'Gala browning' and other apple storage issues

Chris Watkins

Hudson Valley Commercial Fruit Growers' School

Kingston, NY

February 15, 2017

Stem end browning in 'Gala'



Stem end flesh browning

- Appears to be an increasing problem in New York
 - higher fruit volumes = longer storage periods
- Orchard block factors are large
 - Strain effects?
- Problem elsewhere some Washington Orchards, Brazil

2013

- HARVEST DATE
- SPOT COMPARED WITH STRIP PICK
- CONDITIONING

2013 Harvest date and conditioning

- Commercial block of 'Gala' (Fulford strain)
- Untreated, Harvista (1 week before H1), ReTain (half rate 3 weeks before H1)
- Fruit harvest
 - 1. H1 spot pick
 - 2. H2 spot pick harvest all remaining fruit from 1.
 - 3. H2 strip pick (no harvest in week 1)
- On each harvest date, fruit either untreated or treated with 1 ppm SmartFresh, and then stored at 33°F, or 7 days at 50°F, before storage at 33°F.
- 4 months CA (2%/2%) plus 7 days at 68° F



Harvest 2 – week 2: second spot pick Stem end browning (%)



Harvest 2 – week 2: strip pick Stem end browning (%)





Flesh firmness (lb-f): Harvest 1 – spot pick



Summary 2013

- No effect of SmartFesh
- Conditioning reduced SEB, but effective mostly at first harvest
- Harvista consistently reduced SEB
- ReTain reduced at week 1, but not at week 2
- Harvista retained flesh firmness greater than fruit untreated or treated with SF, and no effect of conditioning

2014

• Two harvests – spot picks at two harvest dates

• Untreated and Harvista only

• 24 weeks storage in air, CA and DCA

2014 Stem end browning (%)

Harvest 1 (9/9/14)



2014 Stem end browning (%)

Harvest 2 (9/15/14)



Over both harvest dates

- Untrt = 71%
- Harvista = 30% ***

- Non cond. = 64%
- Cond. = 37%***







Using HarvestWatch to determine LOL in apple



DCA – Stem end browning (%) at 12 weeks DCA Air CA Trt Control 30 17 1 Control + SF 15 30 0 Harvista 25 0 7 Harvista + SF 23 0 7

DCA – Stem end browning (%) at 24 weeks DCA Air CA Trt Control 75 **67** 24 Control + SF 69 18 **67** Harvista 48 11 **40** Harvista + SF 62 44 7

MATURITY

Delta absorbance (DA) meter (Sintéleia, Bologna, Italy)

- Non-destructive measurement
- Developed from vis/NIR spectroscopy
- Difference of Absorbance (DA or I_{AD}) between 670 and 720nm



Flesh browning related to DA meter 2014/15

DA	IEC (ppm)	Firmness (lb)	SSC (%)	TA (%)	SPI	Wt (kg)
0	2.194	18.1	13.2	0.345	5.4	1.60
0.01-0.1	1.931	20.0	12.8	0.344	4.0	1.40
0.1-0.2	0.674	20.5	11.3	0.319	3.1	1.45
0.2-0.3	0.489	21.0	11.3	0.313	2.3	1.35
0.3-0.4	0.422	21.0	10.9	0.280	1.9	1.40
0.4-0.5	0.420	22.5	11.1	0.310	2.6	1.30
0.5-0.6	0.491	19.6	10.7	0.293	2.5	1.40

Stem end browning (%) in CA stored fruit 2 temperatures plus/minus conditioning



FB incidence greater in more mature fruit, and effect of conditioning more marked in fruit stored at 33F

Stem end browning (%) in CA stored fruit
2 temperatures plus/minus conditioning



-33F - 33F + C - 38F - 38F + C

Summary

Flesh browning incidence is:

- decreased by Harvista treatment, indicating a maturity effect on the disorder.
- Usually decreased by conditioning but effects are inconsistent.
- No major effects of SmartFresh
- DCA delayed browning development
- Maturity appears to be a critical factor
- Is 32-33F the right temperature for NY-grown Gala?

Current experiments in storage

- Untreated and Harvista
- CA and DCA at 33° and 38°F with different carbon dioxide concentrations
- DA meter and dry matter (F750 meter) relationships with browning



Acknowledgements

The people

Jackie Nock

Yosef Al Shoffe

Nurdan Gunes

Franny Doerflinger

Gilang Sutano

Jinwook Lee

The Fowler team

The consultants and many growers who helped directly with trial help and indirectly through fruit supply

The funding

NY Apple R&D program

NY Farm Viability Institute

AgroFresh Inc.

Federal formula funds

