

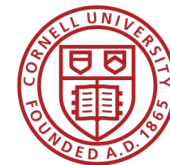
Are combinations of ReTain™ & Harvista™ better than either alone?



PGR's for Harvest Management

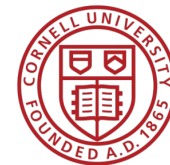
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Management, Team Leader

In-Depth School, Syracuse, NY 3-27-19



Background

- **Based on a 2 year study looking at Applications of ReTain, Harvista, and Combinations using Multiple Timings for the Improvement of Postharvest Fruit Quality on Gala, Honeycrisp, and Fuji**



Objectives

- How late can we go ? (weather-permitting)
- Acceptable fruit quality on last pick?
 - Color? Firmness? Brix? Disorders?
- Ideal quality on 2nd pick?
- Can we reduce rain cracking in Gala?
- Can we reduce the number of picks in Honeycrisp & Gala?
- Drop reduction in Honeycrisp?
- Watercore reduction in Fuji?



Procedures- 2017 & 2018

- 2 Gala blocks
- 1 Honeycrisp block
- 1 Fuji block
- RCB design, 7-8 treatments, 3 reps
- 3 Harvests – H1 at anticipated correct maturity of the UTC, H2 7 days later, H3 7 days later



Procedures- 2017 & 2018

- All Retain and Harvista applied with Solo™ Motorized Mistblower
- 2-4 tree treatments, with border trees on either side
- Same blocks and trees used both years, but treatments adjusted slightly





Harvest/Storage/Evaluation Methods Both Years

- 35 fruit per harvest per rep
 - 25 to commercial storage, all MCP-treated
 - Storage (CA or RA) determined by harvest maturity
 - 10 for harvest maturity
 - Internal ethylene, firmness, brix, SPI





Postharvest Evaluations Both Years

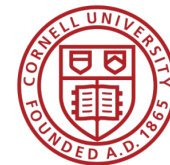
- 25 fruit per rep in storage, to room temp (RT)
 - Evals at 1 day RT and 7-8 day RT (12-13 fruit evaluation)
 - firmness, brix, % color, external and internal disorders

Treatment List Comparison - Gala

| # | Treatments 2017 |
|---|---|
| 1 | UTC |
| 2 | Retain half pouch/A @ 3-4 WBH |
| 3 | Retain full pouch/A @ 1WBH |
| 4 | Harvista ^A @ Starch Timing A = 1.5 SPI |
| 5 | Harvista ^A @ Starch Timing B = 2.5 SPI |
| 6 | NOT DONE Harvista ^A C = 3.5 SPI * |
| 7 | Retain ½ pouch/A @ 3-4 WBH + Harvista ^A @ 1 WBH |
| 8 | Retain full pouch/A @ 1 WBH + Harvista ^A @ 1 WBH |

A – Harvista rate too low B = Harvista 1.3 SC applied at correct rate 60 G ai/A

| # | Treatments 2018 |
|---|---|
| 1 | UTC |
| 2 | Retain half pouch/A @ 3 WBH |
| 3 | Retain full pouch/A @ 1WBH |
| 4 | Retain half pouch/A @ 1 WBH |
| 5 | Not Done (missed early Harvista timing) |
| 6 | Harvista ^B @ Starch Timing B= 2.5 SPI |
| 7 | Retain ½ pouch/A @ 3 WBH + Harvista ^B @ 7 DBH |
| 8 | Retain full pouch/A @ 1 WBH + Harvista ^B @ 1 WBH |



2017 vs 2018

2017- Weather patterns “normal” and spray timings and harvests ideal

Some Gala Harvests went to CA

All HC & Fuji to RA

Data shown H2 & H3 only

2018 – Hot/dry summer then rain/clouds 2 months of harvest

All fruit stressed, late harvest, all to RA

Data shown H2 only for Gala & Fuji, H2 & H3 for HC

Gala 2017

- Few disorders
- Good color, NS
- Firmness differences NS but shown
- Trt 8 always better than 7 in % red color in 2017

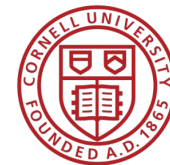
Across all 3 harvests (but NS)

7 = Retain ½ pouch/A & 3-4 WBH + Harvista 1 WBH

8 = Retain 1 pouch/A @1 WBH + Harvista 1 WBH



Gala Firmness 2017



| | Farm 1 - 8 Day RT | | Farm 2- 7-8 Day RT | |
|------|-------------------|------|--------------------|------|
| Trt. | H2 | H3 | H2 | H3 |
| 1 | 15.7 | 14.2 | 16.9 | 15.7 |
| 2 | 17.0 | 15.1 | 18.0 | 17.0 |
| 3 | 16.8 | 15.7 | 17.6 | 16.6 |
| 7 | 16.5 | 15.5 | 17.9 | 16.9 |
| 8 | 16.6 | 15.8 | 17.9 | 16.8 |

1 = UTC 2 = Retain Std 3-4 WBH 3= Retain 1 WBH
7 = Retain ½ pouch/A & 3-4 WBH + Harvista 1 WBH
8 = Retain 1 pouch/A @1 WBH + Harvista 1 WBH

Gala 2018

- Rain cracking extreme – no significant differences
- Poor color
- Firmness – few significant differences
- Trt 8 only better than Trt 7 in color on 1 farm
- Shrivel extreme postharvest
 - Only treatment differences in 3rd harvest (too late)

Farm 1 H3

Farm 2 H3

| Trt | % Shrivel | Trt | % Shrivel |
|-----|-----------|-----|-----------|
| 1 | 55 A | 1 | 51 A |
| 3 | 35 AB | 4 | 31 AB |
| 6 | 33 AB | 7 | 20 B |
| 4 | 16 AB | 8 | 18 B |
| 7 | 15 AB | 3 | 18 B |
| 2 | 10 B | 6 | 17 B |
| 8 | 10 B | 2 | 10 B |

1 = UTC 2 = Retain ½ pouch @3WBH 3= Retain 1 pouch @1WBH

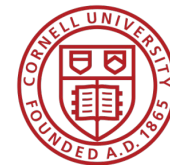
4=Retain ½ pouch @1WBH 6= Harvista Starch Timing B 2.5 SPI

7 = Retain ½ pouch @ 3WBH + Harvista 1 WBH 8 = Retain 1 pouch 1 WBH + Harvista 1WBH





Gala Firmness 2018



| | Farm 1 - 8 Day RT | | Farm 2- 7-8 Day RT | |
|------|-------------------|------|--------------------|------|
| Trt. | H2 | H3 | H2 | H3 |
| 1 | 15.0 | 14.4 | 14.0 AB | 14.8 |
| 2 | 14.9 | 15.5 | 16.5 A | 16.5 |
| 3 | 15.7 | 15.5 | 15.4 AB | 15.7 |
| 4 | 16.3 | 15.3 | 15.0 | 15.0 |
| 6 | 15.7 | 16.9 | 13.3 B | 14.4 |
| 7 | 16.4 | 17.7 | 15.6 AB | 15.9 |
| 8 | 16.2 | 15.3 | 15.2 AB | 15.4 |

Red numbers

STDEV > 1

Treatments not connected by the same letter are not significantly different

1 = UTC 2 = Retain ½ pouch @3WBH 3= Retain 1 pouch @1WBH

4=Retain ½ pouch @1WBH 6= Harvista Starch Timing B 2.5 SPI

7 = Retain ½ pouch @ 3WBH + Harvista 1 WBH 8 = Retain 1 pouch @ 1 WBH + Harvista 1WBH



Treatment List Comparison - Honeycrisp

| # | Treatments 2017 | # | Treatments 2018 |
|---|---|---|---|
| 1 | UTC | 1 | UTC |
| 2 | Retain full pouch/A @ 3-4 WBH | 2 | Retain half pouch/A @ 3 WBH |
| 3 | Retain full pouch/A @ 1WBH | 3 | Retain full pouch/A @ 1WBH |
| 4 | Harvista ^A @ Starch Timing A = 1.5 SPI | 4 | Retain half pouch/A @ 1 WBH |
| 5 | Harvista ^A @ Starch Timing B = 2.5 SPI | 5 | Not Done (missed early Harvista timing) |
| 6 | Not done = 3.5 SPI * | 6 | Harvista ^B @ ~Starch Timing B= 3.2 SPI |
| 7 | Retain ½ pouch/A @ 3-4 WBH + Harvista ^A @ 1 WBH | 7 | Retain ½ pouch/A @ 3 WBH + Harvista ^B @ 7 DBH |
| 8 | Retain full pouch/A @ 1 WBH + Harvista ^A @ 1 WBH | 8 | Retain full pouch/A @ 1 WBH + Harvista ^B @ 1 WBH |
| A – Harvista rate too low B = Harvista 1.3 SC applied at correct rate 60 G ai/A | | | |

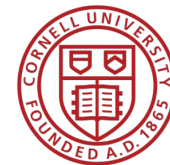
Honeycrisp 2017



- Firmness differences (not significant) but shown, not expected in this variety
- Color not ideal (shading in block)
- Drops collected – NS
- Postharvest losses high (did not precondition)



Honeycrisp Firmness 2017



| | Farm 1 - 8 Day RT | |
|------|-------------------|------|
| Trt. | H2 | H3 |
| 1 | 14.2 | 13.7 |
| 2 | 14.6 | 14.5 |
| 3 | 14.8 | 13.9 |
| 7 | 15.3 | 14.5 |
| 8 | 14.8 | 14.9 |

1 = UTC 2 = Retain Std 3-4 WBH 3= Retain 1 WBH

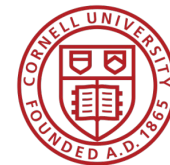
7 = Retain Std 3-4 WBH + Harvista 5 DBH 8 = Retain 1 WBH + Harvista 5DBH

Honeycrisp 2018



- Few disorders
- Poor color, NS
- Firmness differences (not significant) but shown

Honeycrisp Firmness 2018



| | Farm 1 - 8 Day RT | |
|------|-------------------|------|
| Trt. | H2 | H3 |
| 1 | 14.0 | 14.0 |
| 2 | 14.7 | 14.7 |
| 3 | 15.2 | 14.2 |
| 4 | 14.8 | 14.1 |
| 6 | 15.2 | 14.2 |
| 7 | 14.9 | 14.6 |
| 8 | 15.5 | 14.6 |

Red numbers
STDEV > 1

1 = UTC 2 = Retain ½ pouch @3WBH 3= Retain 1 pouch @1WBH 4= Retain ½ pouch @ 1WBH
6= Harvista Starch Timing B (3.2 SPI) 7 = Retain ½ pouch @ 3 WBH + Harvista 1 WBH
8 = Retain 1 pouch @1WBH + Harvista 1WBH

Treatment List Comparison - Fuji

| # | Treatments 2017 | # | Treatments 2018 |
|---|---|---|---|
| 1 | UTC | 1 | UTC |
| 2 | Retain full pouch/A @ 3-4 WBH | 2 | Retain half pouch/A @ 3 WBH |
| 3 | Retain full pouch/A @ 1WBH | 3 | Retain full pouch/A @ 1WBH |
| 4 | Harvista ^A @ Starch Timing A = 1.5 SPI | 4 | Retain half pouch/A @ 1 WBH |
| 5 | Harvista ^A @ Starch Timing B = 2.5 SPI | 5 | Harvista ^B @ late Starch Timing = 3.0 SPI |
| 6 | Not done = 3.5 SPI * | 6 | MISSED Early timing Harv.= 1.5 SPI |
| 7 | Retain ½ pouch/A @ 3-4 WBH + Harvista ^A @ 1 WBH | 7 | Retain ½ pouch/A @ 3 WBH + Harvista ^B @ 1 WBH |
| 8 | Retain full pouch/A @ 1 WBH + Harvista ^A @ 1 WBH | 8 | Retain full pouch/A @ 1 WBH + Harvista ^B @ 1 WBH |
| A – Harvista rate too low B = Harvista 1.3 SC applied at correct rate 60 G ai/A | | | |

Fuji 2017



- “Normal” during growing season, until ~ month before harvest
- Late September and most of October very warm
- Firmness differences NS, as expected with this variety
- Major watercore in 2nd and 3rd harvests
 - No treatments worked in reduction
 - Not as much of a problem with
 - new strains and early harvest









Fuji 2018



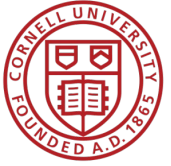
- “Hot dry during growing season, until late August
- Then wet and cool
- Firmness differences NS, as expected with this variety
- 3rd harvest still in storage - severe Watercore
- Major watercore in 2nd harvest
 - No treatments worked in reduction

Conclusions



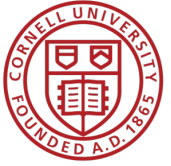
- Gala
 - Firmness differences – little statistical SD, but Retain + Harvista and Retain 1 WBH + Harvista 1WBH in general has better color than Retain 3-4WBH + Harvista 1 WBH
 - However Retain alone (different rates and timings) also show nearly equal benefit
 - Retain closer to harvest (1-2 weeks) can reduce impact of color delay used at 3-4 weeks timing
 - No treatments reduced rain cracking, but little RC in 2017 and severe RC in 2018

Conclusions



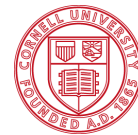
- Honeycrisp
 - Drop control NS in 2017, little drop in 2018
 - In 2018, PH quality good even in 3rd pick (10/10), Retain + Harvista (same timing as Gala above) – can possibly increase quality later picks & reduce the number of picks
 - Retain alone (different rates and timings) also show nearly equal benefit
 - Retain closer to harvest (1-2 weeks) can reduce impact of color delay used at 3-4 weeks timing

Conclusions



- Fuji
 - Too much watercore in older strains
 - No treatments worked in reduction
 - Early harvest best (no PGR's?)
 - Newer strains (Aztec) less WC
- More work needed in Gala and Honeycrisp

QUESTIONS?



Thanks!

- Valent -Greg Clarke and Jim Wargo
- Lakeside Orchards – Dan Ingersoll
- Kast Farms – Gary Davy, Brett Kast, Dave Kast
- Liz Tee – LOFT Technician
- AgroFresh - Keith Culver, Ken Silsby, Nick Michalisin, Chelsea VanAcker

