Sample August 19th-23rd
for Passive Model for Honeycrisp Bitter Pit Prediction!

Craig Kahlke, Chris Watkins, Mario Miranda Sazo, Terence Robinson, Lailiang Cheng

Running the GDD model (base 39), with accumulations from April 1 – August 10, compared to last year, we vary between 3 days later than last year to 4 ½ days earlier, depending on the weather station. There is no pattern (inland vs lake, east vs. west) either. Therefore, we predict the first pick Honeycrisp will occur the week of September 12 for most in our region. Therefore, the suggested sampling timing for collection of Honeycrisp for the passive bitter pit prediction model developed by Dr. Chris Watkins is between August 19 and August 23.

Below is the protocol:

1) Between **Friday August 19 and Tuesday August 23**, select 100 representative fruit from a block (growers who submitted peel samples in July should sample the same trees/area of the block now in August). Try to target August 19-20 to give extra time before harvest begins. If you did not do so last year, flag the area and/or row(s) and/or trees to be sampled in 2022 for future fruit samplings in 2022 and beyond.
   - Sampling more trees is better than fewer trees
   - No less than 20 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 or onion bags
2) Label with farm name, block #, date picked/put in storage, contact name #, email
3) Take to a participating storage
   - Wayne
     - Pomona & Empire growers, and others can take their fruit to Lake Country Storage
     - Other options: KM Davies (Williamson), Cherry Lawn (Sodus)
   - Orleans
     - Lake Ontario Fruit, Inc
     - HH. Dobbins
   - Niagara
     - Niagara Fresh (Bucolo Cold Storage)
     - Sun Orchard Fruit Company
4) LOF will evaluate fruit after ~ 21 days at room temp (September 8-12)
5) Cornell will send data to growers and their packers along with results of the peel sap nutrient levels, hopefully before 1st pick to assist in storage decisions for each block of fruit to maximize its post-harvest performance.

Note: Even if you did not submit peel samples in July, it is still beneficial to collect fruit for the passive model. An accurate assessment of bitter pit risk can help determine storage and marketing decisions that can save you money.

For more background information, please review 202's (8-11-20) 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.

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

The Use of Plant Growth Regulators Near Harvest

Terence L. Robinson, Mario Miranda Sazo and Craig Kahlke

The 2022 growing season started later than usual (compared to the last 15 years) with green tip in mid-April. Tree development slowed somewhat with a cool April and early May. However, a warm-up from May 10th-15th brought temps in the upper 70's to lower 80's, and with it, full bloom. Bloom was fairly rapid, and there were good pollination conditions. Below average rainfall persisted through the rest of spring and into early summer for Monroe, Orleans and Niagara counties. At the time of this article, all of these three counties are still abnormally dry (USDA Northeast Climate Hub Drought monitor from August 9). The western third of Wayne County is also abnormally dry, while the rest of the county and Oswego County have had average rainfall.

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: GDD accumulations were tracked (base 39 F), from April 1- August 10 in most NEWA stations on/near apple farms in our region. Using a 22.7 GDD per day for the rest of August and early September (average accumulation for that period for the past 3 years), this would put the picking dates for early September apple varieties ranging from three days later than last year to 4 1/2 days ahead of last season, with an average of only 2 days ahead. (I've never seen such a range across weather stations, and there is no pattern comparing inland vs. lake, west vs. east).

- Pre-harvest drop: We had approximately 6 days in May-June, 8 days in July, and 4 days in August thus far in which temperatures have topped out between 85-91F. Given the high temps are only ~20% of the last 90 days, I would expect there would be only a moderate risk of preharvest drop.
- Color development: The projected forecast for the remainder of August is about 1F cooler than average for highs, an about 1.5F warmer for lows. In addition, there looks to be a lot of cloudy weather in the forecast, which will delay color development, however, the temperatures of early September can also be determining factors. We have had a string of cool nights (lows even in the upper 40's in some places) last week and an average number in July. Thus, we expect a good coloring year.
- Fruit size: There should be reduced fruit size of unirrigated orchards in the droughty areas of Niagara, Orleans, Monroe, and western Wayne Counties. If these have been irrigated properly (especially during cell division), then fruit size should be good. The wetter areas of west/central Wayne Counties and Oswego County should have good fruit size.
- Bitter pit: While we would predict that dry weather in the above counties from mid-May to mid-June should have reduced Ca uptake and should result in high bitter pit incidence, our early peel sap results are pointing to fairly good Ca ratios, and a lower risk of bitter pit overall. However, this is extremely block dependent.
- Chilling injury: The forecasted average temperatures and rainfall for the rest of August and average temperatures and precipitation in September should result in a low incidence of chilling injury.

There are four principal uses of PGRs near harvest.

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

Preharvest drop control in 2022. 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. It takes about 7 days after application before ReTain 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. **Consult your Valent representative for more information.**

  - **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 2022. For WNY we have estimated the start of McIntosh harvest for early sites to begin September 10. Thus, the suggested date for the first application of ReTain + NAA would be 3 weeks earlier on Aug. 20. 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 2022 we estimate Gala harvest will begin on Sept 6 thus the suggested date to apply ReTain at the 2-week timing is August 23. 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. 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. ReTain also has reduced Stem End Flesh Browning during storage (Chris Watkins data) and thus ReTain is a suggested strategy for fruit destined for long term storage where Stem End Flesh Browning can be a severe problem.
  - **Honeycrisp** is a variable 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 2022 we estimate Honeycrisp harvest to begin on Sept. 12 and our suggested application date for the 2-week timing is August 29. 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 risk.

- **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 (9-15 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 closer to harvest 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 risk. **Consult your AgroFresh representative for more information, and application timing, based on the starch pattern index.**

Improving Fruit Red Color in 2022

Red color development could be delayed in 2022 due to warm (but not hot) weather with cloudy weather in late August and Early September. We don't expect the lack of color development to be as severe as in past years which have had warmer weather in September than the current long-range forecast for 2022. 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 buy 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 improvements 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).