2018

2018 Pesticide Safety - Fungus and Fruit Rot

Martha Sylvia
UMass Cranberry Station, martys@umass.edu

Fungus and Fruit Rot

Revisiting Franks Fungal Insights With Erika's 2 cents!

UMass Pesticide Safety Training 2018

Martha M. Sylvia

~~**Frank L. Caruso**~~

UMass Cranberry Station

~~**UMass Cranberry Station**~~


Upright dieback in Early Black

Upright dieback

- High incidence in 2017, after stress of drought in 2016
- mostly in Early Black
- Some beds had 10% affected uprights, although more vegetative uprights were affected
- No prolonged periods of drought stress in 2017, so should not be much UD present in 2018, but…..


Late March symptoms


30% uprights affected

Upright dieback

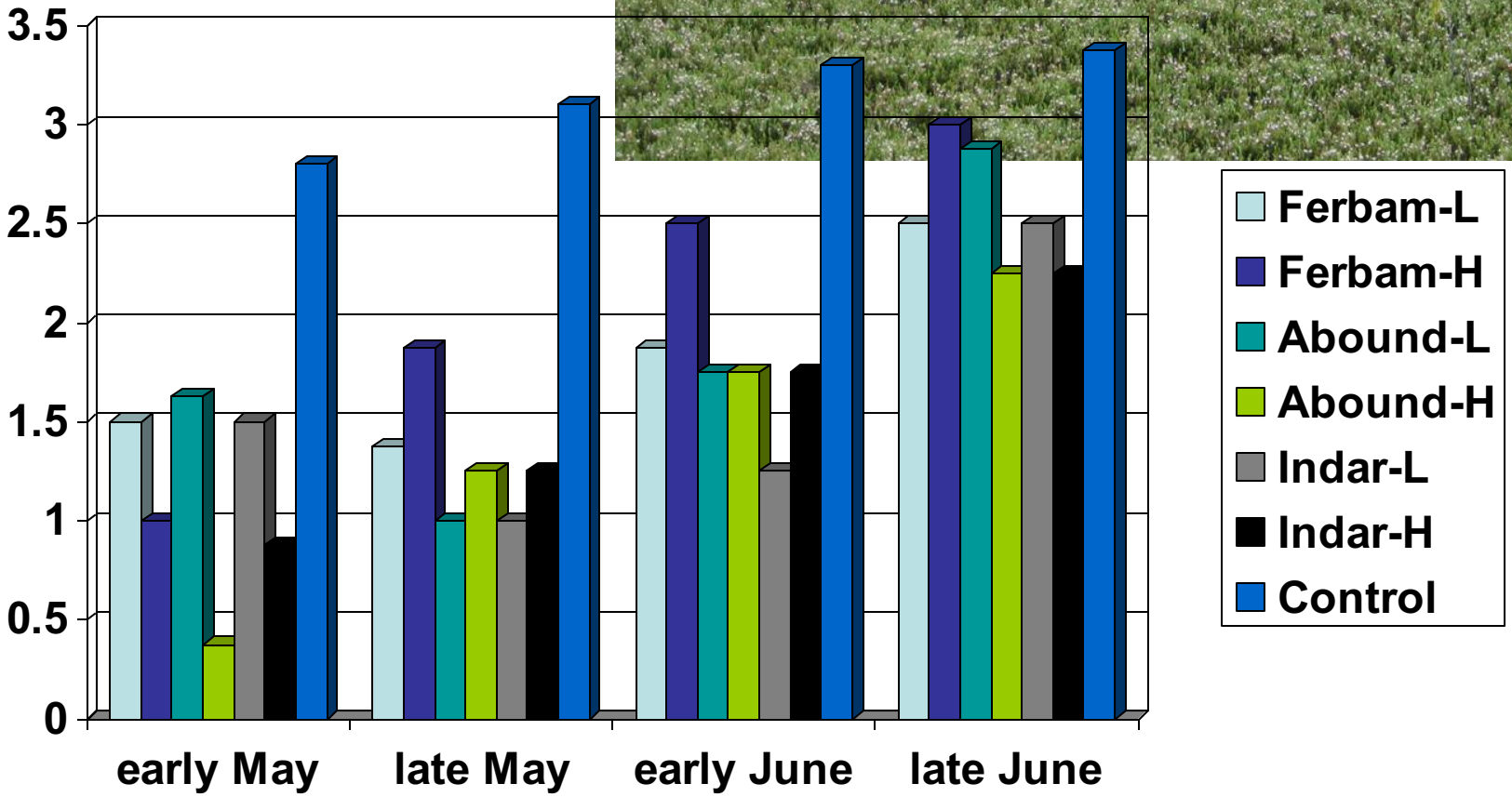
- Avoid stress on the plants through hottest portion of growing season
- Spores of primary causal agent Phomopsis begin to be produced from overwintering cranberry tissue in April and May and the emerging buds are particularly susceptible to infection.
- Fungicides targeting fruit rot control also give a degree of protection mid-season.

Treatment for Upright Dieback

- Early season fungicide application at *bud break and/or early bud expansion*
- April 25 through May 15
- Copper - Champ formulations
  - Not other copper formulations
- Chlorothalonil
  - Not all chlorothalonil labeled for UD
  - List in chart book
    - NOT Initiate720 or Echo Zn


Fairy ring in Early Black

Fairy ring trial – Howes – 2002



Fairy ring

- Increasing in incidence and severity, as more Ben Lear and Stevens beds come into production
- Causal agent has been identified in both MA and NJ
- May treatments (Abound, Indar) are more effective than June treatments (Ferbam)
- May treatment (Abound, Indar) is a soil drench NOT just a chemigation application
- Should run sprinklers before and after application for 30 minutes


Phytophthora root rot in Early Black


What symptoms look like right now

Phytophthora root rot

- Disease is prominently present, especially in poorly-drained beds
- Many renovated beds have quickly developed the disease
- You must improve the drainage before using any of the “very effective fungicides”
  - Ridomil, Metastar, Ultra Flourish
  - Aliette WDG
  - Phostrol, ProPhyt, Fungi-phite, Fosphite, K-phite, Rampart, Alude, Oxiphos, Confine Extra, Reliant, Reveille

Two year-old Crimson Queen bed

When renovating a bed that has had root rot, you MUST treat the soil with Basamid or the disease will quickly return

Fruit Rot

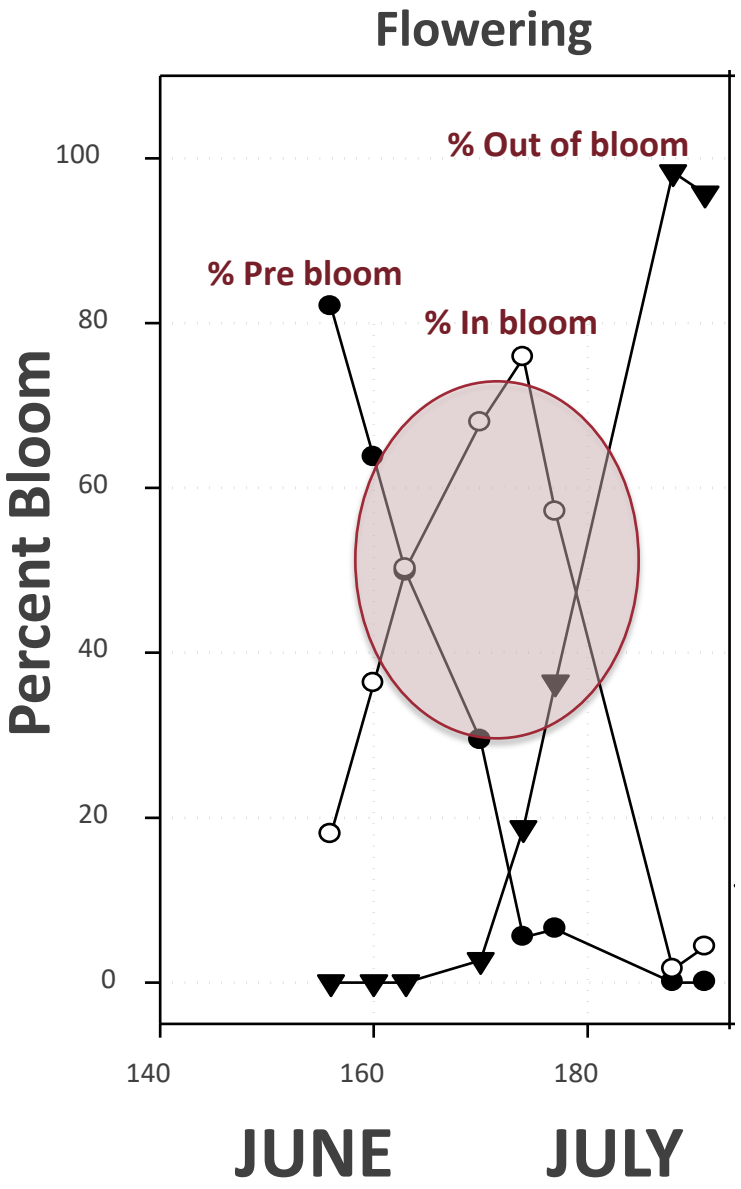
- History of each bed
- If you sanded it should help in reducing inoculum for infection this year in that bed

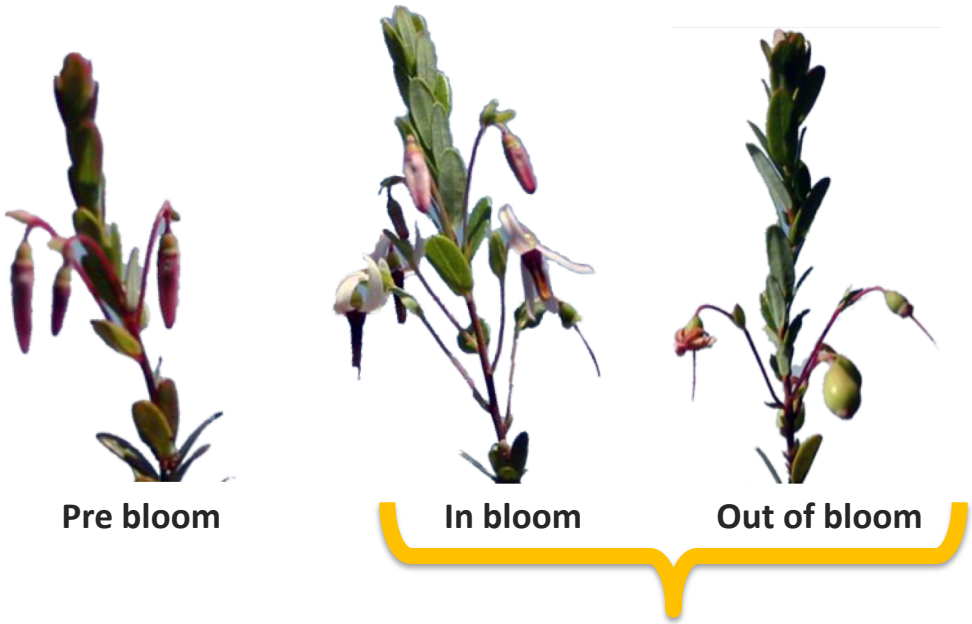
- **Preliminary Keeping Quality Forecast – 1/10 points = POOR**

Fungicide timing

- First application at 5-10% open blooms
- Second and third applications ~~10–14~~ 7-10 days apart
- May want to add other fungicide applications, given poor KQF
- Once fruit has set and sized a bit, no fungicides (e.g., coppers) are necessary
- Late applications (September) will not help fresh fruit avoid storage rot

Impact of timing fungicide applications





Most fungi infect during this stage

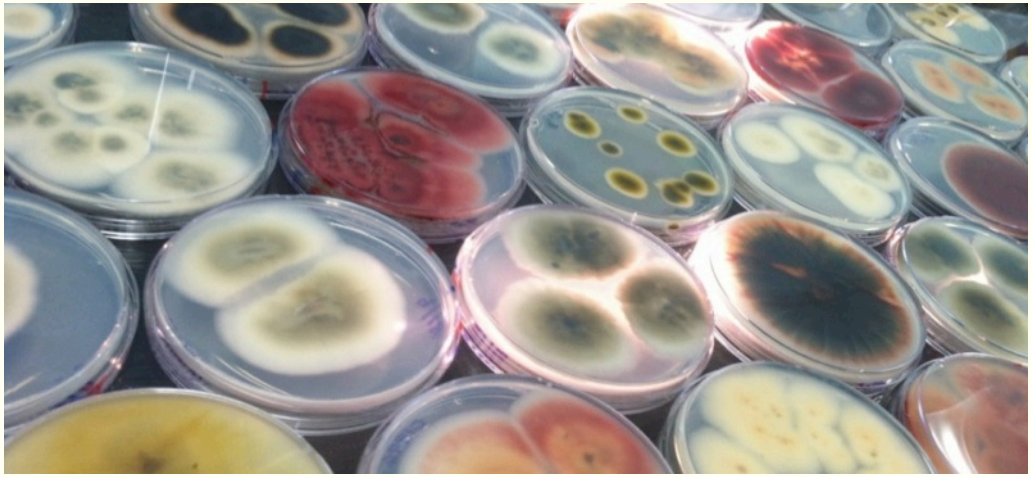
First fungicide application:

Enough open bloom to make it cost effective!

- **Spectrum of action** – the range of fungal species affected by each fungicide

Storage Rot
Allantophomopsis lycopodina
Allantophomopsis cytisporea
Coleophoma empetri
Fusicoccum putrefaciens
Phyllosticta elongata
Phyllosticta vaccinii
Physalospora vaccinii
Strasseria geniculata

Field Rot
Coleophoma empetri
Colletotrichum accutatum
Colletotrichum gloesporioides
Fusicoccum putrefaciens
Phomopsis vaccinii
Phyllosticta vaccinii
Physalospora vaccinii



- **Efficacy** – The overall effect of a particular fungicide on the level of fruit rot disease

In order of efficacy (best to worst):

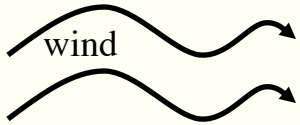
Broad Spectrum

- Chlorothalonil - Bravo, Equus, Echo, Initiate
- EBDC's – Manzate, Dithane, Roper

Not broad spectrum

- Prothioconazole – Proline
- Fenbuconazole - Indar
- Azoxystrobin – Abound, Satori, A-frame
- Ferbam
- Coppers – Champ, Kocide, Badge, Nu-Cop

Where are the pathogens hiding?



Phyllosticta elongata
Colletotrichum acutatum

(Current-year leaves)
Phyllosticta vaccinii
Phyllosticta elongata
Physalospora vaccinii

(Flowers)
Fusicoccum putrefaciens

(Green fruit)
Phyllosticta vaccinii

(Stems)
Colletotrichum gloeosporioides

(1- and 2-year leaves)
Phyllosticta vaccinii
Phyllosticta elongata
Physalospora vaccinii
Fusicoccum putrefaciens

(Current-year pedicel)
Fusicoccum putrefaciens
Phomopsis vaccinii

(Sound, red fruit)
Physalospora vaccinii
Phyllosticta elongata
Coleophoma empetri

(Rotten fruit)
Physalospora vaccinii
Coleophoma empetri

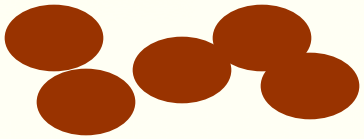
(1-year pedicel)
Fusicoccum putrefaciens
Phomopsis vaccinii

Phyllosticta elongata
Coleophoma empetri
Colletotrichum acutatum

water

(Duff--leaves)
Phyllosticta elongata
Coleophoma empetri
Colletotrichum gloeosporiodes

(Duff--fruit)
Coleophoma empetri



False blossom disease

Phytoplasma vectored by
the blunt-nosed leafhopper

- A disease caused by a phytoplasma that is vectored by blunt-nosed leafhopper.
- This disease threatened NJ and MA cranberry in the early 1900's.
- No blunt-nosed leafhoppers were detected on the acreage where the false blossom was observed in 2017.
- Several sites reported sharp-nosed leafhopper, however, this insect is not considered a vector of the phytoplasma.

Sterile flowers of false blossom

Blunt-nosed leafhopper

Things to note about False blossom disease

- In New Jersey, the disease is making a resurgence due to the use of ‘biosafe’ insecticides which has allowed the leafhopper to multiply
- In Massachusetts, the disease and vector are both present in wild cranberry stands at Sandy Neck and the Cape Cod National Seashore (even at Crane’s Beach in Ipswich!)
- Now found on commercial bogs in Halifax

Things to note about False blossom disease

- Most easily recognized during bloom
- Flowers assume an upright position because the pedicels are straight rather than arched
- Petals are short and streaked with red, appearing dark pink and straight rather than curved
- In severe cases the plant will have a “witches’ broom” appearance with many branches
- Uprights are taller than uninfected uprights
- Very hard to see after the blooms have faded

Not false blossom
Not blunt nosed

Fruit Firmness Research Summary

Ocean Spray Ag Sciences
April 2018
Thanks to David Nolte and Rod Serres

Contact Info:
Erika Saalau Rojas
esrojas@oceanspray.com
p **(508) 923.3966 | *c* (774) 223.2800**

Fruit Firmness a long history with the cranberry industry

- Cranberry Firmness is the *original* fruit quality measure
- Sound, unbruised, undamaged fruit has the best keeping quality and also makes the highest quality SDC product
- Attention to fruit firmness was largely lost during the transition to a predominantly juice products industry

Bioworks Firmtech 2 Fruit Firmness Tester

- Created by USDA-ARS Ag Engineer Paul Armstrong
- Widely used in the cherry and blueberry industry over 20 years
- Allows rapid measurement of multiple fruits
- Ease of use, low variability, repeatability
- OSC purchased 3 units in 2013

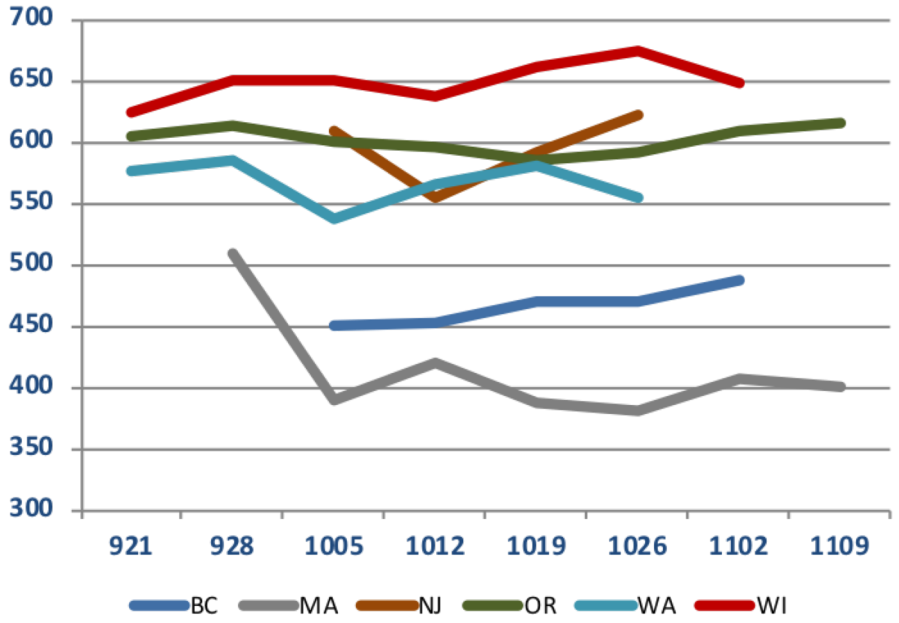
http://postharvest.tfrec.wsu.edu/pages/PC97I

Bioworks Firmtech 2 Fruit Firmness Tester

- Firmness is consistent through the season
- 25 berries fit on the sampler
- 50 berries tested per sample
- Can measure berry size as well as firmness
- Catch can NOT probe for sample

Fruit firmness delivery statistics

2015 Fruit Firmness by Week- All Regions

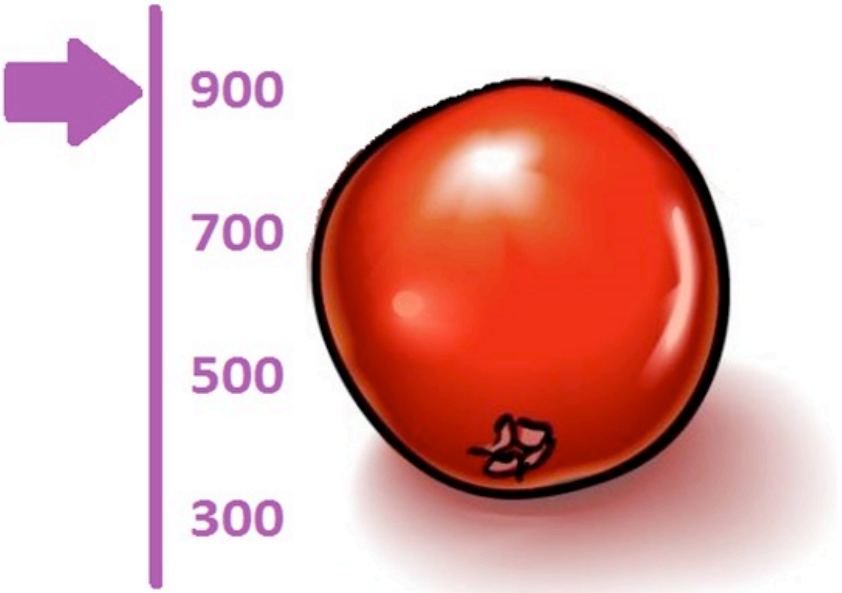


2017
MA Firmness
Average
645

Variety and unharvested time in the field Do Not appear to be significant drivers of firmness loss. No correlation for any growing region between fruit size and firmness.

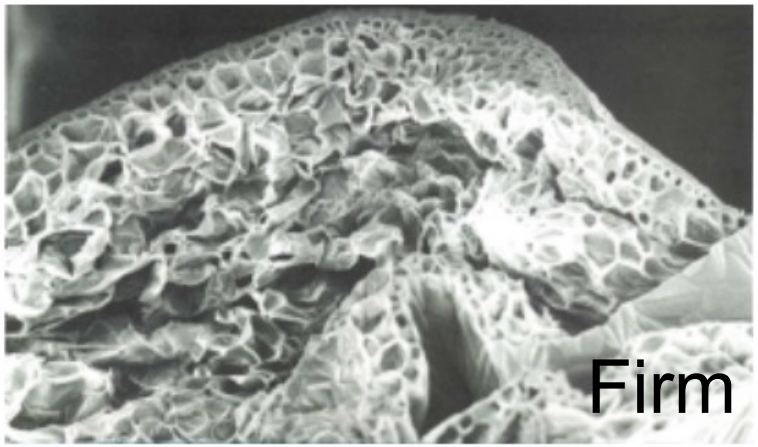
Fruit Firmness measurement in the field

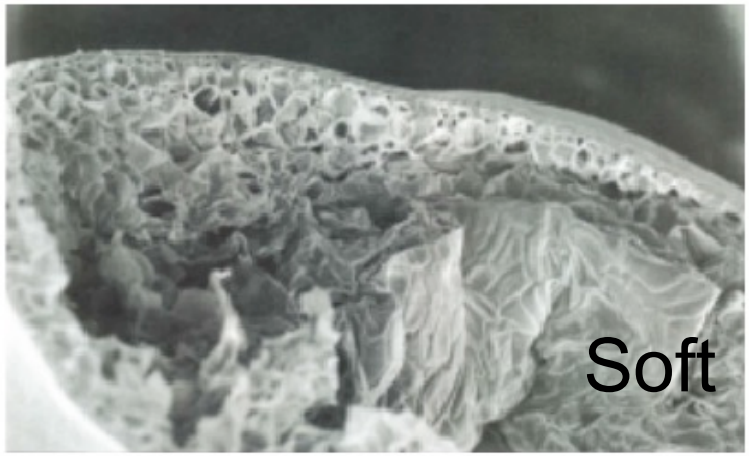
- In all regions fruit firmness for fruit attached to the vine was similar
- Fruit firmness did not decline on its own over the normal harvest season
- While initial fruit firmness prior to harvest was around 800-900 g/mm, delivered fruit firmness was much lower, with distinct regional differences



- $1.00 incentive for firm fruit at OS
- 451-549 .01-.99 cents
- 555 and up get the $1.00

SDC process and fruit firmness





- collapsed cell walls of soft berry make juice extraction and infusion difficult
- firm fruit slices cleanly, soft fruit tends to tear

Harvest equipment impact on fruit firmness- Harrows and Reels

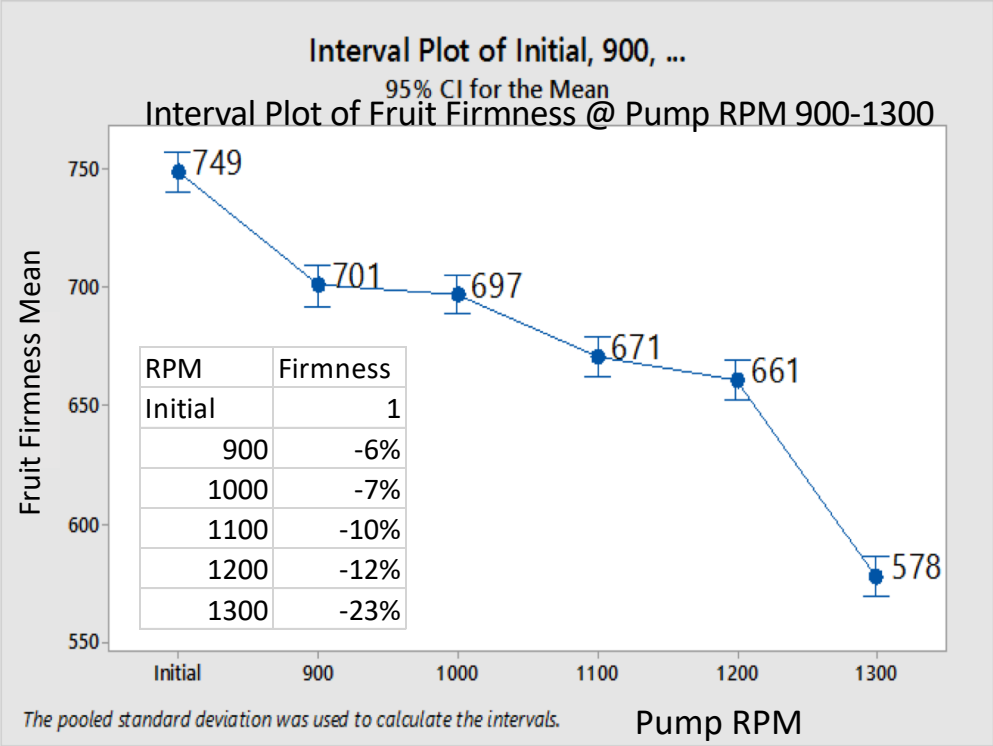
Region	Year	# Farms	Reel Type	Firmness Before	Firmness After	Loss Firmness	Notes
BC	‘14	9	Sulky	762	634	-17%	
BC	‘16		Sulky			-2.2%	Fast Reel 290 rpm 1.6 mph
BC	‘16		Sulky			-3.5-16%	Slow Reel 100-108 rpm 1.6 mph
MA	‘15	5	Ride On	845	774	-8%	Slow Reel
MA	‘15	5	Ride On	831	816	-2%	Fast Reel

- * There is somewhat of a consensus that reels turning the opposite rotation as the travel wheels produce less fruit damage – hydrodynamic rather than mechanical forces strip the berries off the vine. There is also some indication a faster reel speed may do less damage than a slower reel speed.
- Flood depth and ground speed also play a role in loss of firmness.

Fast reel speeds and reels rotating in the opposite direction as the drive wheels may be stripping the berries off the vines with hydrodynamic forces, rather than mechanical.
This may be doing less damage to the fruit and maintaining better fruit firmness.

Harvest equipment impact on fruit firmness- Pump RPM

- Two year study, multiple locations and pumps WI
- Focus on Cornell 6NHPP
- 2017 table represents 35 measurements at each RPM- all Stevens variety
- **Consistent results year to year**
- Looked at mechanical feeders (Jasperson Wheel) vs manual feed



RPM	Firmness
Initial	1
900	-6%
1000	-7%
1100	-10%
1200	-12%
1300	-23%

2017 WI Cornell 6NHPP

<u>Increased pump rpms caused an increased loss of fruit firmness</u>

mechanical feeders may help growers maintain a more consistent loading rate

Harvest equipment impact on fruit firmness- Cleaning Towers

- Fruit Firmness measured as paired samples before and after washing rack
- 5 MA farms at 2-4 different nozzle pressures
- Only significant loss of fruit firmness at any nozzle pressure between 45-165 psi occurred on over-ripe fruit
- Most towers at most pressures did not remove a statistically significant % of rot
- Cleaning towers can reduce firmness- growers should confirm rot removal

increasing pressure from 100 to 160 psi increased loss of fruit firmness but did not translate into better rot removal

Harvest impacts on fruit firmness- float time

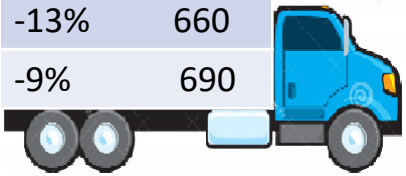
Region	Variety	Conditions	4 Day Float		Observations
BC	Stevens	Field	-2%		Reeling FT -23%
BC	Bergman	Field	-17%		Reeling FT -11%
					Fruit Splitting
Region	Variety	Conditions	4 Day Float	8 Day Float	Observations
NJ	Stevens	Buckets 68F	-7%		Tap & Bog Water
NJ	Stevens	Buckets 68F	-7%	-22%	Same Loss of FT
Region	Variety	Conditions	24 Hour Float		
MA	Stevens	Field	-6%		

Harvest impacts on fruit firmness- trucking

Loss of Firmness of about 10% was observed at the floor and at 2', 4', and 6' above the floor in dump trucks loaded to between 7' and 8' high- impact was to about 60% of the load. (about 130 bbl.)

Firmness	756
-2%	742
-9%	694
-13%	660
-9%	690

Dumps to 8' Ht



Loss of Firmness of about 10% was observed at the floor and at 2' above the floor in trailers loaded to about 6' high- impact was to about 30% of the load. (about 160 bbl.)

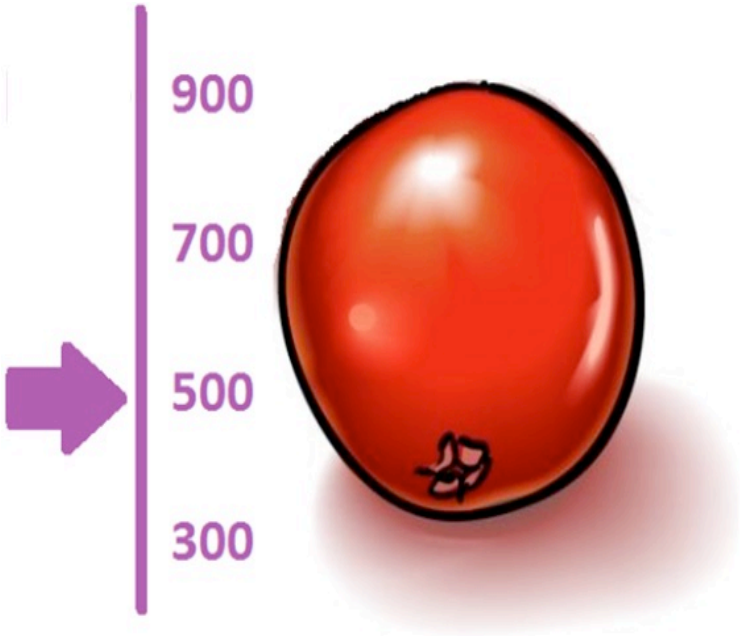
Firmness	818
0	823
-12%	708
-11%	710

Trailers to 6' Ht

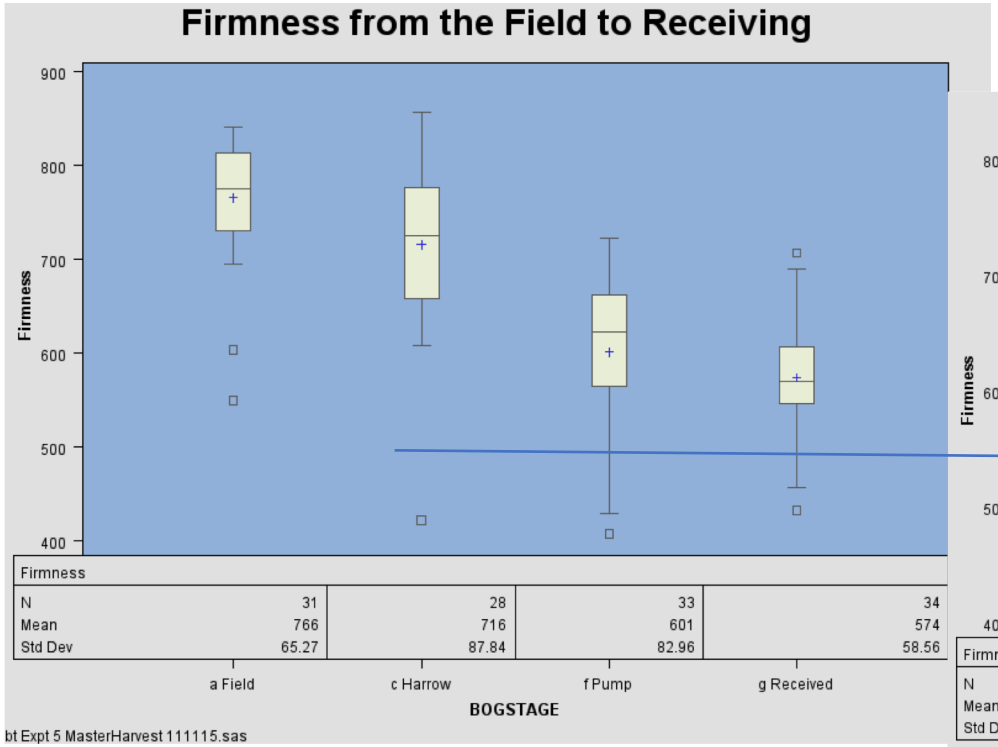
*Growers should consider load height when arranging for trucking, particularly when loads are traveling long distances.

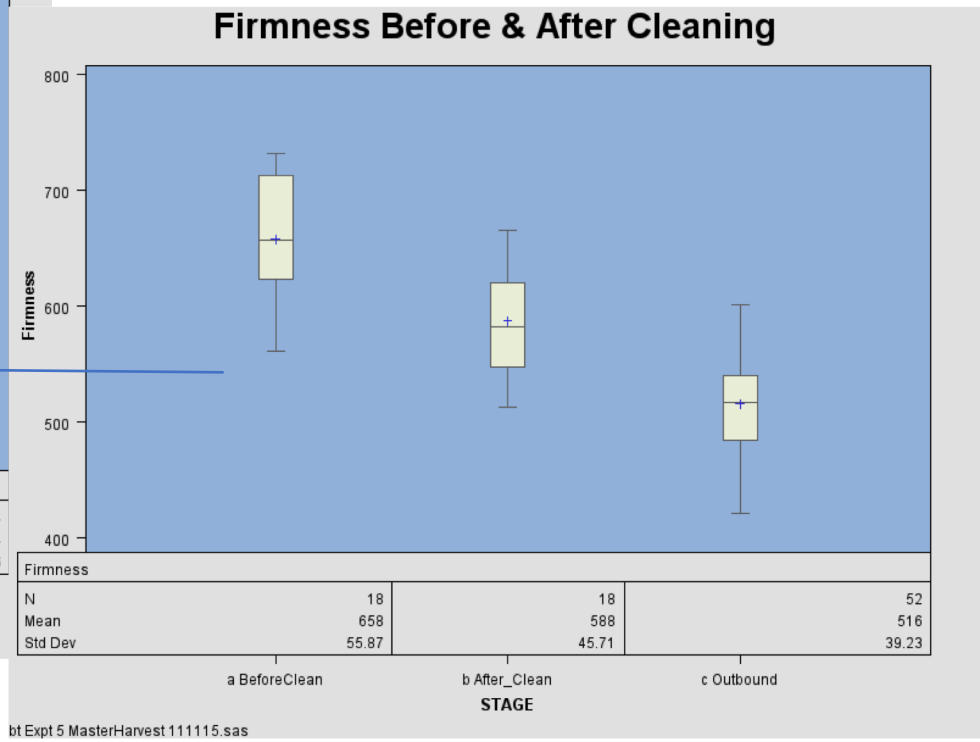
Cumulative harvest impacts on fruit firmness

- Combined harvest impacts on reducing fruit firmness can approach 40-50% or more!
- Growers with low delivered fruit firmness should evaluate each harvest unit process for potential impacts.
- Very significant negative harvest impacts on fruit firmness include:
  - High travel speed on reels or harrows (>4mph)
  - Slow reel speed + slow ground speed (1.6 mph, 100 rpm)
  - Berry pumps > 1200 rpm / fruit loading > 2500#/minute
  - Long pipe runs from pumps
  - Berry truck load depths > 6-7’
  - Late harvest - over-ripe fruit



Receiving Station impacts on fruit firmness



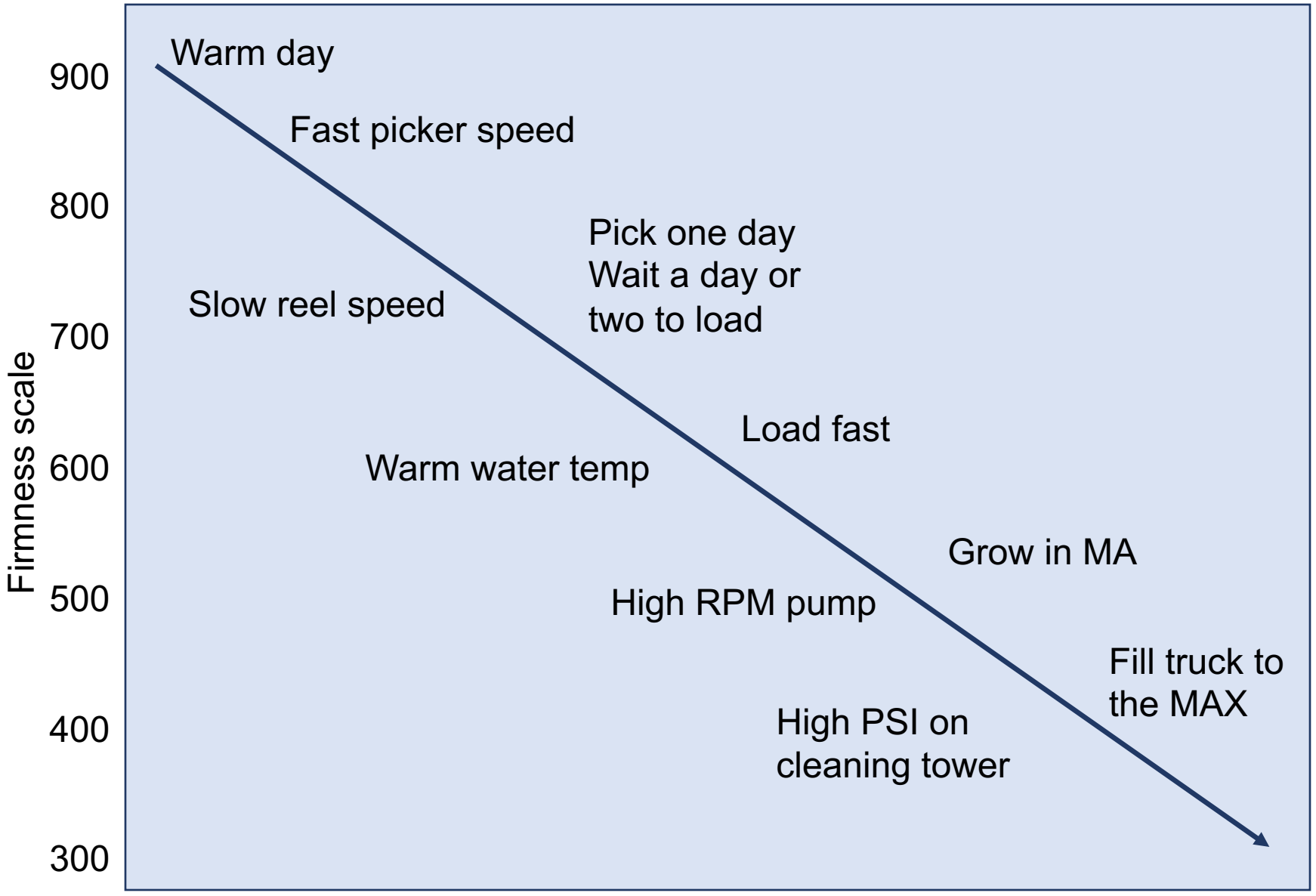


- Loss of fruit firmness is very consistent across receiving locations.
- Studies of receiving stations in NJ, EC, WI, and OR have all showed consistent reductions.
- Most significant loss of firmness occurs at the brush washers (-10-15%) and at the binning station hoppers (-10-15%).

Fruit firmness research summary

- Firm fruit is important to the efficient conversion of cranberries to high value food products.
- Fruit firmness can be negatively impacted throughout the harvest and receiving process.
- Within every unit process there are opportunities to minimize this damage.
- The cumulative effects of small damages can add up to a significant loss of fruit firmness.

- increase the speed of harvest, decrease fruit firmness
- design systems that minimize damage to berry



No single step to fix our firmness problem

Questions???