Cornell University Cooperative Extension

Eastern NY Commercial Horticulture Program

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# Tree Fruit News

## Apple Harvest Summaries– Season to Date

**In this issue of Tree Fruit News:**



**Hudson Valley,** *Dan Donahue*

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

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

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

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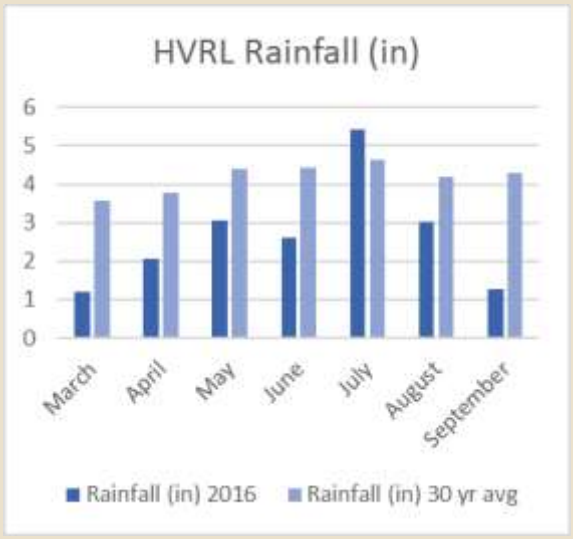
**Temperature and Rain 9/17/16 - 10/17/16**

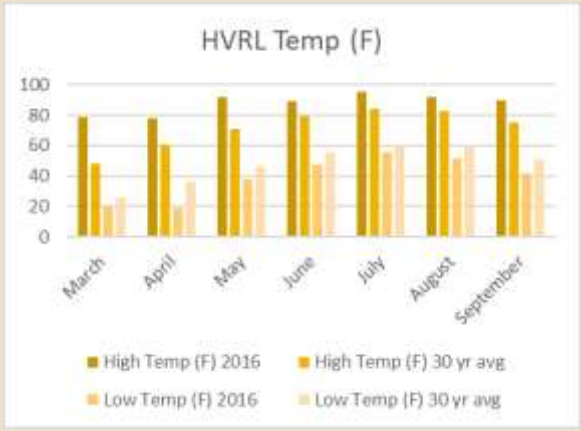
| Locations | Avg Temp (F) | Max Temp (F) | Min Temp (F) | Total Rain (in) |
|---|---|---|---|---|
| Chazy | 56.9 | 80.2 | 33.4 | 1.74 |
| Peru | 57.4 | 83.8 | 29.4 | 1.14 |
| Crown Point | 56.9 | 83.5 | 28.9 | 0.03 |
| Clifton Park | 58.6 | 88.2 | 29.9 | 1.32 |
| Hudson | 59.1 | 87 | 29 | 2.57 |
| Highland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

this article is written, Standard Fuji, "Maslin" Pink Lady, and Law Rome are being harvested. All in all, I'd estimate most varieties will pick out at 50% of last year's crop, with Gala being the bright spot at 75%.

**Highland Rainfall and Temperature 2016 vs 30 Yr Average**

| | Rainfall (in) | | High Temp (F) | | Low Temp (F) | |
|---|---|---|---|---|---|---|
| **Month** | **2016** | **30 yr avg** | **2016** | **30 yr avg** | **2016** | **30 yr avg** |
| March | 1.19 | 3.57 | 78.6 | 48.1 | 19.7 | 25.5 |
| April | 2.07 | 3.78 | 77.9 | 60.8 | 18.9 | 36.6 |
| May | 3.04 | 4.41 | 91.7 | 71.3 | 37.9 | 46.3 |
| June | 2.62 | 4.43 | 89.2 | 79.5 | 47.7 | 55.7 |
| July | 5.44 | 4.65 | 95.1 | 84.4 | 55.7 | 60.8 |
| August | 3.01 | 4.2 | 92.1 | 82.6 | 51.6 | 59.6 |
| Sept. | 1.27 | 4.28 | 90 | 75 | 41.5 | 51.1 |




**Champlain Valley**, *Anna Wallis*

**Weather Conditions:** Winter conditions were extremely mild prior to the 2016 growing season in the Champlain Valley. Temperatures rarely dropped below 0°F, with the exception of two cold nights in February that reached nearly -20°F. Throughout the growing season, environmental conditions posed major challenges to this year. Bud swell began very early, due to warmer than average temperatures in May. In the first week of April, the region experienced frost conditions several nights in a row. Fortunately, tree growth was not advanced enough to cause significant bud injury; most farms experienced minimal to zero damage, for the most part restricted to loss of a few king flowers and/or some lopsided fruit in the most advanced varieties and blocks. Multiple severe isolated thunderstorms including very high wind gusts (>40MPH) and hail occurred in July. Greater than 90% crop loss due to hail was estimated in several locations. Very dry conditions for most of May, June, and July caused severe drought stress. Rain at the end of July and beginning of August have provided relief to dry weather and are contributing to fruit sizing.

**Insects:** In general insect damage was heavier than usual this year. Early season pests including plum curculio and tarnished plant bug caused more damage than normal, most likely due to an extended bloom period and a general movement away from pink sprays. Summer lepidoptera, especially obliquebanded leafroller, oriental fruit moth, and codling moth, had a late generation that typically is not seen in the Champlain Valley. Dipel appears to have been very effective at controlling overwintering generations. Apple maggot pressure was very high this year in every trapping location, and required more late sprays than usual. Wooly apple aphid pressure was also higher this year than is typical.

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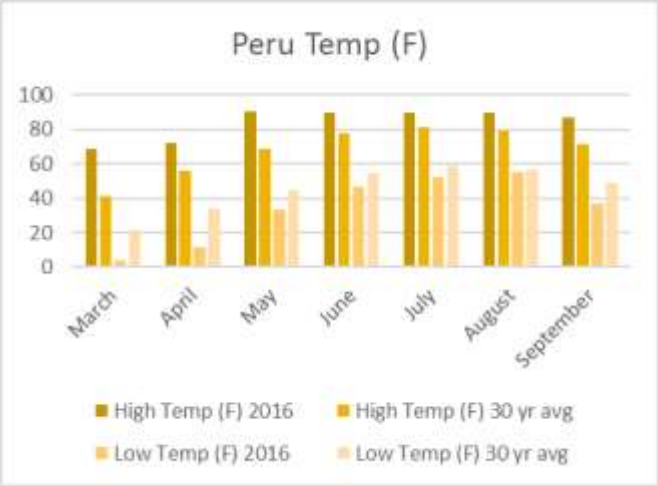
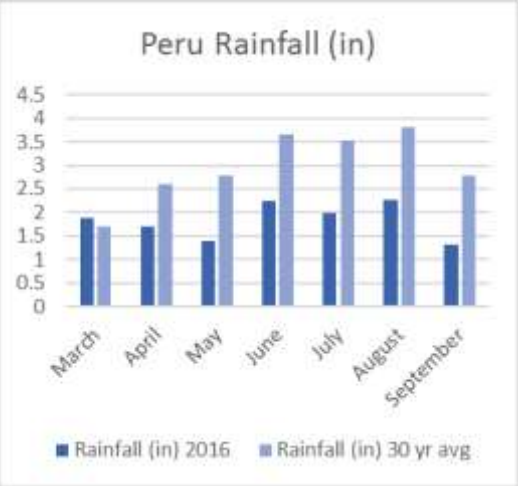
**Peru Rainfall and Temperature 2016 vs 30 Yr Average**

| Peru | Rainfall (in) | | High Temp (F) | | Low Temp (F) | |
|---|---|---|---|---|---|---|
| **Month** | **2016** | **30 yr avg** | **2016** | **30 yr avg** | **2016** | **30 yr avg** |
| March | 1.88 | 1.71 | 68.7 | 41.2 | 3.6 | 21.5 |
| April | 1.69 | 2.61 | 72.1 | 56.1 | 11.8 | 34 |
| May | 1.4 | 2.77 | 90 | 68.5 | 33.6 | 44.8 |
| June | 2.24 | 3.66 | 89.3 | 77.4 | 46.9 | 54.4 |
| July | 1.97 | 3.54 | 89.7 | 81.4 | 52.1 | 59 |
| August | 2.26 | 3.81 | 89.3 | 79.3 | 55.4 | 56.6 |
| September | 1.3 | 2.79 | 87.1 | 71.3 | 36.8 | 48.8 |




**Disease (Fire Blight):** Very warm conditions and rain events at the tail end of bloom led to severe fire blight infections in most orchards. This disease has only been present in a few seasons and in isolated blocks in the past, so growers have very little experience managing it, and antibiotics are typically not used. Growers responded by using cultural, mechanical, and chemical practices to slow down plant growth, in order to minimize further spread of infection. These management decisions had an effect on vegetative growth, crop load, and fruit development. Conditions were exacerbated by severe thunderstorms and hail in July.

## Fall Fire Blight Management

*Anna Wallis, ENYCHP & Dr. Srdjan Acimovic , Cornell Hudson Valley Research Lab*

2016 was a milestone year for fire blight in the NY Champlain Valley apple growing region. Historically, the disease has been virtually unknown in this region—in only a few seasons there were small outbreaks in isolated blocks. However, in the 2016 season it affected nearly every orchard that we visited with extensive infections and tree death. Some trees have asymptomatic trunk or rootstocks infections that this fall or next year will result in tree death. It goes without saying—we don't want 2017 to be another year like this one.

More than likely, it will not be. The pathogen will persist in orchards over the winter and will be present in 2017 and years to come to spread infection. But it will take specific weather conditions—conditions typically unusual for the Champlain Valley—to facilitate infection periods and repeat an epidemic. In addition, we can only expect that farmers will be vigilantly managing the disease in the coming seasons, taking the most proactive steps to reduce inoculum and prevent new infections.

Nevertheless, extreme caution should be used to prevent infection in 2017. Due to the high level of infection this season, there will be a large source of inoculum present in the form of infected, asymptomatic trees and cankers that were not removed. There are many steps that can and should be taken over the fall and dormant seasons to reduce risk next year.

*Fire blight canker on a dwarf tree with infected rootstock but healthy scion. Arrow pointing at canker margin. Bark has been cut away from rootstock exposing dead, brown cambium. Photo: A. Wallis.*

**Pruning and Sanitation**

A concerted effort was made during the growing season to remove as much infected tissue as possible. However, for various reasons, it is guaranteed that not all of the trees and tissue with disease symptoms were removed. Take the time now to remove any flags or cankers that remain in your orchard. Do this *before* leaves fall to the ground, as the diseased tissue will be *much* easier to find. At the very least, send someone to flag infected trees so they can be easily found later.

Because trees are no longer actively growing, the disease has stopped spreading into the tissue visibly. But it may be surviving in the vascular tissue of the plant. Use 70% rubbing alcohol/

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*Dwarf tree with fire blight rootstock infection. Tree showed decline during late summer and early fall in the form of tree decline and gradual browning of green tissue. Rootstock was completely dead. Photo: A. Wallis*

*Fire blight infected rootstock with ooze evident as dark streaking or drip trail of fluid.*

ethanol or 10% bleach solution to sanitize tools between each cut. Do not prune in rainy conditions, which risks spreading bacteria more.

Once infected limbs are pruned out, what should you do with them? Fire blight requires living tissue to survive. So pruned brush should be left in the aisle to dry and then flail mowed or removed from the orchards *only when completely dry*.

**Ugly Stubs**

One practice that was used during the dormant season is the 'ugly stub' pruning method. In this method, 4" naked (ugly) stubs are left on the tree where a flagging branch or shoot is removed. As a result, the bacteria will colonize in the stub, rather than forming a canker on the main trunk of the tree, the stubs being much more easily removed later. These ugly stubs should be removed during dormant pruning *when temperature are below 40F*. Again, bright flagging can be employed here at the time of pruning to make the stubs more visible.

**Copper**

Copper applications will be an important tool to help reduce inoculum levels on the surface of the trees. These sprays will not kill bacteria in the overwintering cankers, but they will reduce populations building up on the surface of the tree (buds, bark). Effectiveness of copper is very dependent on timing.

- ***Late Dormant Copper is essential.*** Bacteria become active in the spring when temperatures warm and sap starts to flow, i.e. when cankers start to ooze. Applications should be made at dormant, from silver tip to green tip (but not at and after ½ inch green tip). Use EPA labeled rates for dormant sprays. For example, if you will spray before fall rains but after leaf fall, and you choose Badge SC apply 11.1 - 14.8 pints/A (use higher rate when disease occurred in your orchard development). For the late dormant spray of Badge SC use 7.4 - 14.8 pints/A to kill bacteria on the surface of the cankers and in the ooze. Follow the label to determine the rate of other cooper products during dormancy.
- ***Fall Copper is not recommended.*** It is NOT recommended for copper to be applied in the fall—really there is nothing that can be done at this time of year in terms of spraying. Although cankers can remain active and continue to ooze droplets, it is extremely rare for there to be any new infections at this time. Your time and resources are much better spent on other tasks. Instead, concentrate on dormant pruning to reduce inoculum, and making copper and streptomycin applications in the spring.

**Rootstock Infections**

In a number of high density orchards, fire blight infections are presenting as completely declining trees. These trees did not necessarily show the characteristic shoot blight flagging earlier this summer. Bacteria appear to have moved into and killed the rootstock without causing symptoms in the rest of the tree. Fire blight can be identified by the cankers present on the trunk, which are sunken and darkly discolored, sometimes (but often not) cracked around the edges. Also, there are typically signs of ooze from the canker edges or near the graft union. This appears as a dark, sticky, streak or drip stain. These trees should be flagged and removed from the orchard during the dormant season.

**Additional Reading:**

For more information, please follow more detailed instruction available:

1. Dr. Srdjan Acimovic's Blog: Fire Blight in the Champlain Valley 2016 & 2017
2. U Mass Extension: Annual Fire Blight Fact Sheet
3. University of Maryland: Ugly Stub Pruning

## BMSB News: The Invasive Parasitic Wasp, Trissolcus japonicus, Recently Found in New York State

*Peter Jentsch, Cornell Hudson Valley Research Laboratory*

*Trissolcus japonicus* Image: Elijah Talamas, USNM

The Asian micro-hymenopteran wasp, *Trissolcus japonicus*, (Hymenoptera: Scelionidae) is considered one of the primary parasitoids of the brown marmorated stink bug (BMSB) *Halyomorpha halys*, in its native region of origin. A common name presently under consideration is the **Samurai wasp**. Asian fruit growers consider BMSB as only a secondary pest of apple, likely due to the suppression of BMSB provided by native biological controls that include *Trissolcus japonicus*.

After the severe tree fruit losses from BMSB in the mid-Atlantic in 2011, a team of USDA researchers, including lead entomologist Kim Hoelmer, traveled to Asia to find native predators and parasites of the newly invasive stink bug. A survey of parasitoids was conducted in China & Korea, collecting species of wasps to bring back to the US for further study under quarantine in the USDA laboratories in Newark, Delaware.

*Trissolcus japonicus* became a prime biological control candidate for BMSB, able to parasitize up to 90% of the eggs in a BMSB cluster while under quarantine, demonstrating high efficiency and limited impact on the native predatory stink bug complex during choice and non-choice studies. This tiny wasp is now considered a viable biological control agent for release to control BMSB in the U.S. where it has become an important agricultural and urban household pest.

*Parasitism of BMSB eggs by Trissolcus japonicus*

It was quite a surprise when in 2014, a survey of resident egg parasitoids of the BMSB by Don Weber, (ARS-Beltsville Area Research Center), using sentinel brown marmorated stink bug egg masses, revealed that *T. japonicus* was present in the wild at one of his study sites in Beltsville, MD. Since then, several *T. japonicus* wasp clusters have been found in Maryland and Virginia over the past two years. More recently, it appears that *T. japonicus* was also found in Vancouver, Washington. To add to these finds, we have also captured *T. japonicus* in the Hudson Valley of New York over the past 2 weeks, using sentinel brown marmorated stink bug egg masses. This work was fully supported by program funds directly from the NY State apple growers.

Beginning 22nd of July 2016, Cornell faculty and staff stationed at the Hudson Valley Research Lab began a baseline study to determine levels of parasitism of brown marmorated stink bug egg laying. We employed BMSB eggs that had been frozen for 3 minutes in -80C, used to reduce the natural defense mechanism of the eggs to parasites. We chose two locations in two counties in the mid-Hudson Valley that had both high traffic of plant products on and off of farms to increase the chance of finding invasive parasitoids that had moved into the region on plant material from the south.

To date 108 clusters containing 3024 eggs were placed in each site with only a single location within one of the sites found parasitized emerging in late August.

In Ulster County, eggs were placed along the wooded edge perimeter of organically grown Jalapeno pepper in Marlboro, NY, stapling egg masses to the leaves of the Asian invasive tree, Tree of Heaven, *Ailanthus altissima* and Black Walnut. The BMSB eggs placed in early and mid-August began to darken, indicating development of parasite larva within the egg. From these we found 70-90% of the individual eggs in each cluster of approximately 28 eggs parasitized. By early September microhymenopteran in the Genus Trissolcus was found successfully emerging from BMSB eggs. Adult wasps were sent to Elijah Talamas, Research Entomologist at the USDA Systematic Entomology Laboratory in Washington, DC for confirmation.

Our second site in which sentinel brown marmorated stink bug egg masses were placed along the perimeter of peach and apple plantings

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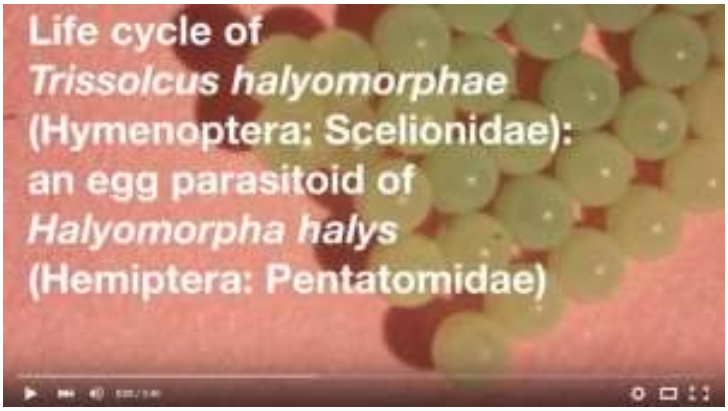
*A female Trissolcus japonicus parasitoid wasp emerging from parasitized Halyomorpha halys eggs (Image: USDA-APHIS Quarantine Facility, Corvallis, Oregon.)*

of a conventional orchard in Warwick, NY has yet to produce parasitic wasps from BMSB egg clusters.

This first observation of *Trissolcus japonicus* in NY is an important development to farmers as well as homeowners. For the grower of fruit and vegetable, it signifies a step toward the sustainable management of a very unpredictable agricultural pest. If *T. japonicus* can overwinter and build in numbers in NY we will likely see increasing levels of biological control of BMSB. This may lead to moderate and low level populations in deciduous forests with reduced damage to fruit and vegetable crops during the growing season.

The second benefit of increasing biological control would of course be to homeowners, with lower numbers of BMSB adults in homes and offices over the next few years.
Our short term research goals will include expanding our monitoring range of *T. japonicus* in other Southeastern NY Ag. sites. We plan to expand our Citizen Science Project mapping using EddMaps/BMSB to reach out to the public who have contributed to our understanding of the spread of BMSB in NYS. We hope to determine if BMSB populations are changing in urban areas while searching for *T. japonicus* using sentinel BMSB egg surveys.




*Trissolcus japonicus* An Egg Parasitoid of the Brown Marmorated Stink Bug *Halyomorpha halys*

## Fall Weed Management in Apples

*Dan Donahue & Anna Wallis, ENYCHP*

The post-harvest fall season can be an ideal time to start your weed management efforts for the upcoming growing season. Spring is the traditional timing for orchard herbicide applications, with a strategy of delaying application until weeds emerge, then combining a burn-down material with one or more pre-emergence herbicides. This strategy has the perception of efficiency and economy, as the orchard manager is waiting until the last possible moment to burn-down newly emerged weed seedlings at 2-3", while stretching the residual effectiveness of the pre-emergence materials further into the growing season.

The trouble is, spring is a busy time of the year in an apple orchard, and numerous orchard operations are being conducted concurrently and with equal urgency. Everything is a priority, and proper timing is always the name of the game. Often, spring herbicide applications are delayed to the point that emerged weed seedlings have grown out of the stage where chemical control is effective, resulting in unwanted competition for water and nutrients. Adjusting sprayer booms upwards to adequately cover larger weeds can lead to problems with spray materials drifting into the tree canopy, damaging foliage, and contributing to over-all tree stress.

The post-harvest fall period in the Hudson Valley, from mid-October through mid-November is more relaxed three week period for apple growers. Of course, owners, managers, and employees are exhausted by this point, and maybe this is why it can be difficult to fire up the weed rigs for one last go before the snow hits. From a time management and efficacy perspective, this period can be an excellent time to be concentrating on orchard weed control.

**Fall Applied Herbicide Evaluation Trials in Eastern NY**
***Hudson Valley Herbicide Trial 2015***

In the fall of 2014, a trial was conducted at the Cornell Hudson Valley Research Laboratory in Highland New York to evaluate the efficacy of several herbicides when applied under apple trees in the late fall. Selected pre-emergence herbicides were applied in tank mix combinations with paraquat (Gramoxone SL 2.0) to 6' X 20' plots, replicated three times, under high density apple trees, cultivar Honeycrisp, on 12-November, 2014. Ambient temperature at the time of application was $59^0$F. Post-application rainfall received was 0.21" within 48 hours with a five day total of 1.04" at an average temperature of $37^0$F.

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***Champlain Valley Herbicide Trial 2016***

In the fall of 2015, a trial was conducted in the Champlain Valley at a commercial orchard site in Peru to evaluate the efficacy of fall applied herbicides for weed control in the subsequent season. Ten selected pre-emergent herbicide treatments were applied; ground was nearly bare (no weeds present), so surfactant and burndown materials were not included in tank mix. Treatments were applied to 9'x4' plots to include 3 trees, replicated 3 times, under NY-1/Nic -29, on October 28th, 2015. Temperature at the time of application was 40°F. Post application rainfall was 1.02" within 24hrs, and a 5-day total of 1.12". Temperatures in the 5 days following treatments averaged 43°F, ranging from a low of 27.5°F 3 nights after treatment (the only night sub-freezing), and a high of 64°F. Weeds were rated one time in the spring on 17-May, 2016 for percent ground cover and the weed species present in each plot.

**2015 Hudson Valley Results**

The 12-November 2014 application was made following a frost event, with cool average temperatures experienced during the five days following application. Adequate post-application rainfall was received to incorporate and activate herbicides that require it, such as Casoron and Alion. In this study, Lambsquarters and Pennsylvania Smartweed were the toughest weeds to control season-long, the distribution of Canada Thistle was uneven in this study. The combination of Gramoxone and Alion resulted in near season-long control, producing 77% control as late as 2-October, with the closest competition being Gramoxone/ Chateau and Gramoxone/Goaltender at 33% control. The ratings of these three treatments on 29-June were statistically identical, and significantly better than the other six treatments. With the exception of the three combinations mentioned earlier, all other treatment combinations would have required the follow-up application of a burn-down material such as Gramoxone, Rely, or Roundup sometime in June. The Chateau and Goaltender treatments held out an additional month. It was interesting that the control plot had reached 60% infested by 25-May, meaning that it was already late for a conventional spring burn-down treatment. Gramoxone alone in the fall did buy a little extra time for that spring follow-up.

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

| | | Tank Mix Combinations | | | | % Weed Cover | | | | Weed Species Breakthrough |
|---|---|---|---|---|---|---|---|---|---|---|
| Material #1* | Rate | Material #2 | Rate | Material #3 | Rate | 25-May | 8-Jun | 29-Jun | 2-Oct | |
| Control | na | na | na | na | na | 60 | 90 | 100 | 100 | see full list |
| Gramoxone | 3.5 pts/A | na | na | na | na | 27 | 70 | 100 | 100 | LQ PS CT |
| Gramoxone | 3.5 pts/A | Matrix 25 DF | 4 oz/A | na | na | 3 | 17 | 87 | 97 | LQ PS CT BG |
| Gramoxone | 3.5 pts/A | Alion 1.67 | 6 oz/A | na | na | 0 | 0 | 13 | 23 | N/A |
| Gramoxone | 3.5 pts/A | Simazine 90 DF | 1.1 lbs/A | Diuron 80 DF | 1.25 lbs/A | 13 | 30 | 90 | 97 | LQ PS BP |
| Gramoxone | 3.5 pts/A | Chateau 51 SW | 10 oz/A | na | na | 0 | 3 | 20 | 67 | RC BG |
| Gramoxone | 3.5 pts/A | GoalTender | 3 pts/A | na | na | 3 | 7 | 23 | 67 | CC PR LQ PS |
| Gramoxone | 3.5 pts/A | Sandea 0.75 | 0.8 oz/A | na | na | 13 | 50 | 90 | 93 | LQ PS RC |
| Gramoxone | 3.5 pts/A | Casoron 1.4 CS | 2.3 gal/A | na | na | 0 | 13 | 83 | 97 | PR LQ BG |
| * LI-700 at 0.125% added to all spray treatments | | | | | | | | | | |
| | | | | | | | | | | |
| Key: LQ: Lambsquarters; PS: Pennsyvania Smartweed; CT: Canada Thistle; BG: Bermudagrass; BP: Broadleaf Plantain | | | | | | | | | | |
| RC: Red Clover; CC: Common Chickweed; PR: Perennial Ryegrass | | | | | | | | | | |
| Additional species found in the control plots: Buckhorn Plantain, Common Groundsel, Common Mallow | | | | | | | | | | |
| Dandelion, Mare's Tail, Mouse Ear Chickweed, Orchardgrass, Redroot Pigweed, Yellow Wood Sorrel | | | | | | | | | | |

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

| Material #1 | Rate | Material #2 | Rate | % Weed Cover | Weed Species Breakthrough |
|---|---|---|---|---|---|
| Control | na | na | na | 92 | See complete list |
| 2,4-D | 3 pt/A | na | na | 85 | OX, V, G |
| Glyphosate | 3 qt/A | na | na | 65 | OX, V, M, LQ |
| Glyphosate | 3 qt/A | 2,4-D | 3 pt/A | 62 | OX, V, M, LQ |
| Alion | 5 oz/A | na | na | 22 | OX, V, G, HW |
| Casoron | 2.8 gal/A | na | na | 70 | OX, V, G, M |
| Chateau | 12 oz/A | na | na | 36 | OX, V, D, G, LT |
| GoalTender | 4 pt/A | na | na | 67 | OX, V, G, HW |
| Matrix | 4 oz/A | na | na | 8 | OX, V, G |
| ProwlH2O | 4 pt/A | na | na | 68 | V, G, M, HW |
| Sandea | 1 oz/A | na | na | 18 | OX, V, D, G |
| Stinger | 0.67 pt/A | na | na | 73 | V, G, M |
| * no surfactants or Gramoxone used. Sprayed onto nearly bare ground. | | | | | |
| | | | | | |
| KEY: OX: Oxalis, V: Vetch, D: Dandelion, G: Orchard Grass, M: Mustard, LQ: Lambs Quarters, LT: Lady's Thumbprint, HW: Horseweed | | | | | |

**2016 Champlain Valley Results**

Conditions for the 28-October, 2015 herbicide application were very good, with cool average temperatures following the application and adequate rainfall within 24hrs to activate herbicides that require it. Prior to the application, the ground was nearly bare, so a burn-down material was not included in the tank mix. In

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this plot, the most common weeds to break through in the spring were vetch, oxalis, and orchard grass. The best control in terms of ground cover was provided by Matrix, Sandea, and Alion, with 92%, 82% and 78% control respectively. Chateau provided moderate control (64%), but with considerable variability between plots. The remaining treatments provided on average less than 40% control, requiring a burndown material in the spring.

**Fall Weed Control Recommendations**

*Champlain Trial Control Plot, 6th Leaf NY-1 on 17-May, 2016 Photo by Anna Wallis*

*Champlain Valley Alion Treatment, 6th Leaf NY-1 on 17-May, 2016*
*Photo by Anna Wallis*

- There is a narrow post-harvest window available for the application of fall application of certain herbicides. The results of this study indicate that application after frost, and followed by cool weather, does not necessarily reduce herbicide performance. Our fall season tends see more rain, which helps in the incorporation and activation of herbicides.
- Avoid applications of glyphosate (Roundup) in the fall due to concerns that contact with green tissue (especially root suckers) will result in translocation of the active ingredient into the tree with a negative impact on winter hardiness.
- The Gramoxone/Alion combination offered exceptional control at the 6 oz. / A rate tested. Consider using the lowest labeled rate of 5 oz./A, rotate to an alternative herbicide every third season for resistance management, and DO NOT apply to soils with greater than 22% gravel content. Quite a few Hudson Valley orchard soils have very a high gravel content.
- Often the reward for excellent weed control is often the establishment of Canada Thistle and Bindweed (Field & Hedge). Fall-applied Casoron is a solid general performer that offers some activity against Canada Thistle. Consider a June follow-up application of Stinger. An alternative strategy could be a half-rate of Stinger, with Casoron, in the fall, followed by a second half-rate Stinger application in June. Note that there is a label restriction on the total amount of Stinger that can be applied per year. Further research is underway to evaluate this and other strategies for thistle management.
- Caution is recommended when using Sinbar (terbacil) for weed control in NY -1 on gravelly soils. Two commercial blocks were observed with symptoms of terbacil injury in the Hudson Valley during the 2015 growing season. In both cases, the spring applications were followed by several inches of rainfall. The most severely affected trees eventually dropped damaged leaves. Adjacent varieties did not display symptoms.

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