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Fruit Notes

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Cornell Cooperative Extension
Lake Ontario Fruit Program

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The Use of Plant Growth Regulators Near Harvest

Terence L. Robinson, Mario Miranda Sazo and Craig Kahlke

The 2020 growing season started early with green tip in late March or early April. However, tree development slowed after green tip due to cold weather resulting in a late bloom in late May. This was followed by a hot and dry June and July. August is turning out to be warm and dry. How will the weather conditions of this very interesting season impact harvest date, pre-harvest drop, color development and fruit quality? We predict the following impacts:

- **Harvest date:** The late bloom date should result in a delay of harvest by 3-5 days but the warm temperatures of June should advance harvest by 3-5 days, thus harvest could be close to historical average date.
- **Pre-harvest drop:** The warm August should result in significant pre-harvest drop.
- **Color development:** The warm temperatures in August will delay color development, however, the temperatures of early September will be the determining factor.
- **Fruit size:** The warm and sunny conditions from mid-May through early July should have given good cell division and large size potential but the drought in June probably reduced fruit size of unirrigated orchards.
- **Bitter pit:** The dry weather from mid-May to mid-June reduced Ca uptake and should result in high bitter pit incidence.
- **Chilling injury:** The forecasted warm and sunny August should result in a low incidence of chilling injury.

There are four principal uses of PGR's near harvest.

- **Control preharvest drop**
- **Manipulate harvest date**
- **Control cracking, greasiness and internal flesh pigmentation**
- **Enhance red color development**

Preharvest drop control in 2020. There are three materials registered for control of preharvest drop in apples.

- **NAA** provides modest drop control but has the negative effect of stimulating ethylene production and fruit ripening. Since NAA stimulates ripening and often gives limited drop control when applied alone, we do not recommend the use of NAA alone. If growers use NAA on drop prone varieties like McIntosh they should apply when the first sound fruit drops and apply a high rate (20ppm) and then pick the fruit within 10-14 days of application. If harvest is delayed the fruit will begin to drop very rapidly about 2 weeks after application. This fruit should not be stored for a long time but marketed before Christmas.
- **ReTain** reduces ethylene production and reduces preharvest drop. It is a much more effective drop control product than NAA and should be applied 1-4 weeks before anticipated normal harvest. The earlier ReTain is applied the greater the negative effect it has on fruit color and the sooner it wears off, but waiting too long will result in some ethylene production and some fruit drop before ReTain suppresses ethylene production but it takes about 7 days after application before it effectively controls ethylene production thus it is important to apply ReTain 7 days before ethylene production starts. (Follow ethylene development in Fruit Maturity reports). It also reduces fruit cracking and fruit



greasiness but it delays the development of fruit red color about 1 week. Its performance is improved when combined with NAA since the two products work synergistically to reduce fruit drop while the ReTain suppresses the production of ethylene by NAA.

- In recent years there are two trends that have become common with ReTain. The first is applying ReTain closer to harvest: With Gala and Honeycrisp the negative effects of ReTain on red color development can be reduced by delaying application until 2 or 1 week before harvest. The second is combining ReTain with NAA: The combination of ReTain and NAA has given better drop control than either chemical alone especially in hot years.
 - **McIntosh** We recommend a combined application of ReTain (1 pouch) + NAA (10ppm) 3 weeks before expected first harvest when August weather is warm (but not hot) such as 2020. For WNY we have estimated the CA cutoff date for McIntosh to be Sept. 24 and expected harvest about 10 days earlier Sept. 14. Thus the suggested date for the first application of ReTain + NAA would be 3 weeks earlier on Aug. 24. If hot weather continues into September then apply a second application of the same tank mix 2 weeks after the first application
 - With **Gala** we recommend the application of only ½ pouch/acre of ReTain for older less well-colored strains and 1 pouch/acre of the newer high coloring strains. Apply 2 weeks (or even 1 week) before expected first harvest. In 2020 we estimate Gala harvest will begin on Sept 7 thus the suggested date to apply ReTain is August 24. ReTain will permit Gala fruit to remain on the tree an additional 14-21 days resulting in improved fruit size (1 box size with a 21 day delay), good color development and less stem end cracking. ReTain delays maturity but results in a more even maturity on the tree. Multiple picks on Gala can be reduced to 2 or even 1 picking in some cases. ReTain also reduces fruit stem end cracking and greasiness that are problems as Gala fruits mature in the second and third picks
 - **Honeycrisp** is a low ethylene producing variety that has very uneven ripening but can have significant pre-harvest drop in some years. We recommend a very low rate of 1/3 pouch per acre of ReTain applied 1-2 weeks before expected harvest in blocks which have had a drop problem in the past. In 2020 we estimate Honeycrisp harvest too begin on Sept. 14 and our suggested application date is Sept 1. A note of caution: ReTain (or Harvista) on Honeycrisp can have negative consequences during storage of this variety. If the risk of bitter pit is high then ReTain will increase the bitter pit incidence after harvest. The decision on whether to use ReTain or Harvista on Honeycrisp should be made only after an assessment of the risk of bitter pit development.
 - **For late September and October varieties** the negative effect of ReTain on fruit color development is much less than in early September varieties, thus we suggest the use of the full pouch/acre of ReTain to provide a consistent reduction of fruit drop and greasiness. For late September and October varieties which are harvested under cooler conditions, application timing should be 3 weeks before normal harvest date (10-15 of September). Treating **Empire, Delicious and Jonagold** provides some flexibility in harvest date since those three varieties need to be harvested at about the same time. **Cortland and Jonagold** both suffer from greasiness problems as the fruit mature and ReTain applied 3 weeks before normal harvest can be a very effective control strategy. **Idared and Rome** both suffer from internal flesh pigmentation (bleeding), which can result in rejection of the fruit at the processing plant. Our research indicates this problem can be controlled effectively with ½ pouch/acre of ReTain applied in mid-September.

Reminder: It is critical to include an organosilicone surfactant with ReTain especially when combined with NAA. The organosilicone surfactant improves the uptake of ReTain better than other surfactants thus ensuring that sufficient ReTain is absorbed by the leaf to suppress the stimulatory effect of NAA on ethylene production.

- **Harvista** is a very effective drop control product which can be applied latter than ReTain (1 week or less before anticipated harvest). It does not suppress ethylene production but inhibits its action in the fruit and reduces fruit drop. It has a much more rapid action in the plant and can prevent fruit drop even when applied close to harvest. It has a long-lasting effect and will keep fruit on the tree more

than 4+ weeks which is longer than ReTain. However, like ReTain it also delays red color development. Harvista's active ingredient is MCP which is a gas and thus must be applied with specialized equipment to get consistent results. A note of caution of using Harvista on Honeycrisp. If the risk of bitter pit is high then Harvista will increase the bitter pit incidence after harvest. The decision on whether to use Harvista on Honeycrisp should be made only after an assessment of the risk of bitter pit development.

Improving Fruit Red Color in 2020

Red color development is likely to be delayed in 2020 due to warm (but not hot) weather in late August and Early September. We don't expect the lack of color development to be as severe as 2018 which was hotter in September than the current long range forecast for 2020. Using reflective film under the tree is a non-chemical method of improving fruit color. However, among the chemical methods of improving color there are 2 options which have been successful in our trials.

- **Ethrel** (300ppm) improves fruit color if applied 1 week before harvest but stimulates ripening and excessive drop 10 days after application. If NAA is mixed with Ethrel then drop can be delayed 10 days but if the fruit is not harvested on time then excessive drop will occur.
- **Blush** is a plant growth regulator featuring a jasmonate PGR (active ingredient prohydrojasmon PDJ). We found modest but significant improvement in red color when Blush is applied twice (3 weeks and 1 week before harvest of Honeycrisp. Its response was improved by combining with Stimplex (algae extract that has low levels of hormones. Also the response was improved by waiting for application until fruit are entering maturation (DA meter reading of 1.25).

Sample Later Next Week for Passive Model for Honeycrisp Bitter Pit Prediction!

On August 11, we hosted a Zoom webinar titled "Honeycrisp Bitter Pit Prediction Models" In which Drs. Terence Robinson and Chris Watkins presented on the continuation of our year-long Precision Crop Load Management in Honeycrisp. Please view the webinar here:

<https://youtu.be/kztJuVtY4yY>. In addition, the presenter's PowerPoint presentations are located here: https://rvpadmin.cce.cornell.edu/uploads/doc_912.pdf. On the webinar, Terence presented a summary of the peel sap analysis for bitter pit prediction that was collected from growers across Western NY. Chris followed with data supporting the use of his passive prediction model in making storage and marketing decisions, along with instructions on how to use the passive prediction model. Craig talked about a sampling protocol for the passive model and arrangements for fruit storage in commercial storages, along with help in evaluating the fruit. The full panel (Lailiang Cheng, Cornell, Mario Miranda Sazo, and Scott Henning, Lake Ontario Fruit, Inc.) was involved in discussion and question answering.

Following the webinar, it was decided that growers should sample fruit later next week for the passive bitter pit prediction model. Below is the protocol. (The protocol is also downloadable here:

https://rvpadmin.cce.cornell.edu/uploads/doc_911.pdf)

- 1) Between **Wednesday August 19 and Friday August 21**, select 100 fruit representative from a block (growers who submitted peel samples in July should sample the same trees/area of the block now in August). Flag the area and/or row(s) and/or trees to be sampled in 2020 for future fruit samplings in 2021 and beyond.
 - Sampling more trees are better than less trees
 - No less than 10 trees/block
 - No more than 2-3 apples/tree
 - Use a couple of cardboard fruit boxes or a small wooden or plastic crate or lug
- 2) Label with farm name, block #, date picked/put in storage, contact name #, email
- 3) Take to a participating storage
 - Wayne
 - Pomona & Empire growers can take their fruit to Lake Country Storage
 - Other options: KM Davies (Williamson) , Fowler Bros. (Wolcott), Cherry Lawn (Sodus)
 - Orleans

- Lake Ontario Fruit, Inc
 - HH. Dobbins
 - Niagara
 - Niagara Fresh (Bucolo Cold Storage)
 - Sun Orchards
- 4) LOF will evaluate fruit after ~ 21 days at room temp (Sep 9-11)

- 5) Will send data to rest of panel for evaluation and comparison to peel sap results, before 1st pick, hopefully by September 15

Questions? Contact Mario (315-719-1318, mrm67@cornell.edu) or Craig (585-735-5448, cjk37@cornell.edu).

▪ **Thanks to the Sponsors of our Prediction of Bitter Pit in ‘Honeycrisp’ Efforts!**

- Niagara Fresh, Inc. (Chris Bucolo)
- H.H. Dobbins (Justin Whipple)
- Fowler Brothers, Inc. (J.D. Fowler)
- Lake Ontario Fruit, Inc. (Scot Henning)
- LynOaken Farms (Chris Oakes)
- Pomona Packing, Inc. (Phil Smith)
- Sun Orchard Fruit Co. (Steve Riessen)
- Schwab Farms (Kent Schwab)
- Valent USA & Valent Biosciences (Jim Wargo, Mike Keller, Poli Francescato, Greg Clarke)
- Wayne County Fruit Sales (Scot VanDeWalle)
- Agro100, Lorne Bienstock Joliete (Quebec) Canada Mobile: (514) 220-3444
Email: l_bienstock@agro-100.com



Preparing for Harvest

Craig Kahlke

Now is the time to find your pressure testers (penetrometers) and refractometers (brix) testers – for possible suppliers, or to order new ones check the following links:

- for Wagner Instruments pressure testers: <http://www.fruittest.com/>
- or for refractometers, try Atago USA: <http://www.atago-usa.com/non-destructive-c283/>
- or Frostproof: <http://frostproof.com/fruit-testing/> (they have refractometers & pressure testers)

Wilson Irrigation has lots of testing equipment: <http://www.wilsonirr.com/ecommerce/testing-equipment.php>

- Get a notebook to record your testing results.
- **Iodine Orders – NOTE NEW PROCEDURE THIS SEASON** - We have two sizes available, pint (16 oz) size (\$10 each) or by the gallon (\$45 each). Starch charts are also available free of charge (Cornell scale

1-8). Due to the pandemic, we won't be stocking iodine at any CCE offices this season. LOF will deliver to a storage facility in your area. For iodine orders, please text or email Craig (585-735-5448, cjk37@cornell.edu) the quantities wanted, your location, and if you need any starch charts. You will be invoiced at the end of the season. Is last year's iodine still any good? Iodine can be stored for up to two years. It should be stored in an opaque container, out of sunlight in a cool dry place. If any holdover supplies last year did not receive proper storage or if you are unsure, it is best to buy new.

Crop Forecast:

We have a good size crop in Western NY- not a bumper crop by any means, but larger than we thought in spring. See Mark's past newsletter article (Issue 11) for the Premier Co-Op estimates in late June. In addition, the US Apple Outlook forecast is slated for August 20-21 online (register here: <https://usapple.org/events/outlook-2020>).

Harvest Maturity Date Predictions for Apples in Western NY

Craig Kahlke

Our very early green tip (late March to early April) gave way to a very cold April and the first half of May that brought us 7-7.5 weeks between GT and Full Bloom. That's got to be an all-time record. "Normal" is around 4 weeks. Despite last season's near-record late GT, FB dates were nearly identical this season as compared to 2019, around May 22 on average (vs May 21 for last year) for McIntosh. After winter in April and the first part of May this season, we jumped right into "summer" with very high temperatures around Memorial Day. The heat and very dry conditions continued for June well into July. While we've had more relief as of late in both cooler temps and increased precipitation, there are regions in our territory that are in severe deficits, while others have fared somewhat better. As of August 6th, most of our fruit growing region in Western NY is in a deficit that rates as "Abnormally Dry". This includes nearly all of Niagara, Orleans, Wayne, and Oswego counties. Only Monroe seems to have adequate rainfall. See current USDA Drought monitor maps at:

<https://droughtmonitor.unl.edu/CurrentMap/StateDroughtMonitor.aspx?Northeast>

As we've done for decades, we've put these FB dates in Macs into the Blanpied-Silsby CA cutoff model (See "Predicting Harvest Date Windows for Apples by Blanpied & Silsby, 1991 at: <https://ecommons.cornell.edu/bitstream/handle/1813/3299/Predicting%20Harvest%20Date%20Window%20for%20Apples.pdf?sequence=2&isAllowed=y>).

The model approximates last harvest dates for controlled atmosphere (CA) storage. While Macs in our region are in serious decline, we still feel the model has value for estimating the earliness or lateness of the harvest season for early varieties, and therefore helps growers time when to bring in labor for the start of picking.

We put temperature data into the model at selected NEWA weather stations in our region, with Full Bloom and then it calculated CA Cutoff Dates. While the average FB date is a day later than last year, the average CA cutoff date is predicted to be 6 days earlier, at September 24 (**Table 1**). This means pick dates for Mac should start ~10 days earlier, or around September 14.

Table 1. Full Bloom & Corresponding CA Cutoff Dates for McIntosh, 2020 vs 2019, for Select NEWA Weather Stations in Western NY

NEWA Station	2020		2019	
	FB	CA Cutoff	FB	CA Cutoff
Albion	21-May	24-Sep	NA	NA
N. Appleton	23-May	26-Sep	NA	NA
Ashwood	23-May	26-Sep	NA	NA
Burt	23-May	26-Sep	22-May	1-Oct
Butler	20-May	22-Sep	2-May	29-Sep
Fairville	20-May	24-Sep	NA	NA
Knowlesville	21-May	23-Sep	NA	NA
Lyndonville	22-May	24-Sep	NA	NA
Medina	21-May	23-Sep	20-May	27-Sep
Pt. Breeze	22-May	22-Sep	NA	NA
Ransomville	23-May	24-Sep	NA	NA
Sodus - Cherry Lawn	21-May	24-Sep	NA	NA
Sodus - Lake	22-May	25-Sep	NA	NA
Sodus	20-May	24-Sep	21-May	30-Sep
Waterport	21-May	23-Sep	NA	NA
Williamson - Mason	21-May	25-Sep	21-May	30-Sep
Williamson - Orbaker	23-May	26-Sep	NA	NA
	2020		2019	
AVERAGE (n=17 for 2020, n=5 for 2019)	22-May	24-Sep	21-May	30-Sep

Another overall maturity indicator is growing degree days. For harvest maturity approximations, we use GDD (base 39) accumulation from April 1 to date (August 10th for comparison purposes thus far) of each year (**Table**

2). With our much hotter late spring and early summer in 2020 as compared to last season, the average GDD accumulation is 2946. For the much cooler late spring/early summer of 2019, the GDD was only 2783 at the same time point. The extended heat/drought year of 2018 was higher than both, at 3029. If the average GDD at this point in 2020 is 163 ahead of 2019, and if we use a 25 GDD average this would put the picking dates for early season apple varieties about 6 ½ days ahead.

To summarize, looking at these two models, the Mac CA Cutoff model of Blanpied & Silsby is predicting harvest to be 6 days ahead of last year, and the GDD model base 39 is predicting ~6.5. However, you have to take into

Table 2. Growing Degree Day Calculator, base 39, accumulation April 1 through August 10th of each year. Courtesy of NEWA.

NEWA Station	GDD Accumulation, April 1 - August 10			This season, #GDD ahead of <u>2019</u>	This season, #GDD BEHIND <u>2018</u>
	2020	2019	2018		
Albion	2998	2890	3140	108	-142
N. Appleton	2901	2677	2921	224	-20
Ashwood	2925	2749	3012	176	-87
Burt	2900	2727	2964	173	-64
Butler	3031	2938	3114	93	-83
Fairville	2892	2674	2982	218	-90
Knowlesville	2935	2830	3118	105	-183
Lyndonville	2971	2825	3077	146	-106
Medina	2992	2908	3112	84	-120
Pt. Breeze	3132	2932	3191	200	-59
Ransomville	3038	2926	3159	112	-121
Sodus - Cherry Lawn	2915	2740	2991	175	-76
Sodus - Lake	*	2709	3056		
Sodus	*	2743	2972		
Waterport	2934	2758	3014	176	-80
Williamson - Mason	2840	2703	2829	137	+ 11
Williamson - Orbaker	2789	2585	2842	204	-53
AVERAGE	2946	2783	3029	155	-85

* NEWA Growing Degree Day Calculators could not calculate GDD accumulation for Sodus Lake and Sodus stations for 2020.

account that weather patterns throughout the month of August can sway maturity in either direction. Continued hotter than normal could still advance maturity, while cooler than normal could delay it. Also keep in mind that trees with lighter crop loads tend to have advanced maturity; those with heavier crop loads should see delayed maturity. Variable crop loads within blocks can also having different maturation, making harvest difficult, especially in a variety that is supposed to be single pick. Severe stress, such as in the form of drought, can delay maturity and/or make it unpredictable.

I'd pin harvest at 4-7 days ahead of last year. If you keep detailed records of harvest dates of your early varieties, the historical average should be very close, as last year was a late year for the start of harvest. For comparison to 2018 (even hotter and drier than this season), perhaps 3-3.5 days later. Looking at the monthly forecast (AccuWeather™) it looks to be slightly cooler than normal high temps at this point, but mainly warmer than normal nighttime lows, which is not conducive to ideal fruit

coloring. This will delay color. If continued dry weather, fruit size could further delay harvest, especially with PGR use, which is what happened in 2018, 2016, and several other years in the last decade. I'm going to look at Paula Red, Zestar!™, Ginger Gold, Premier Honeycrisp™ and Bartlett pears later next week. Look for the first Harvest Maturity Report on Friday, August 21.

Statewide Harvest PGR and Storage Webinar from August 4th on CCE-ENYCHP's YouTube Channel Page

The ENYCHP & LOFP co-hosted a Harvest Plant Growth Regulator and Storage webinar on Tuesday August 4th, that was proudly sponsored by AgroFresh and Valent USA.

Here are the links to the videos (broken up into speakers) and slidesets: <https://www.youtube.com/playlist?list=PLk2Q-bw9Aiu4R2hE6tEQOCsb9NT-tdDT>

This webinar covers the use of plant growth regulators for fruit quality and harvest management, as well as the effects of PGRs on storage quality. Speakers include Dr. Terence Robinson of Cornell University, Keith Culver of AgroFresh, Dr. Greg Clarke of Valent USA, and Dr. Chris Watkins of Cornell University.

Sampling Help Needed West of Rochester for the Harvest Maturity Program This Season!

Craig Kahlke

The collecting of samples for the Harvest Maturity Program (HMP) is extremely important. In the past, I was able to grab a few from sites in Niagara County and then rely on growers, field men from packinghouses, and crop consultants to collect samples and either deliver them to the testing sites (Orleans County Cornell Cooperative Extension on Mondays, K.M. Davies, Inc. on Tuesdays) or drop them at another location for pickup by LOF. Retirement and other duties has limited our sampling help in recent years. Therefore, Liz (our super technician!) and I have had to spend a lot of time collecting samples (mainly in Niagara & Orleans Counties on Mondays). This takes significant time away from the actual testing. If we can't get significant help in testing this season, we have to run less samples, which means less data points and less reliable maturity data.

What are the pros of collecting samples for your farm/neighborhood farms? You get the benefit of internal ethylene (IE) testing using a gas chromatograph. For most varieties, this is the only indication of true maturity. When apples such as Empire, McIntosh, and Red Delicious start producing measurable IE, they have entered the maturation phase and time is short to begin harvest for longer-term CA potential. We also perform firmness (in PSI with a FTA unit), brix (in % total soluble solids with a hand-held Atago unit), and the Starch Pattern Index (SPI) using a starch

iodine solution and the Cornell Starch Chart. You'll get this data emailed to you on a weekly basis, along with a spreadsheet of the other farms/blocks tested.

Sampling Protocol for the HMP: Craig emails how many samples he's looking for (for each variety) the day before and provides a label template (includes grower, block, variety, irrigated/non-irrigated, PGR's, crop load, etc) for printing at home. Collect 11-12 representative fruit from one block to make one sample. Don't take all from 1 tree. I like to sample from across the block. Guidelines: For a multiple pick variety such as Gala or Honeycrisp, pick the most mature (nearest to the next pick). For a single pick variety, randomly select the fruit but don't choose shaded fruit from too deep in the canopy. For all samples, avoid overly over-mature and under-mature fruit. Place the samples in a fruit bag that can hold a dozen mature fruit or a plastic shopping bag. Due to NYS restrictions, these may be hard to come by this season. Make sure a paper label is added. The samples can be dropped off Mondays before noon at Orleans County Cooperative Extension or arrangements can be made to meet Craig or drop the samples in a convenient location. Craig emails the data that late afternoon or evening, that is compiled with all other maturity samples.

Interested? Questions? Contact Craig at 585-735-5448 or cjk37@cornell.edu.

Apple Storage Recommendations for 2020

Michael Basedow & Daniel J. Donahue, CCE Eastern NY Commercial Horticulture Program

When it comes to storing fruit long term, there are a number of factors to keep in mind. Below we've reviewed the key storage recommendations for Honeycrisp, Gala, NY-1, NY-2, Mac, Cortland, and Empire, along with a quick comparison of utilizing dynamic controlled atmosphere (DCA) storage and 1-MCP.

Honeycrisp

Fruit in air or CA should be stored at 38°F as any lower temperature is risky. Conditioning for 7 days at 50°F reduces soft scald, but will likely exacerbate bitter pit. (Figure 1) The decision to condition or not should be determined by your block history and results of prediction protocols. If a block is very vulnerable to bitter pit, it is likely best to skip conditioning.

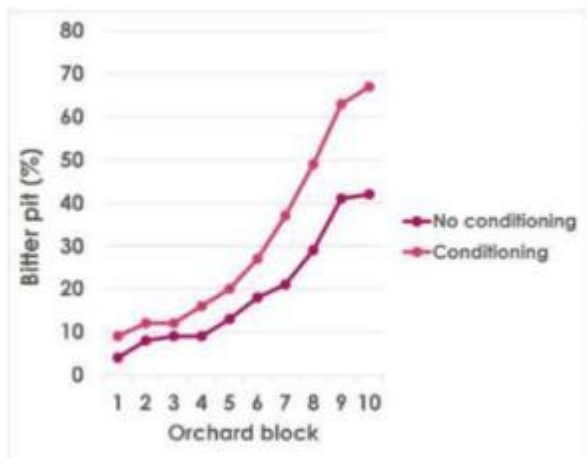


Figure 1. Conditioning and Bitter Pit Incidence

Soft scald can be particularly prominent if fruit are stored at lower temperatures, closer to 33°F, but risk is lowered if fruit are conditioned. While not always a problem, some extensive soft scald losses were observed in the Hudson Valley in 2019 when fruit were stored at these lower temperatures without conditioning. If a 38°F room is absolutely not possible, precondition fruit and do not store for more than 2 months. Monitor fruit condition regularly for development of off-flavors as this can be a sign of pending fruit damage.

Air stored fruit can be treated with 1-MCP, as it will help fruit retain acceptable levels of acidity. 1-MCP may decrease the incidence of bitter pit and senescent breakdown.

An increasing number of growers are using Harvista to manage their Honeycrisp harvest. Chris's recent work found that Harvista decreased soft scald, but increased bitter pit incidence of stored fruit. Fruit treated with a combination of Harvista and 1-MCP also had a greater incidence of leather blotch.

For fruit destined for CA storage, CO₂ injury can be problematic, and is generally worse further south in the state. CO₂ injury can be controlled with diphenylamine (DPA), or by delaying CA storage by up to 4 weeks. In Chris's studies, fruit that were delayed CA storage for up to 4 weeks and treated with 1-MCP had very little loss of fruit quality, but greasiness and core browning did increase to a small extent.

Chris's overall recommendation for Honeycrisp currently is air storage with 1-MCP to avoid CA related injuries. Storages should be high quality however, i.e. modern CA-like storages with good control of temperature.

Gala

A major concern for Gala right now is stem end flesh browning (SEFB). So far we know that:

- Harvista or ReTain decrease the incidence of SEFB.
- DCA at 0.5% O₂ delays browning development, but will not completely prevent it. DCA may also prevent core browning.
- 1-MCP treatment has inconsistent effects on SEFB incidence. Washington State and Ontario studies suggest delayed cooling, paired with early CA storage, may help to reduce some browning disorders. This approach needs more study in New York conditions.

Regardless of storage treatment, being on top of harvest date (erring earlier than later) and planting high-coloring strains like Brookfield that can be picked earlier are two of the best strategies for successful long-term storage of Gala .

NY-1

For successful long-term CA storage of NY-1, the current recommendation is to focus on your harvest management. NY-1 should be picked as

early as possible to avoid fruit with high internal ethylene, though this may require compromising between ethylene and fruit color. Fruit should be stored at 38°F like Honeycrisp to reduce stem end flesh browning. 1-MCP should not be used for long term storage of NY-1, as it increases flesh browning. Fruit are susceptible to CO₂ injury.

NY-2

Similar to NY-1, Chris suggests early harvest timing is key to maintaining good quality for long term CA storage. NY-2 should also be stored at 38°F. 1-MCP is recommended for NY-2. In Chris’s studies, 1-MCP helped retain firmness, and reduced superficial scald and stem end flesh browning. It did, however, lead to some additional general flesh browning.

McIntosh

1-MCP helps keep Macs firm on the shelf after long-term storage, and will also help reduce superficial scald and senescent breakdown. It may, however, slightly increase CO₂ injury, and maintaining low CO₂ in the CA storage for the first 4-6 weeks is critical. CO₂ levels should then be increased as maintaining lower levels will compromise maintenance of firmness. DPA eliminates any concerns of CO₂ injury, and there is no need to be concerned about risk of injury.

Cortland are hard to control against superficial scald regardless of postharvest treatments, but both DCA and 1-MCP help to some extent. DCA plus 1-MCP returned the best fruit in Chris’s trials, but he added expense might not make this approach feasible commercially. DCA helps maintain fruit quality regardless of 1-MCP treatment, but a tasting panel found that Cortland stored with 1-MCP maintained a better level of ‘snap’ after storage. Continued use of DPA is strongly recommended.

1-MCP treated **Empire** tend to retain their firmness better, but may be more susceptible to CO₂ injury and flesh browning. For Empire flesh browning, the best way to keep levels down is to harvest early. Later picks will develop more browning, regardless of 1-MCP practices.

How does DCA stack up to 1-MCP?

Dynamic controlled atmosphere (DCA) is a storage method that actively measures fruit response to storage oxygen levels to determine the optimum oxygen level for that storage room. By keeping the oxygen level just above the “low oxygen limit”, respiration rate can be reduced to a minimum. By slowing respiration further, fruit quality out of DCA storage is higher, with less superficial scald. Below are some of the benefits (+) and negatives (-) of using DCA and 1-MCP (Tables 1 & 2).

Table 1. Benefits and Negatives of using DCA:

<i>Benefits</i>	<i>Negatives</i>
<ul style="list-style-type: none"> + Chemical Free + Easily installed in existing high quality storages + Can inhibit superficial scald and some internal flesh browning disorders + Some post-storage residual benefits 	<ul style="list-style-type: none"> - Need to have that high quality facility - Higher upfront investment costs, depending on system, e.g. purchase for HarvestWatch, leasing for Safe Pods - Storing fruit closer to oxygen levels at which injury can occur, and therefore higher risk - Need to select uniform fruit to serve as your samples: HarvestWatch allows different lots in a room to be measured, while Safe Pods are based on a single sample of fruit to represent the entire room - Greater potential for quality loss after storage, unless combined with 1-MCP

Table 2. Benefits and Negatives of using 1-MCP:

<i>Benefits</i>	<i>Negatives</i>
<ul style="list-style-type: none">+ Applied as a gas at low concentrations for 24 hours or less+ High quality rooms not required+ No investment on computerized CA technology+ No risk of low O₂ injury+ Flexible timing of 1-MCP application+ Can maintain fruit quality in air storage+ Can inhibit superficial scald development+ Maintains quality parameters, like firmness and acidity, during the marketing chain	<ul style="list-style-type: none">- Not for organic use- Ongoing cost every time you apply- Can increase some physiological disorders, such as CO₂ injury and some flesh browning disorders, depending on variety.

Brown Marmorated Stink Bug in WNY – monitoring and biological control

By Janet van Zoeren and Peter Jentsch

We are looking for sites to release the Samurai Wasp, natural enemy of the BMSB!

We are looking for new sites, with significant BMSB populations, where we can release the Samurai Wasp.

Samurai wasp (*Trissolcus japonicus*) is a parasitoid wasp, which lays its eggs inside the egg of BMSB. The hope is that *T. japonicus* will establish itself in our region, and provide long lasting management of BMSB.

If you have seen a lot of BMSB (either in your orchard or in your house) last year, please contact me soon (see contact info below) so that I can include your location in our upcoming release of these BMSB natural enemies.

Janet van Zoeren – jev67@cornell.edu ; 585 797 8368

The brown marmorated stink bug (BMSB) is an invasive insect pest of fruit crops in New York state and across the United States. BMSB feeds on a wide range of seeds and fruits, including apples, peaches, grapes, nuts, vegetable crops and many of our native tree species.

One of the more promising control methods for BMSB is the release of the natural predator, *T. japonicus* (the “samurai wasp”), which is a biological control agent from the native range of BSMB. These tiny, stingless wasps lay their eggs inside the eggs of BMSB and occasionally native stink bugs. The larval wasps feeds on and kills the stink bug egg, before pupating and emerging as an adult wasp.

T. japonicus has been found in New York (it arrived on its own, presumably inside a BMSB egg mass that was accidentally imported from Asia to the US). Now that it is “established” in the state of New York, we are allowed, by the DEC, to rear a colony and release these wasps, to try to augment their population and contribute to the control of BMSB.



Trissolcus japonicus adult. Photo by Elijah Talamas, USNM.

The Jentsch lab has been rearing and releasing *T. japonicus* in western NY since 2017. It appears that the wasps are able to lower BMSB populations during the year they are released, although it is so far less clear if they are able to successfully overwinter and establish themselves as a more permanent control strategy.



Newly emerged brown marmorated stink bug nymphs, surrounding their egg shells.

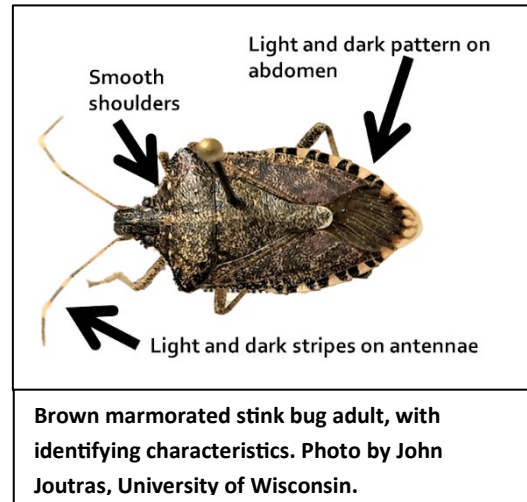
Identification. Brown marmorated stink bug looks similar to many of our native stink bugs. However, BMSB adults can be differentiated from native stink bugs by their size (1/2" to 3/4" long), alternating white and black pattern on the edge of the abdomen, white bands on the antennae, and smooth shoulders (lacking spines). A common look-alike, the dusky stinkbug, is much smaller and has pointed shoulders, whereas BMSB is larger with smooth, rounded shoulders. BMSB eggs are light green, and laid in a cluster on leaves of potential host-plants. The nymphs start off red and black, then turn brown as they molt and mature. As they turn dark, they can even be mistaken for ticks (but can be differentiated

because stink bugs, as insects, have 6 legs, whereas ticks have 8).

Monitoring effort. You can monitor for BMSB using either a black pyramid trap, generally about four feet tall, with a collection jar containing a kill strip at the top of the trap, or a clear sticky panel trap mounted about 4-5 ft above the ground. Either trap uses a lure with an aggregation pheromones to attract BMSB. Lures are attractive to native stink bugs as well.

Regardless of which trap you use, research in apple orchards has shown a provisional economic threshold of **10 BMSB adults per trap per week**. Traps are typically set along the orchard borders, to intercept BMSB as they often fly into the orchard from surrounding woods and hedgerows.

In western NY, we have caught BMSB nymphs and adults already this year in our monitoring traps.



Brown marmorated stink bug adult, with identifying characteristics. Photo by John Joutras, University of Wisconsin.

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Craig Kahlke

Now is the time to renew your subscriptions to the Harvest Maturity Reports if you have not done so. Your \$60 subscription (if in the Lake Ontario Fruit Program partner counties of Niagara, Monroe, Orleans, Oswego and Wayne) gets you critical information on a weekly basis during apple harvest. Fruit samples are collected early in the week from across the region and sampled for internal ethylene concentration, firmness, starch/iodine, and total soluble solids. Results are summarized and recommendations for harvest windows of major apple and pear varieties are either faxed or emailed to subscribers late in the week. Satellite subscribers outside of the four county regions can receive reports as well, for \$100.

MARK YOUR CALENDARS

- August 17th – NEDPA Webinar: Important Updates to New York Farm Labor Laws in 2020, 11:30AM. Register at: https://cornell.zoom.us/webinar/register/WN_J8BBeyfzQtyd6PjHa128UQ
- August 20th – Food Industry Virtual Office Hours, Grocery Industry Virtual Office Hours: Consumer Education and COVID-19. 10:00AM-11:00AM – Register at: https://cornell.zoom.us/webinar/register/WN_ods7J5hXRjeVQGwQVViOlg

Cornell Cooperative Extension

Lake Ontario Fruit Program

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Sampling Help Needed West of Rochester for the Harvest Maturity Program This Season!

Apple Storage Recommendations for 2020

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Fruit Notes

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Fruit Specialists



Craig Kahlke | 585-735-5448 | cjk37@cornell.edu
Team Leader, Fruit Quality Management

Areas of Interest: Fruit Quality and factors that affect fruit quality before, during, and after storage,
Crops: Blueberries, Raspberries / Blackberries, Strawberries, Apples, Apricots, Cherries, Nectarines, Peaches, Pears, Plums



Mario Miranda Sazo | 315-719-1318 | mrm67@cornell.edu
Cultural Practices

Crops: Blueberries, Raspberries / Blackberries, Strawberries, Apples, Apricots, Asian Pears, Cherries, Currants, Gooseberries, Nectarines, Peaches, Pears, Plums



Janet van Zoeren | 585-797-8368 | jev67@cornell.edu
Integrated Pest Management (IPM)

Areas of Interest: IPM of tree fruit and berry pests, biological control, and pollinators.
Crops: Blueberries, Raspberries / Blackberries, Strawberries, Apples, Apricots, Asian Pears, Cherries, Currants, Nectarines, Peaches, Pears, Plum



Mark Wiltberger | 315-272-8530 | mw883@cornell.edu
Business Management

Crops: Apples, Cherries, Nectarines, Peaches, Pears, Plums

For more information about our program visit us at lof.cce.cornell.edu

Harvest Maturity Report Subscription

Please print and submit this form with a check for \$60, (\$100 for those who live and farm outside of Monroe, Niagara, Orleans, Oswego and Wayne counties) made payable to

“Cornell Cooperative Extension” or go online and fill it out at:

https://lof.cce.cornell.edu/submission.php?id=309&crumb=harvest_storage|harvest_storage

And mail to: Orleans County CCE

Attn: Kim Hazel

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