Fazio, G., **Hoying, S.**, Sazo M. M. and Iungerman, K. 2011. Geneva® rootstocks for weak growing scion cultivars like ‘Honeycrisp’. *NY Fruit Quarterly* 19(2):10-16.
- Robinson, T., **Hoying, S.**, and Fazio G. 2011. Performance of Geneva® rootstocks in on-farm trials in New York State. *Acta Hort.* 903:249-255.
- Robinson, T., **Hoying, S.**, and Reginato, G. 2011. “The Tall Spindle planting system: Principles and performance”. *Acta Hort.* 903:571-579.
- Robinson, T., **Hoying, S.**, Reginato, G. and Kviklys, D. 2012. Fruit Size of High Density Peaches is Smaller than Low Density Systems. *Acta Hort. (ISHS)* 962:425-432
- Robinson, T.L., Lakso, A.N. and **Hoying, S.A.** 2012. Advances in Predicting Chemical Thinner Response of Apple using a MALUSIM Carbon Balance Model.” *Acta Hort. (ISHS)* 932:223-229.

Abstracts: Presentations at Scientific Meetings

- Beckerman, J.L., Sundin, G.W., and Rosenberger, D.A. 2011. How IPM contributed to the current fungicide resistance crisis in apple scab management. *Phytopathology* 101 (No. 6, supplement): S213. (Abstr.)
- Rosenberger, D.A., Watkins, C.B., Nock, J.F., Miranda Sazo, M.R., Kahlke, C.J., and Fargione, M.J. 2011. Non-target effects of glyphosate on apples. *Proc. Northeastern Division APS Mtg, Oct 2010, Phytopathology* 101(6): S262. (Abstr.)
- Carroll J.E., Burr T.J., Robinson, T.L., Hoying, S.A. and Cox, K.D. 2011. Evaluation of pruning techniques and bactericides for managing bacterial canker of sweet cherry APS Annual Meeting, Honolulu, HI, August 6-11.

Book contributions (short articles)

- Rosenberger, D.A. and Hickey, K.D. 2013. Calyx-End Rot. *In "Compendium of Apple and Pear Pests"*, T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].
- Rosenberger, D.A. and Hickey, K.D. 2013. Nectria Twig Blight. *In "Compendium of Apple and Pear Pests"*, T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].
- Rosenberger, D.A. 2013. Dry Eye Rot. *In "Compendium of Apple and Pear Pests"*, T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].

- Rosenberger, D.A. 2013. Postharvest Diseases. *In* "Compendium of Apple and Pear Pests", T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].
- Rosenberger, D.A. 2013. Blue mold. *In* "Compendium of Apple and Pear Pests", T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].
- Rosenberger, D.A. 2013. Phomopsis Canker, Rough Bark, and Fruit Decay. *In* "Compendium of Apple and Pear Pests", T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].
- Rosenberger, D.A. and van der Zwet, T. 2013. Mycosphaerella Leaf Spot. *In* "Compendium of Apple and Pear Pests", T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].
- Rosenberger, D.A. and van der Zwet, T. 2013. Fabraea leaf spot. *In* "Compendium of Apple and Pear Pests", T.B. Sutton and H. S. Aldwinckle, eds., APS Press, St. Paul, MN. [In press].

Articles in New York Fruit Quarterly:

Accessible online one year after publication at
<http://www.nyshs.org/fq.php>

- Hoying, S. A. 2012. Experiences with Support Systems for the Tall Spindle Apple Planting System. *New York Fruit Quarterly* 20(4):3-8.
- Hoying, S. A., Robinson, T. L., DeMarree, A. M., and Sazo, M.M. 2012. Successful Apple Grafting Techniques for New York. *New York Fruit Quarterly* 20(1):7-10.
- Jentsch P. J. 2012. The Unpredictable Brown Marmorated Stink Bug in New York State. *N.Y. Fruit Quarterly* 20 (4).
- Rosenberger, D.A. 2011. Controlling postharvest diseases and disorders of apples with non-recycling drenches. *N.Y. Fruit Quarterly* 19(2):21-24.
- Rosenberger, D., Cox, K, Rugh, A., Villani, S, and Fredericks, Z. 2012. A new fungicide for controlling summer diseases on apples? *New York Fruit Quarterly* 20(4):9-13.

Contributions to Scaffolds Newsletter:

Accessible at

<http://www.nysaes.cornell.edu/ent/scaffolds/index.html>

- Jentsch P. J. 2011. Stink Bug Management in the Hudson Valley. *Scaffolds Fruit Journal* 20(1).
- Jentsch, P. 2011. NY Brown Marmorated Sink Bug Survey. *Scaffolds Fruit Journal* 20(16).

- Jentsch, P. 2011. Plum Out of Time. *Scaffolds Fruit Journal* 20(11).
- Jentsch, P. 2011. Strategies for Pear Psylla Management During the Pre-bloom Period. *Scaffolds Fruit Journal* 20(3).
- Jentsch, P. 2011. Weighing in on Scale. *Scaffolds Fruit Journal* 20(5).
- Jentsch P. J. 2012. Hudson Valley Pest Management Updates. *Scaffolds Fruit Journal* 21(24).
- Jentsch P. J. 2012. Hudson Valley Pest Management Updates. *Scaffolds Fruit Journal* 21(22).
- Jentsch P. J. 2012. Stink Bug Management in the Hudson Valley. *Scaffolds Fruit Journal* 21(17).
- Jentsch P. J. 2012. Hudson Valley Insect Pest Management. *Scaffolds Fruit Journal* 21(13,19,22-24).
- Jentsch, P. 2012. Weighing in on Scale. *Scaffolds Fruit Journal* 21(12).
- Jentsch, P. 2012. Hudson Valley Pre-bloom Pear Psylla Management. *Scaffolds Fruit Journal* 21(3).
- Rosenberger, D. 2011. Spring copper sprays for fruit diseases. *Scaffolds Fruit Journal* 20(2):4-6.

Reprinted/excepted in:

- CCE-HV Tree Fruit Grower Alert for 5 April 2011. Email messages for Hudson Valley fruit growers compiled by Mike Fargione.
- Healthy Fruit 19(1), 5 April 2011. University of Massachusetts Extension fruit newsletter edited by J. Clements.
- Northeast Tree-Fruit Newsletter 15(3):2-4. April 2011. K. lungerman, ed.

- Rosenberger, D. 2011. Selecting apple fungicides for controlling scab and mildew. *Scaffolds Fruit Journal* 20(2):5-7.

Reprinted/excepted in:

- Ohio Fruit ICM News 15(4):7-8, H.J. Siegrist, ed.

- Rosenberger, D. 2011. Playing catch-up on scab control between green tip and tight cluster. *Scaffolds Fruit Journal* 20(4):5-7.
- Rosenberger, D. 2011. Adjusting fungicide rates to maximize control of apple scab. *Scaffolds Fruit Journal* 20(8):8-11.
- Rosenberger, D., and Jentsch, P. 2011. New option for controlling Fabraea fruit and leaf spot on pears. *Scaffolds Fruit Journal* 20(9):5-7.
- Rosenberger, D. 2011. Pear blast. *Scaffolds Fruit Journal* 20(10):6-7.

Rosenberger, D. 2011. Disease management during prolonged wetting periods. CCE-HV Fruit Grower Alert for 17 May 2011 compiled by M. Fargione.

Reprinted/excepted in:

Healthy Fruit 19(7), 17 May 2011. University of Massachusetts Extension fruit newsletter edited by J. Clements.

Rutgers Plant & Pest Advisory, Fruit Edition 16(7):2-3, May 17, 2011.

Vermont Apple IPM Alert for 17 May 2011 edited by L. Berkett.

Rosenberger, D. 2011. Critical updates for apple storage operators. Scaffolds Fruit Journal 20(31):3-5.

Reprinted/excepted in:

Fruit Notes 11(18):4-7, 11 Aug. 2011, Lake Ontario Fruit Program, edited by Deborah Breth.

Northeast Tree-Fruit 15(7):2-4. 16 Aug. 2011, CCE Northeast NY Commercial Fruit Program, edited by K. lungerman

Rosenberger, D. 2011. Fungicide options for controlling storage decays of apples. Scaffolds Fruit Journal 20(22):5-7.

Reprinted/excepted in:

Northeast Tree-Fruit 15(7):4-6. 16 Aug. 2011, CCE Northeast NY Commercial Fruit Program, edited by K. lungerman

Rosenberger, D. 2011. The summer disease threat for apples. Scaffolds Fruit Journal 20(23):3-5.

Reprinted/excepted in:

Fruit Notes 11(19):2-4, 1 Sept. 2011, Lake Ontario Fruit Program, edited by Deborah Breth.

Rutgers Plant & Pest Advisory, Fruit Edition 16(22):6-7, Aug 30, 2011.

Facts for Fancy Fruit 11(10):4-6, Purdue University Extension, online at: <http://www.hort.purdue.edu/fff/FFF11/FFF11-10.pdf>

Rosenberger, D. 2011. Risks and benefits of using non-recycling drenches to apply DPA and postharvest fungicides to apples. Maine Apple Newsletter 19(19):4-6, Univ. of Maine, G.W Koehler and R. Moran, eds.)

Rosenberger, D. 2012. Options, benefits, and liabilities for copper sprays in tree fruits. Scaffolds Fruit Journal 21(1):6-9.

Reprinted/excepted in:

Fruit Notes 77(2):3-6. (W.R. Autio and W. P. Cowgill, Jr., Eds.), University of Mass., Amherst, MA.

Northeast Tree-Fruit Vol. 15, Issue 2 (Green Tip Addendum #1), March 2012, (K. lungerman, ed.).

Rosenberger, D., and Cox, K. 2012. Managing apple scab in high inoculum orchards. Scaffolds Fruit Journal 21(1):2-5.

Reprinted/excepted in:

Fruit Notes 77(2):16-19. (W.R. Autio and W. P. Cowgill, Jr., Eds.), University of Mass., Amherst, MA.

Fruit Notes: Lake Ontario Fruit Program 12(4):1-4, March 20, 2012, (D. Breth, ed.).

Rutgers Plant & Pest Advisory-Fruit Edition 16(33):4-5, March 21, 2012 (W. Cowgill, ed.).

Penn State Extension Fruit Times, March 26, 2012, On-line at <http://extension.psu.edu/fruit-times/news/2012/managing-apple-scab-in-high-inoculum-orchards>.

Northeast Tree-Fruit Vol. 15, Issue 2 (Green Tip Addendum #2), March 2012, (K. lungerman, ed.).

Rosenberger, D. 2012. Spray incompatibility note. Scaffolds Fruit Journal 21(3):7.

Reprinted/excepted in:

Fruit Notes: Lake Ontario Fruit Program 12(5):1, March 28, 2012, (D. Breth, ed.).

Rosenberger, D. 2012. Controlling apple mildew. Scaffolds Fruit Journal 21(4):3-5.

Reprinted/excepted in:

Fruit Notes: Lake Ontario Fruit Program 12(6):5-7, April 5, 2012, (D. Breth, ed.).

Tree Fruit Grower Alert Message – Wed, April 11, 2012, (M. Fargione, ed.).

Rosenberger, D. 2012. Using Apogee to manage fire blight and improve fruit finish. Scaffolds Fruit Journal 21(5):1-4.

Reprinted/excepted in:

Fruit Notes: Lake Ontario Fruit Program 12(7):4-5, April 12, 2012, (D. Breth, ed.).

Fruit Notes: Lake Ontario Fruit Program 12(8):2-3, April 18, 2012, (D. Breth, ed.).

Rosenberger, D. 2012. Disease management suggestions for frost-damaged orchards. Scaffolds Fruit Journal 21(8):2-4.

Reprinted/excepted in:

Tree Fruit Grower Alert Message – Tues., May 1, 2012, (M. Fargione, ed.).

Healthy Fruit 20(5):3-5; May 1, 2011. University of Massachusetts Extension fruit newsletter edited by J. Clements.

Northeast Tree-Fruit Newsletter 16(4):2-4. May 2012. K. lungerman, ed.

Facts for Fancy Fruit 12(4):3-4. May 8, 2012. Purdue University Extension, online at <http://www.hort.purdue.edu/fff/FFF12/FFF12-04.pdf>

Rosenberger, D. 2012. Controlling apple powdery mildew after the disease is evident. Scaffolds Fruit Journal 21(14):3-6.

Rosenberger, D. 2012. Scab spore maturity delayed. E-mail alert sent to 10 regional scientists and extension educators on May 17, 2012.

Rosenberger, D. 2012. Fungicide label warnings and restrictions. Scaffolds Fruit Journal 21(15):5-7.

Reprinted/excepted in:

Northeast Tree-Fruit Newsletter 16(6):4-6. July 2012. K. lungerman, ed.

Rosenberger, D. 2012. Questions about Indar for brown rot. Scaffolds Fruit Journal 21(15):8.

Rosenberger, D. 2012. Precautions for avoiding phytotoxicity with postharvest bin-top treatments on apples. Scaffolds Fruit Journal 21(24):2-3.

Reprinted/excepted in:

Northeast Tree-Fruit Newsletter 16(8):3-4. September 2012. K. lungerman, ed.

Rosenberger, D. 2012. Sanitize apple storage rooms to minimize postharvest decays. Scaffolds Fruit Journal 21(24):4-5.

Other extension newsletters:

Fargione, M.F. and Hoying, S.A. 2012. Will you be ready if spring comes early? 2012 Hudson Valley Tree Fruit Newsletter 2012 (1):5-8.

Hoying, S.A. 2011. Taking care of trees while waiting for better planting conditions. Horticulture and Pest Management Notes Fruit FAX 4/26/11 pgs. 2. Sazo, M.M. and Breth, D.I.,

Hoying, S.A. and McKay, S.A. 2011, 2012 Weekly regional contributions to *Veraison to Harvest*. www.Grapesandwine.cals.cornell.edu.

Jentsch P. J. 2012. Brown marmorated stink bug in the Hudson Valley. Appellation Cornell Newsletter Issue 12 November 2012 <http://grapesandwine.cals.cornell.edu/cals/grapesandwine/appellation-cornell/>

Robinson, T.L., Hoying, S.A., Fargione, M.F. 2012. The Effect of the Mild Winter of 2011-2012 on Fruit Trees. Hudson Valley Tree Fruit Newsletter 2012 (1):1-5.

Extension publications other than newsletters:

Agnello, A., A. Landers, D. Rosenberger, T. Robinson, J. Carroll, L. Cheng, P. Curtis, D. Breth, and S. Hoying. 2011. Pest Management Guidelines for Commercial Tree Fruit Production 2011. Cornell University, 252 pp.

Agnello, A.M., A. Landers, D.A. Rosenberger, T.L. Robinson, J.E. Carroll, L. Cheng, P.D. Curtis, D.I. Breth, and S.A. Hoying, R. Gardiner, M. Helms, K. Cox, D. Cain, R. Bellinder, 2012. Pest management guidelines for commercial tree-fruit production 2010. Cornell University, Ithaca NY 252 pp.

Cheng, L. and Hoying, S.A. "Removal of Macro- and Micro-nutrients by Fruit Harvest in Major New York Apple Cultivars and Its Implications for Orchard Nutrition Management" NYS ARDP Progress Report 2012 (November 26, 2012)

Hoying, S.A. "Systemes de Support Etats-Unis" ZOOM Arbre Fruitier, Edition 2012, pp18-21.

Hoying, S.A. and Cheng, L. "Managing Bitter Pit on Honeycrisp apple through the Trickle Irrigation System" NYS ARDP Progress Report 2012 (November 26, 2012)

Hoying, S.A., and Landers, A.J. "DosaFruit vs TRV Spraying" Proceedings of the 2012 Great Lakes Fruit Workers' Meeting, Niagara Falls, ON, CN (November 4-7, 2012) p 35.

Jentsch P. J. 2011. Results of Insecticide and Acaricide Studies in Eastern New York. Cornell University's Hudson Valley Laboratory Pub. # HV2011.

Jentsch P. J. 2012. Detection and Management of Brown Marmorated Stink Bug (1 credit) PMEP Distance Learning Center: On-Line DEC Pesticide Recertification Module for categories 2, 3a, 9, 10, 7a, 1a, 21, 22, 23, 24, and 25. <http://coursem.cce.cornell.edu/catalog.php?item=10>

Jentsch P. J. 2012. Preliminary Results of Insecticide and Acaricide Studies in Eastern New York. Cornell University's Hudson Valley Laboratory Pub. # HV2012.

Landers, A. and Hoying S.A. "The Application Debate – A report on trials conducted in the 2012 growing season" NYS ARDP Progress Report 2012 (November 26, 2012).

Robinson, T., Hoying, S., Lakso, A., Fargione, M., lungerman, K. and Sazo, M. "Improved Chemical Thinning Efficiency, Return Bloom and Pre-Harvest Drop Control" NYS ARDP Progress Report 2012 (November 25, 2012)

Rosenberger, D. 2012. Biology and control of apple powdery mildew. Proc. Great Lakes Fruit, Vegetable, & Farm Market Expo, 4-6 Dec. 2012, Grand Rapids, MI. Online at http://www.glexpo.com/summaries/2012summaries/apple_II.pdf.

- Rosenberger, D. 2012. Improving apple scab management via inoculum reduction, fungicide selection, and spray timing. Proc. Great Lakes Fruit, Vegetable, & Farm Market Expo, 4-6 Dec. 2012, Grand Rapids, MI. Online at http://www.glexpo.com/summaries/2012summaries/apple_II.pdf.
- Rosenberger, D. 2012. Understanding risks and benefits of copper products for tree fruits. Proc. Great Lakes Fruit, Vegetable, & Farm Market Expo, 4-6 Dec. 2012, Grand Rapids, MI. Online at http://www.glexpo.com/summaries/2012summaries/tart_cherry.pdf.
- Rosenberger, D., 2011. Fire blight control strategies. Pages 164-166 in: Proc. New England Vegetable and Fruit Conference, Manchester NH, Dec. 13-15, 2011.
- Rosenberger, D., 2011. Understanding the limitations of newer apple fungicides. Pages 113-115 in: Proc. New England Vegetable and Fruit Conference, Manchester NH, Dec. 13-15, 2011.
- Rosenberger, D., Watkins, C., Miranda Sazo, M., Kahlke, C., and Nock, J. 2012. Trial studies glyphosate's effects on internal browning. Fruit Grower News 51(4):16-18.2011.
- Rosenberger, D.A. 2011. How will new fungicides fit into apple disease control program? Pages 131-136 in: Proc. 86th Cumberland-Shenandoah Fruit Workers Conference, 18-19 Nov. 2010, Winchester, VA.
- Rosenberger, D.A. 2011. Postharvest fungicide options and fungicide resistance management. Dept. Hort. Publ. 69, 3 p.
- Rosenberger, D.A. 2011. Risks and benefits of using non-recycling drenches to apply DPA and postharvest fungicides. Dept. Hort. Publ. 69, 4 p.
- Rosenberger, D.A. Watkins, C.B., Nock, J.F., Miranda Sazo, M., Kahlke, C.J., and Fargione, M.J. 2011. Is glyphosate compromising apple tree health? Pages 144-149 in: Proc. 86th Cumberland-Shenandoah Fruit Workers Conference, 18-19 Nov. 2010, Winchester, VA.
- Watkins, C., Rosenberger, D., Cheng, L. 2011. Flesh browning again! Updates on effects of temperature, CA, glyphosate and minerals. Dept. Hort. Publ. 69, 17 p.

Plant Disease Management Reports

Technical reports from field trials:

- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Apple disease control with Agion, Fontelis, Luna Sensation, Merivon, and Rally, 2011. Plant Disease Management Reports 6:PF022. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Apple disease control with Merivon, Inspire Super, Omega, Indar, Topguard, and Rally, 2011. Plant Disease Management Reports 6:PF023. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Controlling early-season apple diseases with Penncozeb, sulfur, IKF-5411, and Rally, 2011. Plant Disease Management Reports 6:PF024. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Controlling apple summer diseases with IKF-5411, Luna Sensation, Merivon, and Pristine, 2011. Plant Disease Management Reports 6:PF025. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Controlling gray mold in stored apples with Scholar, Penbotec, and difenoconazole, 2011-12. Plant Disease Management Reports 6:PF040. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Controlling blue mold in stored apples with Scholar, Penbotec, and difenoconazole, 2011-12. Plant Disease Management Reports 6:PF042. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Controlling bitter rot in stored apples with Scholar, Penbotec, and difenoconazole, 2011-12. Plant Disease Management Reports 6:PF041. Online publication. DOI:10.1094/PDMR06.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Apple disease control with Esteem, Flint, Luna Sensation, and four DMI fungicides, 2010. Plant Disease Management Reports 5:PF052. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Comparison of Captan and Ziram used alone or with other products to control apple summer diseases, 2010. Plant Disease Management Reports 5:PF051. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Effects of fungicides and removal of

- fruitlet mummies on incidence of apple summer diseases, 2010. Plant Disease Management Reports 5:PF050. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling gray mold in stored apples with Scholar, Penbotec, and difenoconazole, 2010. Plant Disease Management Reports 5:PF049 Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling blue mold in stored apples with Scholar, Penbotec, and difenoconazole, 2010-11. Plant Disease Management Reports 5:PF048 Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling sooty blotch and flyspeck with fungicides approved for organic production, 2009. Plant Disease Management Reports 5:PF025. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling fruit decays caused by *Botryosphaeria* species in organic apple production, 2009. Plant Disease Management Reports 5:PF024. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Early-season apple disease control with Inspire Super and Rally, 2009. Plant Disease Management Reports 5:PF023. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling summer diseases on apples with Inspire Super, Rally, Indar, Tebuzol, and Luna Sensation, 2009. Plant Disease Management Reports 5:PF022. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Using preharvest sprays and postharvest Scholar treatments to control postharvest decays, 2009-10. Plant Disease Management Reports 5:PF026. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling blue mold in stored apples with fludioxonil, pyrimethanil, difenoconazole and captan, 2009-10. Plant Disease Management Reports 5:PF005 Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Controlling gray mold in stored apples with fludioxonil, pyrimethanil, difenoconazole and captan, 2009-10. Plant Disease Management Reports 5:PF006. Online publication. DOI:10.1094/PDMR05.
- Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2011. Evaluation of Fontelis, Luna Sensation, BAS 70301, and Torino for controlling early-season apple diseases, 2010. Plant Disease Management Reports 5:PF012. Online publication. DOI:10.1094/PDMR05.

Oral Presentations Made by Scientists and Educators from the Hudson Valley Lab 2011-2012

Presentations by Hoying:

- Hoying, S.A., DeMarree, A.M., Reisinger, R.E., and Mead, C.E. "New and Exciting Open Release Apple Varieties" NY Fruit and Vegetable EXPO, Syracuse, NY (January 26, 2011).
- Hoying, S.A. and Adams, R.L. "Effect of Crop Load, Fertilizer, and Leader Selection on New Tree Growth" Empire State Fruit and Vegetable EXPO, Syracuse, NY (January 27, 2011).
- Hoying, S.A. "Extending your apple harvest via the strategic use of growth regulators" Upper Hudson/Champlain Commercial Tree Fruit School. Lake George NY (February 14, 2011).
- Hoying, S.A. "Stone Fruit planting Primer – Sweet Cherries" Hudson Valley Commercial Fruit Growers School. Kingston, NY (February 16, 2011).
- Hoying, S.A. "Summary of Hudson Valley Viticulture Research" Hudson Valley Commercial Fruit Growers School. Kingston, NY (February 18, 2011).
- Hoying, S.A. "Practices and benefits of good canopy management" Hudson Valley Commercial Fruit Growers School. Kingston, NY (February 18, 2011).
- Hoying, S.A. "Soil fertility and crop nutrient management in organic blocks" Organic Apple Production Workshop for Commercial apple growers. Ballston Spa, NY (March 11, 2011).
- Hoying, S.A. "Site Selection and Preparation for Establishing New Plantings" CCE Regional Fruit Programs, Highland and via Polycomm to Rochester, NY (March 23, 2011).
- Hoying, S.A. "The Importance of Calcium for Growing Higher Quality Fruit" Nutrient Management In-depth School, Schenectady, NY (March 24, 2011).
- Hoying, S.A., Robinson, T.L., Rosengberger, D.A., and Jentsch, P.J. "Pest management and Crop load Adjustment Meetings" Fix Fruit Farms (April 30, 2011).
- Hoying, S.A. "Organizing your thoughts for thinning" "Nutrient management in apple orchards" presented for L.Cheng. Thinning Meetings Ulster County, Columbia County, Albany County, and Clinton County. (Various dates in May 2011).
- Carroll, J., Burr, T., Robinson, T., Hoying, S. and Cox, K. "Evaluation of pruning techniques and Bactericides to manage bacterial canker of sweet cherry" GLFW Agenda and Abstracts: pg. 28. (November 1, 2011).
- Hoying, S.A. Robinson, T.L. and Lakso A.N. "Programs for Successful Apple Thinning" 2011 Les Journee Horticles Pomme, St. Remy, QU, CN (December 7, 2011).
- Hoying, S.A. and Fargione, M.F. "Effective Tree Support Systems" 2011 Les Journee Horticles Pomme, St. Remy, QU, CN (December 7, 2011).
- Hoying, S.A. and Holze, R. "Pruning Tall Spindle Apple Trees" Coy Fruit Farms, Clintondale NY, (January 11, 2012).
- Hoying, S.A. "Palmette and Other Pruning Methods for Improved Yield and Fruit Quality". Long Island Forum, Riverhead, NY (January 13, 2012).
- Hoying, S.A. "Managing Apple Crop Load from Pruning to Harvest" Long Island Ag Forum, Riverhead, NY (January 13, 2012).
- Hoying, S.A. and Robinson, T.L. "Progress in Sweet Cherry Production in NY" 2012 Traverse City Orchard & Vineyard Show, Traverse City, MI (January 24, 2012).
- Hoying, S.A., Robinson, T.L., and DeMarree, A.M., "Do High Density Apple Planting Systems Make Sense?" 2012 Traverse City, MI Orchard & Vineyard Show. (January 24, 2012).
- Hoying, S.A., DeMarree, A.M. and Sazo, M.M. "Top Working: Does it Make Sense?" NY Fruit and Vegetable EXPO, Syracuse, NY (January 25, 2012).
- Hoying, S.A. and Fargione, M.F. "Regional Pruning Demonstrations" Fix Fruit Farm and Crist Bros. Orchards (February 6, 2012).
- Hoying, S.A., Cowgill, W. "Fruit Tree Pruning and Training Demonstration" Rutgers Snyder Research and Extension Farm NJ (February 10, 2012).
- Hoying, S.A. and Fargione, M.F. "Designing Effective Tree Support Systems to Withstand Weather Extremes" 2012 Upper Hudson Champlain Valley Commercial Fruit School, Lake George, NY (February 13, 2012).

- Hoying, S.A. and Fargione, M.F. "Effective Tree Support Systems for Apples" 2012 Hudson Valley Commercial Fruit Growers School (February 14, 2012).
- Hoying, S.A., Robinson, T.L. and Lang, G. "The Pros and Cons of New Cherry Planting Systems". 2012 Hudson Valley Commercial Fruit Growers School (February 15, 2012).
- Hoying, S.A. "Canopy Management after Cold Temperature Events" Hudson Valley Commercial Grape School, Kingston, NY (February 17, 2012).
- Hoying, S.A. "Soil and Petiole Analysis for Grapes" Presented at the Hudson Valley Grape School. (February 17, 2012)
- Hoying, S.A. and Whalen, J. D. "HV Temperature Studies and Lab Updates" Presented at the Hudson Valley Grape School. (February 17, 2012).
- Hoying, S.A., Robinson, T.L., and DeMarree, A.M., "Apple and Peach Growing Systems" New Mexico Annual Fruit Production Workshop, Santa Fe, NM (April 18, 2012).
- Hoying, S.A., Cowgill, W. and Edwards, H. (2012). "Cherry Planting Systems and High Tunnel Production Demonstration Workshop - Crist Farms. CCE Field Mtg. (April 24, 2012).
- Hoying, S.A., Robinson, T.L., Rosengberger, D.A., and Jentsch, P.J. "Pest management and Crop load Adjustment Meetings" Fix Fruit Farms (April 30, 2012).
- Hoying, S.A. "Tree Fruit Growers Meeting and Grafting Workshop". Wickham's Fruit Farm, Route 25, Cutchogue, New York. (May 31, 2012).
- Robinson, T.L., Hoying, S.A., Fachinello, J., Sazo, M.M., Dominguez, L., and Sander, G.F. "2012 Root Pruning and Apogee Studies in NY" WNY LOFT Summer Fruit Tour Handout. 7pp (July 24, 2012).
- Robinson, T.L., Hoying, S.A., Fachinello, J., Sazo, M.M., Dominguez, L., and Sander, G.F. "2012 Sidewall Shearing Studies in NY" WNY LOFT Summer Fruit Tour Handout. 7pp (July 24, 2012).
- Fargione, M.F. and Hoying S.A., "Apple Harvest Progression and Low Temperature Disorder Risk in NE Tree Fruit edited by K. Iungerman Vol 16(8). September 2012.
- Hoying, S.A. and Fargione, M.F. "Apple Variety Comparison Tasting" Prospect Hill Farms, (October 14, 2012).
- Hoying, S.A. "Determining the best harvest date for NY1 and NY2 using taste testing" GLFWG, November 6, 2012.
- Hoying, S.A., and Landers, A.J. "TRV vs. DosaFrut. Methods for estimating Pesticide Dosage" Great Lakes Fruit Workers Meeting, Niagara Falls, ON, CN (November 6, 2012).
- Hoying, S.A. "NY1 and NY2 Harvest Date Evaluation with Tastings" NYAG Mtg., Lyons, NY (December 12, 2012).
- Hoying, S.A. "Effective Tree Support Systems to Withstand Weather Extremes in Apple Orchards" Long Island Ag Forum, Riverhead, NY (January 11, 2013).
- Hoying, S.A., "Review Of Fruit Related Projects In 2012 – Apples & Cherries" Long Island Ag Forum, Riverhead, NY (January 11, 2013).
- Hoying, S.A., Watkins, C.B., Robinson, T.L., Cheng L. and Kahlke C. "Pre & Post Harvest Treatments for Improved Fruit Quality", OPGMA Annual Meeting, Sandusky OH (January 21, 2013).
- Hoying, S.A., Robinson, T.L. and Lakso, A.N. "Programs for Successful Apple Thinning" OPGMA Congress, Sandusky OH (January 21, 2013).
- Hoying, S.A., Robinson, T.L. and DeMarree, A.M., "New Apple Rootstocks and Trellis Systems - Pros and Cons" OPGMA Annual Meeting, Sandusky OH (January 22, 2013).

Presentations by Rosenberger

(Date, talk title, meeting name, location)

- 6-Jan-2011, *Fungicides 101 and Apple Scab Biology & Management*, Future Fruit Growers Program, Cornell's Hudson Valley Lab, Highland, NY, and (via Polycom) Monroe County CCE Office, Rochester, NY.
- 18-Jan-2011, *Apples in the Dark: The Fascinating Complexity of Postharvest Problems in Apple Storages*, Dept. Seminar, Purdue University, Purdue University, West Lafayette, IN.
- 19-Jan-2011, *Controlling Fruit Rots and Other Summer Problems on Apples*, Indiana Hort. Congress, Indianapolis, IN.
- 14-Feb-2011, *Positioning New Apple Fungicides to Control Mildew (and Scab)*, Upper Hudson/Champlain Fruit School, Lake George, NY.
- 15-Feb-2011, *Tree Fruit Disease Roundup*, Hudson Valley Commercial Fruit Grower's School, Kingston, NY.
- 16-Feb-2011, *Growing Concerns About the Use of Glyphosate Herbicide*, Hudson Valley Commercial Fruit Grower's School, Kingston, NY.

- 7-Mar-2011, *Update on Disease Control Strategies and Materials for 2011*, North Jersey Commercial Fruit Meeting, Asbury, NJ.
- 11-Mar-2011, *Disease Control Strategies for Organic Apple Orchards: Preplant and Prebloom*, Cornell's Organic Apple Production Workshop, Ballston Spa, NY.
- 11-Mar-2011, *Disease Control Strategies for Organic Apple Orchards: Summer Diseases*, Cornell's Organic Apple Production Workshop, Ballston Spa, NY.
- 11-Mar-2011, *Managing the organic orchard during bloom*, Cornell's Organic Apple Production Workshop, Ballston Spa, NY.
- 21-Mar-2011, *Program Overview*, Faculty meeting, Dept. of Plant Pathology and Plant-Microbe Biology, Geneva, NY and via Polycom to Ithaca and Riverhead.
- 24-Mar-2011, *Research with Inspire Super and Scholar*, 2011 – Syngenta Disease & Insect Update Meeting, Dundee, NY.
- 23-May-2011, *Update on Fruit Disease Control for the Lower Hudson Valley*, Fruit Grower Petal Fall Meeting for the Lower Hudson Valley, Milton, NY.
- 23-May-2011, *Update on Fruit Disease Control for the Upper Hudson Valley*, Fruit Grower Petal Fall Meeting for the Upper Hudson Valley, Hudson, NY.
- 26-May-2011, *Update on Fruit Disease Control for the Saratoga Region*, Fruit Grower Petal Fall Meeting, Saratoga Springs, NY, Clifton Park, NY.
- 2-Jun-2011, *Champlain Valley Update on Disease Control for 2009*, Fruit Grower Petal Fall Meeting, Peru, NY, Peru, NY.
- 7-Jun-2011, *Overview of Research and Extension Programs at the Hudson Valley Lab*, Discussion Concerning The Future of the Hudson Valley Lab, Highland, NY.
- 22-Jun-2011, *Tour of Field Research Plots*, Tree Fruit and Berry PWT summer tour, Highland, NY.
- 2-Aug-2011, *Risks and Benefits of Using Non-Recycling Drenches to Apply DPA and Postharvest Fungicides*, Apple Storage Workshop, Ithaca, NY.
- 2-Aug-2011, *Postharvest Fungicide Options and Fungicide Resistance Management*, Apple Storage Workshop, Ithaca, NY.
- 2-Aug-2011, *Flesh Browning Again: Updates on effects of temperature and CA, glyphosate, and nutrition*, Apple Storage Workshop, Ithaca, NY.
- 17-Aug-2011, *Tour of Field Research Plots*, Lab Tour for CCE-Ulster County and New World Foundation, Highland, NY.
- 8-Sep-2011, *Results from Field Trials in 2011*, Fall Tour of Agrichemical Research Trials at the Hudson Valley Lab, Highland, NY.
- 13-Oct-2011, *Controlling Postharvest Diseases and Disorders of Apples with Bin-Top Sprays*, Annual Meeting of the Northeastern Division, New Brunswick, NJ.
- 18-Oct-2011, *Unusual Observations and Disease Problems in 2011*, New England, NY, & Canadian Fruit Workers Conference, Burlington, VT.
- 18-Oct-2011, *Field Studies on the Spread of Fire Blight During Summer*, New England, NY, & Canadian Fruit Workers Conference, Burlington, VT.
- 30-Nov-2011, *Impacts of Glyphosate on Apple Tree Health*, ARDP Research Review, Geneva, NY.
- 1-Dec-2011, *Capabilities and Limitations of SDHI Fungicides in Apple Disease Control Programs*, Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA.
- 1-Dec-2011, *New Options for Controlling Postharvest Diseases and Disorders of Apples*, Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA.
- 2-Dec-2011, *Impacts of Glyphosate on Apple Tree Health*, Cumberland-Shenandoah Fruit Workers Conference, Winchester, VA.
- 14-Dec-2011, *Understanding the Limitations of Newer Apple Fungicides*, New England Vegetable and Fruit Conference, Manchester, NH.
- 14-Dec-2011, *Fire Blight Control Strategies*, New England Vegetable and Fruit Conference, Manchester, NH.
- 13-Jan-2012, *Disease Control for Apples and Stone Fruits*, Long Island Agricultural Forum, Riverhead, Long Island, NY.
- 19-Jan-2012, *Review of Fontelis Apple Trials In the Hudson Valley*, Fontelis Update Meeting, Harrisburg, PA.
- 1-Feb-2012, *What Copper Formulations are Best for Tree Fruit Applications?*, 2012 Mid-Atlantic Fruit and Vegetable Convention, Hershey, PA.
- 2-Feb-2012, *Are Apple Tree Canker Diseases Impacted by Glyphosate Herbicide?*, 2012 Mid-Atlantic Fruit and Vegetable Convention, Hershey, PA.
- 6-Feb-2012, *Review of Research on Glyphosate Effects in Apples*, Lake Ontario Winter Fruit Schools, Lockport, NY.

- 7-Feb-2012, *Review of Research on Glyphosate Effects in Apples*, Lake Ontario Winter Fruit Schools, Sodus, NY.
- 9-Feb-2012, *Strategies for Minimizing Losses to Apple Fruit Blemishes that Develop During Summer*, Southwest Michigan Horticultural Days, Benton Harbor, MI.
- 13-Feb-2012, *How Changes at Cornell and the Hudson Valley Lab May Impact Your Business*, Upper Hudson /Champlain Commercial Tree-Fruit School, Lake George, NY.
- 13-Feb-2012, *Why Late-Summer Rots and Spots Were a Problem in 2011: Ideas for Improving Fruit Quality*, Upper Hudson /Champlain Commercial Tree-Fruit School, Lake George, NY.
- 14-Feb-2012, *Fruit Disease Roundup*, Hudson Valley Commercial Fruit Growers' School, Kingston, NY.
- 15-Feb-2012, *Thoughts on Fire Blight Management in 2012 for the Hudson Valley*, Hudson Valley Commercial Fruit Growers' School, Kingston, NY.
- 6-Mar-2012, *SCAB 101 -- Biology of the Apple Scab Fungus*, Apple Scab in Pennsylvania: A Special Workshop on Managing Apple Scab in the Age of Multiple Fungicide Resistance, Biglerville, PA.
- 6-Mar-2012, *Fungicides for Apple Scab -- Their Chemistry and Modes of Action*, Apple Scab in Pennsylvania: A Special Workshop on Managing Apple Scab in the Age of Multiple Fungicide Resistance, Biglerville, PA.
- 6-Mar-2012, *Learning to Grow Apples with Protectant Fungicides*, Apple Scab in Pennsylvania: A Special Workshop on Managing Apple Scab in the Age of Multiple Fungicide Resistance, Biglerville, PA.
- 7-Mar-2012, *Apple Scab, Fungicide Resistance, and How to Grow Apples with Protectant Programs*, North Jersey Fruit Meeting, Asbury, NJ.
- 7-Mar-2012, *Using Apogee and Summer Fungicides to Avoid Spots, Rots, and Russet on Apples*, North Jersey Fruit Meeting, Asbury, NJ.
- 15-Mar-2012, *Managing Scab in Difficult Seasons: Inoculum Reduction and Infection Period Dynamics*, Cornell's In-Depth Fruit School on Fire Blight and Apple Scab, Geneva, NY.
- 28-Mar-2012, *Tailoring Outreach to Maximize Impact in the Era of Information Overload*, 7th International IPM Symposium, Memphis, TN.
- 3-Apr-2012, *Controlling Apple Scab and Mildew*, Teleconference with Wisconsin ECO-Apple, Madison, WI.
- 3-May-2012, *Update on Apple Diseases*, Columbia County Petal Fall Meeting, Hudson, NY.
- 3-May-2012, *Update on Apple Diseases*, Ulster County Petal Fall Meeting, Milton, NY.
- 23-May-2012, *Update on Apple Diseases*, Champlain Valley Petal Fall Meeting, Peru, NY.
- 20-Jun-2012, *Overview of Fruit Research at the Hudson Valley Lab*, Tour for Chinese Apple Scientists, Highland, NY.
- 19-Jul-2012, *Apple Disease Control Challenges for the Next Decade*, Maine State Pomological Society Summer Meeting and Orchard Tour, Sweden, ME.
- 19-Jul-2012, *Societal Changes are Creating Opportunities and Challenges for Fruit Growers*, Maine State Pomological Society Summer Meeting and Orchard Tour, Sweden, ME.
- 16-Aug-2012, *Biology and Control of Apple Powdery Mildew*, New England Fruit Consultants 2012 Research and Demonstration Field Day, Shelburne, MA.
- 4-Sep-2012, *Overview of Fruit Research at the Hudson Valley Lab*, Tour for Italian Apple Consultants, Highland, NY.
- 7-Sep-2012, *Results from our 2012 Agrichemical Field Trials*, Annual Tour of Agrichemical Field Trials, Highland, NY.
- 23-Oct-2012, *Useful Information from Our 2012 Fungicide Trials*, New England, NY, & Canadian Fruit Workers Conference, Burlington, VT.
- 10-Nov-2012, *Are Herbicides Impacting the Production Potential for Young Apple Trees?*, Risk Management Seminar: Tree Fruits--Year in Review and Planning for the Future, Goffstown, NH.
- 10-Nov-2012, *Strategies for Reducing Risk in Controlling Apple Diseases*, Risk Management Seminar: Tree Fruits--Year in Review and Planning for the Future, Goffstown, NH.
- 10-Nov-2012, *Peach Disease Review*, Risk Management Seminar: Tree Fruits--Year in Review and Planning for the Future, Goffstown, NH.
- 26-Nov-2012, *Impacts of Glyphosate on Apple Tree Health*, ARDP Research Review, Geneva, NY.
- 29-Nov-2012, *Apple-Disease Observations from the Hudson Valley in 2012*, Cumberland-Shenandoah Fruit Workers Meeting, Winchester, VA.
- 29-Nov-2012, *Comparison of Inspire Super and Pristine for Controlling Summer Diseases on Apples*, Cumberland-Shenandoah Fruit Workers Meeting, Winchester, VA.
- 29-Nov-2012, *Impacts of Glyphosate on Fire Blight and Internal Browning: Conclusions at the End of 2012*,

Cumberland-Shenandoah Fruit Workers Meeting,
Winchester, VA.

5-Dec-2012, *Biology and Control of Apple Powdery Mildew*, Great Lakes Fruit, Vegetable and Farm Market EXPO, Grand Rapids, MI.

5-Dec-2012, *Improving Apple Scab Management via Inoculum Reduction, Fungicide Selection, and Spray Timing*, Great Lakes Fruit, Vegetable and Farm Market EXPO, Grand Rapids, MI.

5-Dec-2012, *Understanding Risks and Benefits of Copper Products for Tree Fruits*, Great Lakes Fruit, Vegetable and Farm Market EXPO, Grand Rapids, MI.

Presentations by Jentsch:

Shifting Management Strategies: The Challenge of Filling the Insecticide Void. January 27, 2011. Empire State Fruit and Vegetable Expo, Syracuse, NY.

Invasive Pest Update – Brown Marmorated Stink Bug and Spotted Wing Drosophila. February 14, 2011. Hudson Valley Fruit School, Kingston, NY.

Annual Insect Update: Spotted Wing Drosophila, Stink Bugs, Grape Berry Moth. February 15, 2011. Hudson Valley Fruit School, Kingston, NY.

Tree Fruit Insect Round-Up. Managing the Hudson Valley Pome Fruit Insect Complex. February 17, 2011. Hudson Valley Fruit School, Kingston, NY

Invasive Pest Update – Brown Marmorated Stink Bug and Spotted Wing Drosophila. February 18, 2011. Hudson Valley Fruit School, Kingston, NY

Commercial Orchard Study Comparing Reduced Risk Insecticides to Conventional Tools for Management of Pear Psylla. March 19, 2011. Eastern Branch Entomological Society of America, Harrisburg, PA.

Efficacy of Volium Flexi and Volium Express on Tree Fruit Arthropod Complex. Syngenta Agrichemical Fruit and Vegetable Technical Information Exchange. March 23-24, 2011. Dundee, NY.

The Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in NY. April 29, 2011. Webinar to NY Agricultural Stakeholders. Hudson Valley Laboratory, Highland, NY.

Tree Fruit Efficacy Trial / Field Tour. June 7, 2011. Hudson Valley Laboratory, Highland, NY.

The Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in NY. Workshop to NY Agricultural Stakeholders. June 9, 2011. Hudson Valley Laboratory, Highland, NY.

Threat of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) to NY on Tree Fruit, Small Fruit, Vegetable and Sweet Corn. Northeast IPM Brown Marmorated Stink Bug Working Group meeting. June 20-21, 2011. Biglerville, PA

The Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål). New England, New York & Canadian Fruit Pest Management Workshop. October 18-19, 2011. Burlington, VT.

Strategies For Using Cyazypyr On Pear Psylla In NY Pear Orchards. Oct. 24 – 25, 2011. Northeast Tree Fruit Insect Control Experts Meeting, Newark, DE.

Surveying the BMSB in New York State. Northeast IPM Brown Marmorated Stink Bug Working Group meeting. November 29, 2011, Winchester, VA.

Threat of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) to NY and New England on Tree Fruit, Small Fruit, Vegetable and Sweet Corn. November 30, 2011, Apple Research & Development, Geneva, NY.

2011 Insect Pest Management of Tree Fruit & Web Based Pest Management Resources. January 13, 2012. Long Island Agricultural Forum, Riverhead, NY.

Surveying the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in NY State. January 25, 2012, Fruit & Vegetable Expo, Syracuse NY.

Vegetable Insect Control: Resource, Identification, Scouting and Management For Key Insect Pests in New York Vegetable Production. Cornell Beginner Farmer Program, BF 121- Week 3. February 2, 2012, Webinar: Hudson Valley Laboratory, Highland, NY

Insect Pest Management 101: Future Fruit Growers of NY; Cornell University. February 3, 2012, Hudson Valley Laboratory, Highland, NY

Tree Fruit Insect Pest Management. Novel Insecticides & Newly Invasive Pests. February 6-7, 2012. Western NY Fruit Schools, Niagara County CCE Training Center, Lockport, NY

Tree Fruit Insect Pest Management. Novel Insecticides & Newly Invasive Pests. February 6-7, 2012. Lake Ontario Fruit Schools, Sodus, NY

Invasive Pest Updates – Biology and Management of Brown Marmorated Stink Bug on Tree Fruit. February 13, 2012 Upper Hudson & Lake Champlain School, Lake George, NY

Tree Fruit Insect Round-Up. Managing the Hudson Valley Pome Fruit Insect Complex. February 14, 2012. Hudson Valley Fruit School, Kingston, NY

Invasive Pest Update: Management of BMSB and SWD on Tree Fruit in NY State. February 15, 2012. Hudson Valley Fruit School, Kingston, NY

Invasive Pest Update: Biology and Management of Brown Marmorated Stink Bug and Spotted Wing Drosophila on Grape. February 17, 2012. Hudson Valley Grape School, Kingston, NY

The Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in NY Ornamental and Landscape Environments: Biology and Management. Cornell Cooperative Ext. February 27, 2012, Webinar: Hudson Valley Laboratory, Highland, NY.

Insect Pests of Ornamental and Landscape Plants: Biology and Management. Cornell Cooperative Ext. March 6, 2012; Webinar: Westchester CCE, Valhalla, NY.

Invasive Pest Update – Biology and Management of Brown Marmorated Stink Bug and Spotted Wing Drosophila on Grape. March 8th, 2012. WNY Grape School, Portland, NY.

Threat of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) to New England on Tree Fruit, Small Fruit, Vegetable and Sweet Corn. March 21, 2012, New England Annual Grower and Advisory Meeting, South Deerfield, MA.

Monitoring the Spread of Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in NY. Measuring the Value of Urban Citizen Science. Northeast IPM Brown Marmorated Stink Bug Working Group meeting. June 12-13, 2012. Biglerville, PA.

Invasive Pest Update – Spotted Wing Drosophila. August 15, 2012 Hudson Valley Laboratory, Highland, NY.

The Leafroller and Internal Lepidopteran Complex: How Complex is it? August 16th, 2012; NE Fruit Consultants Summer Tour and Meeting, Shelbourne, MA.

Invasive Pest Update – Spotted Wing Drosophila. August 21, 2012 Cornell Cooperative Education Center, Troy, NY.

Development of a Citizen Science Project to Monitor the Spread of the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål), in NYS. October 23-24, 2012 New England, New York, Canadian Fruit Pest Management Workshop. Burlington VT.

Monitoring the BMSB in Urban and Agricultural Environments in New York State. Agricultural Invasive Species session. November 13, 2012. Annual CCE Agriculture and Food System In-service, Ithaca, NY.

Sweet Corn Insect Pest Management. Updates from the Hudson Valley. November 13, 2012. Annual CCE Agriculture and Food System In-service, Ithaca, NY.

Use of Trap Trees to Manage Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) in NY. November 26, 2012. Apple Research and Development Board Annual Report, Geneva, NY.

Tree Host Survey, Monitoring and Management Strategies for the Invasive Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål): (Pentatomidae), Along Borders of NY Tree Fruit. . Northeast IPM Brown Marmorated Stink Bug Working Group meeting. November 27, 2012, Winchester, VA.

Monitoring the BMSB in Urban and Agricultural Environments in New York State. Northeast IPM Brown Marmorated Stink Bug Working Group meeting. November 29, 2012, Winchester, VA

2012 Insect Pest Management of Tree Fruit Updates January 10, 2013. Long Island Agricultural Forum, Riverhead, NY.

Managing Insecticide Use. January 10, 2013; Aroma Thyme, Ellenville, NY.

Updates on the Brown Marmorated Stink Bug, *Halyomorpha halys* (Stål) and Spotted Wing Drosophila, *Drosophila suzukii* in NY State. January 22, 2013. Fruit & Vegetable Expo, Syracuse NY.

Presentations by Cook:

6-Aug-12. *Berry Crop Nutrient Management*. Grower Meeting. Cornell HV Lab, Highland, NY.

15-Aug-12. *Spotted Wing Drosophila Monitoring and Control*. Grower Meeting. Cornell HV Lab, Highland, NY.

21-Aug-12. *Spotted Wing Drosophila Monitoring and Control*. Grower Meeting. CCE Rensselaer County, Troy, NY.

14-Nov-12. *Invasive Pests of Vegetable Crops: Brown Marmorated Stink Bug and Spotted Wing Drosophila*. CCE Ag In-Service. Ithaca, NY.

14-Nov-12. *Organic Agriculture in Ulster County, NY: Challenges of 2012*. CCE Ag In-Service. Ithaca, NY.

10-Dec-12. *Seed-borne Bacterial Diseases in Vegetable Crops*. Grower Workshop. Cornell HV Lab.

12-Dec- 12. *Organic Management of Spotted Wing Drosophila*. Organic Program Working Group Meeting, via Web-Ex. Cornell HV Lab.

Presentations by Fargione:

- 16-Feb-12. *Preparing a Food Safety Plan for Your Farm*. Hudson Valley Commercial Fruit Growers' School, Kingston, NY.
- 17-Feb-12. *Physical Barriers for Wildlife Control, especially Deer Fencing and Bird Netting*. Hudson Valley Commercial Fruit Growers' School, Kingston, NY.
- 6-Mar-12. *Fruit Basics*. CCE Westchester County Master Gardener Program, Valhalla, NY.
- 20-Mar-12. *WPS Training for Workers and Handlers and Pesticide Training for the 2012 DEC Special Permit*. NY State DEC Region 3 Headquarters, New Paltz, NY.
- 21-Mar-12. *WPS Training for Workers and Handlers and Pesticide Training for the 2012 DEC Special Permit*. CCE Columbia County Office, Hudson, NY.
- 16-Apr-12. *WPS Training for Workers and Handlers and Pesticide Training for the 2012 DEC Special Permit*. Cornell HV Lab, Highland, NY.
- 18-Oct-12. *Fruit Basics*. CCE Dutchess and Putnam Master Gardener Program, Farm and Home Center, Millbrook, NY.
- 23-Oct-12. *2012 Hudson Valley Extension and Field Report: Climate and Horticultural Issues*. New England, New York, Canadian Fruit Pest Management Workshop, Burlington, VT.
- 1-Nov-12. *Tree Fruit Basics*. CCE Orange Master Gardener Program, CCE Orange County Office, Middletown, NY.

Presentations by O'Connell:

- 6-Aug-12. *Berry Crop Nutrient Management*. Cornell HV Lab Highland, NY
- 15-Aug-12. *Spotted wing Drosophila Monitoring and Control in Commercial Fruit Crops*. Cornell HV Lab Highland, NY
- 21-Aug-12. *Spotted wing Drosophila Monitoring and Control in Commercial Fruit Crops*. CCE Rensselaer County office Troy, NY

Presentations by O'Dea:

- 10-Dec-12. *Introduction to Crop Disease Ecology. Grower Workshop*. Cornell HV Lab.