Best Practices for Cane Management and Color Reversion Prevention in Prime-Ark®45

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Outline

• Summary of Research

• Color Reversion and Postharvest Handling

• The CA Experience with Prime-Ark®45
Summary of Research

- Drake and Clark, 2003
- Thompson et al, 2007
- Strik et al, 2008
- Thompson et al, 2009
- Strik and Thompson, 2009
- Strik and Buller, 2012

- Canes MUST be tipped at least once!
Tip-site (1.0 m)

Emerging branches

Petiole

Leaf

Petiole
Un-tipped primocane

Tipped primocane (1.0 m)
Un-tipped primocane

Tipped primocane (1.0 m)
Summary of Research

- Canes MUST be tipped at least once!
- Timing of tipping is critical
Tip 0.5 m (1.5 ft)
Tip 1.0 m (3.2 ft)
Tip 1.5 m (4.9 ft)
Remove flowers at bloom
Too late – **DO NOT TIP!**
Summary of Research

• Canes MUST be tipped at least once!

• Timing of tipping is critical

• Single-tip vs. Double-tip
Single-tip vs. Double-tip

- What’s the difference?
Single-tip = Main cane tipped once

0.5 m

1 m
Double-tip = **Main cane** tipped once (0.5 m)  
**AND**  All branches tipped once (0.5 m)
Single-tip vs. Double-tip

• What is recommended? Double-tip!
  • Labor intensive (canes grow in flushes)
  • Higher yield
  • More concentrated harvest

—Depends on your production goal
Main cane tipped at 0.5 m

Main cane tipped at 1 m
Double-tip = Main cane tipped once (0.5 m) AND branches tipped once (0.5 m)
Summary of Research

• Canes MUST be tipped at least once!

• Timing of tipping is critical

• Single-tip vs. Double-tip

• Soft-tip vs. Hard-tip
Soft-tip vs. Hard-tip

• What’s the difference?
Soft-tip vs. Hard-tip

• What is recommended?

• TIPPING ! (At least once)

• If done by hand, soft-tipping is easier

• If done mechanically, hard-tipping is easier
Outline

• Summary of Research

• Color Reversion and Postharvest Handling

• The CA Experience with Prime-Ark®45
• What is color reversion?

“A condition which manifests only after cold storage”

– Also called red cell, red drupe, reddening
– Individual drupelets turn from black to red
– Up to 30-50% of a berry may turn red
Color Reversion

- What causes it?
  - Stink bugs feeding on fruit? No.
  - Changes in acidity after harvest? Not likely.
  - Cell disruption, leaks pigment? Possibly.
  - Heat, cold, rain damage? Yes!
  - Handling? Yes, in some cases.
  - Genetics? Yes, can influence color.
Color Reversion

• Why is it a problem?
  • Blackberries are supposed to be **black**!!!
  • Increased competition, increased complaints
  • Re-packing is costly
  • Consumer perception:
    – Red = sour fruit
    – Checkerboard-look = defective
Prime-Ark®45
After 7 days in cold storage (~34 °F)
Prime-Ark®45
After 7 days in cold storage (~34 °F)
Prime-Ark® 45
7 days after cooling (~34 °F)
Color Reversion

• Different than:

• Heat damage

• Redberry mite damage
  – *(Acalitus essigi)*
Heat Damage

UV damage (sunburn)

Bronzing
Bronzing
Unripe drupelets remain red and firm, found in patches.
Red Berry Mite
Color Reversion

• What else do we know?

• Warm berries suffer the most (> 72 °F)

• Chill / freeze injury seen most on:
  – Top layer of forced-air cooling
  – Loads near front of reefer trucks

• Nutrition imbalance
  – High N seems to promote reversion
Color Reversion

• Prevention

• More reversion seen at <35 °F
  – Protect top layer of fruit from forced air cooling
  – Check for cold and hot spots in reefers

• Use low-scoring varieties
  – Prime-Ark® 45, Prime-Ark® Traveler, Osage
Prime-Ark® Traveler
After 7 days in cold storage (~34 °C)
Prime-Ark® Traveler
After 7 days in cold storage (~34 °)
Color Reversion

• Prevention

• Less reversion at 41 – 50 °F
  – QC methods used in Mexico
  – Pre-cool for 2 hours @ 45 - 50 °F
Color Reversion

Berry temperature taken upon arrival in Mexico.

Rejected if over 72 °F

Fruit often pre-cooled at 45 – 50 °F
Color Reversion

Prevention

- Reduce temperature in canopy:
  - UV blocking plastic
  - Allow late-emerging canes to grow and shade fruit
Early season canes tipped

Later season canes allowed to grow

Early season canes tipped
Outline

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• Color Reversion and Postharvest Handling

• The CA Experience with Prime-Ark®45
The CA Experience

- Prime-Ark®45:
  - Productive
  - Large berries (10+ grams)
  - Tolerant of many soil / water qualities
The CA Experience

• Prime-Ark®45:

• Harvest on *primocanes* begins:
  – 8.5 – 9 months (Year 1, December planting)
  – 7.5 – 8 months (Year 2, after mow down)
The CA Experience

• Prime-Ark®45:

• Harvest on floricanes:
  – Late April (enclosed tunnels)
  – May (plastic on at bloom)

• Difficult to crop floricanes + primocanes
The CA Experience

• Prime-Ark®45:

• Pests:
  – Raspberry Crown Borer
  – Lygus (Lygus lineolarus)
  – Cucumber beetle
Lygus damage
(Lygus lineolarus)
The CA Experience

• Prime-Ark®45:

• Overall, a positive one:
  – High productivity and vigor
  – Excellent prices July – Oct.
A New Experience

- Prime-Ark® Traveler
- Thornless
- Similar productivity / berry size to Prime-Ark®45
  - Same cane management recommended
- Less reversion, but not zero