Use of Ethephon and 1-MCP in the Harvest and Storage of Manchurian Crabapples and an Update on the Effects of 1-MCP on Cider Aroma

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Manchurian Crabapple in Washington State

- Widely planted pollenizer
- In 60 to 70% of orchards
- 5 to 10% of the total trees
  - _http://www.goodfruit.com/research-on-rot-is-under-way/
- Back of envelope: 148,000 acres X .6 (.7) X 0.05 (.1) = 4,400 to 10,360 acres
- Assume 500 bu/acre?
- Assume 2.8 gallons of juice per bushel?
- ~6 to 15 million gallons of Manchurian juice?

GOOD FRUIT GROWER

Our Magazine Ad

Melissa Hansen // Mar 19, 2014 // Apples // Pollination // Research

Manchurian crab apple trees (trees with dark leaves dotted throughout this orchard) are widely used as pollinizers in Washington State.

(Courtesy Kim Young, Pace International)

Manchurian Crabapple

- Abundant in commercial orchards
- Small (~1” diameter)
- Good for cider
  - Tannin content 3x Kingston Black (~6000 mg/L)
  - Brix 20+
  - Acidity 10-12 g/L
  - Balanced Tannin:acidity ratio (higher than KB)
  - A bittersharp with more tannin per unit acidity than KB
  - Aroma – strong dark cherry and bitter almond
- Can it be managed effectively?
  - Harvest by hand is costly
  - Disease issues
  - Ethephon (Ethrel®) to loosen stems and shake/catch much like a tart cherry capture system
  - 1-MCP to help maintain quality in cold storage

Some Ciders with Manchurian

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Ethephon

- The most widely used plant growth regulator
- Metabolized by the plant it is converted to ethylene
  - Increases ripeness
  - Used on many plants and fruits
- Trade name Ethrel®
- Labelled for loosening the abscission layer between apples and limbs (stem loosener)

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1-Methylcyclopropene (1-MCP, SmartFresh^{SM})

- A competitive inhibitor of ethylene
  - Binds to ethylene receptor in apples, making fruit “blind” to ambient ethylene
  - Used to prolong refrigerated storage life (with or without controlled atmosphere storage)
- Widely used in commercial apple production for increased storage life
- Effect of 1-MCP on cider made from treated fruit compared to untreated fruit is not known

Ethephon on Manchurian Crabapples

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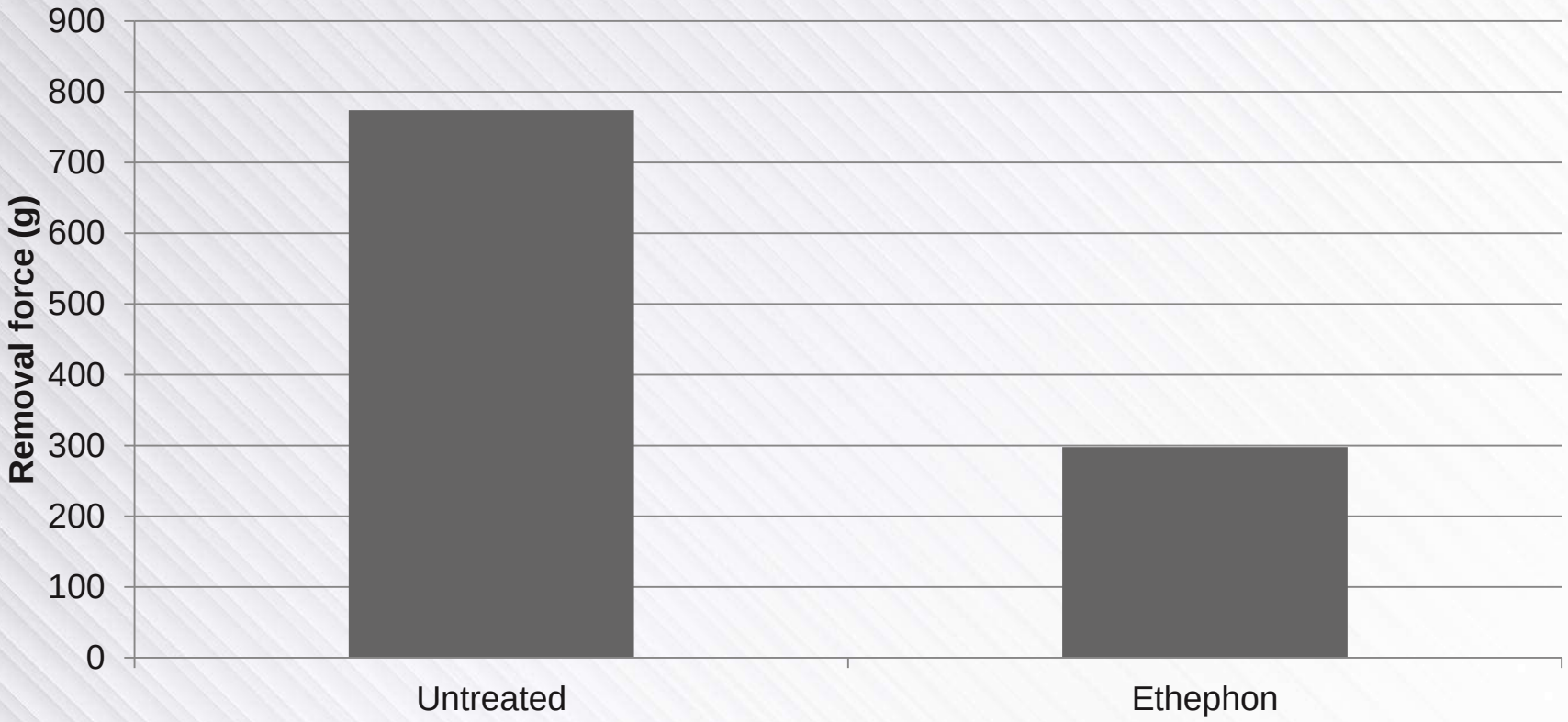
Ethephon on Manchurian Crabapples, year 1



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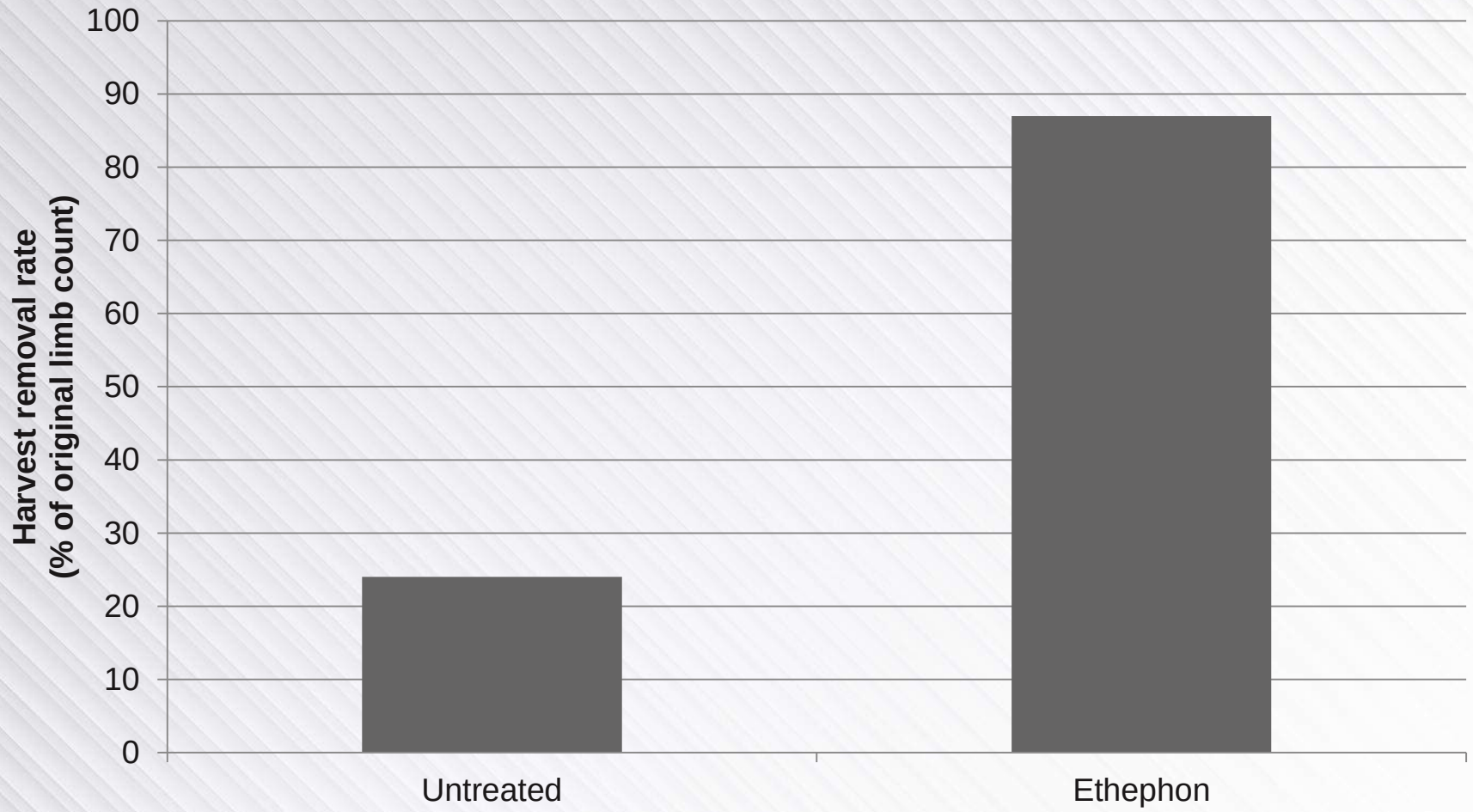
Ethephon on Manchurian Crabapples, year 1



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Manchurian crabapple abscission

Storage Disorders

- Sphaeropsis rot (Sphaeropsis pyriputrescens)
- Speck rot (Phacidiopycnis washingtonensis)

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Can treatment with 1-MCP facilitate longer storage of Manchurian Crabapples?

Treatments

- 1 – Untreated control processed immediately
- 2 – Untreated control processed after 45 – 60 days of storage
- 3 – 1-MCP treated, processed after 45 – 60 days of storage
- 4 – Ethephon treated, processed after 45 – 60 days of storage
- 5 – Ethephon and 1-MCP treated, processed after 45 – 60 days of storage

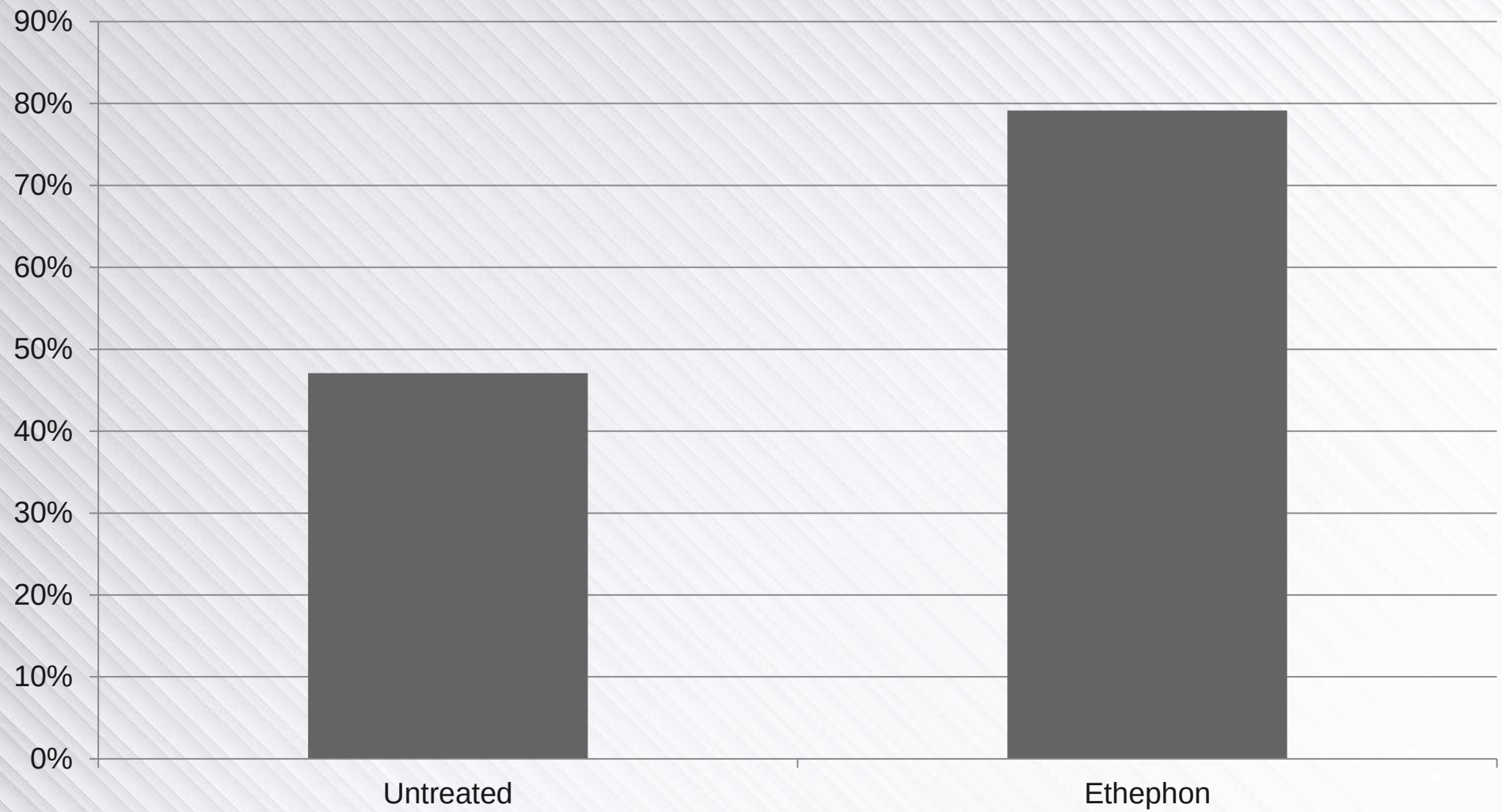
Does ethephon use result in better abscission for Manchurians?

Does ethephon cause faster fruit collapse in cold storage of Manchurians?

Does 1-MCP preserve fruit quality in cold storage with/without initial ethephon application?

What are the juice quality returns from these treatments?

Harvest capture after shaking, year 2



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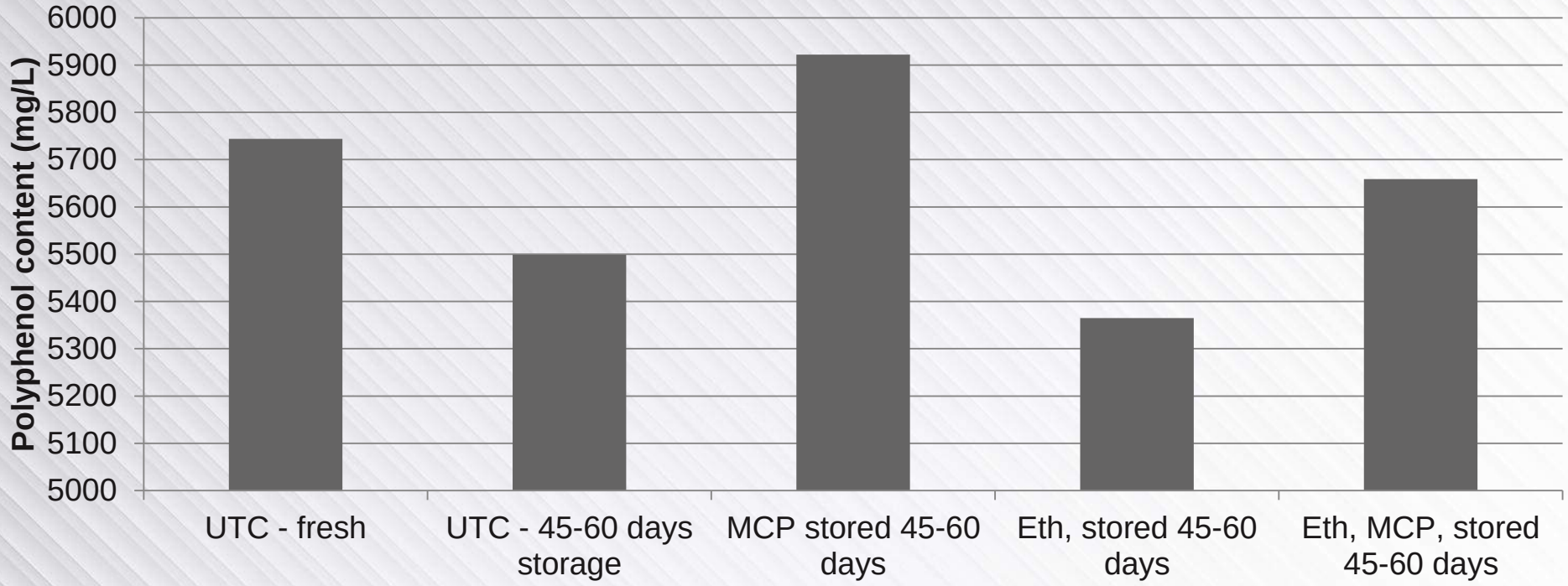
Polyphenol content (Folin-Ciocalteau)



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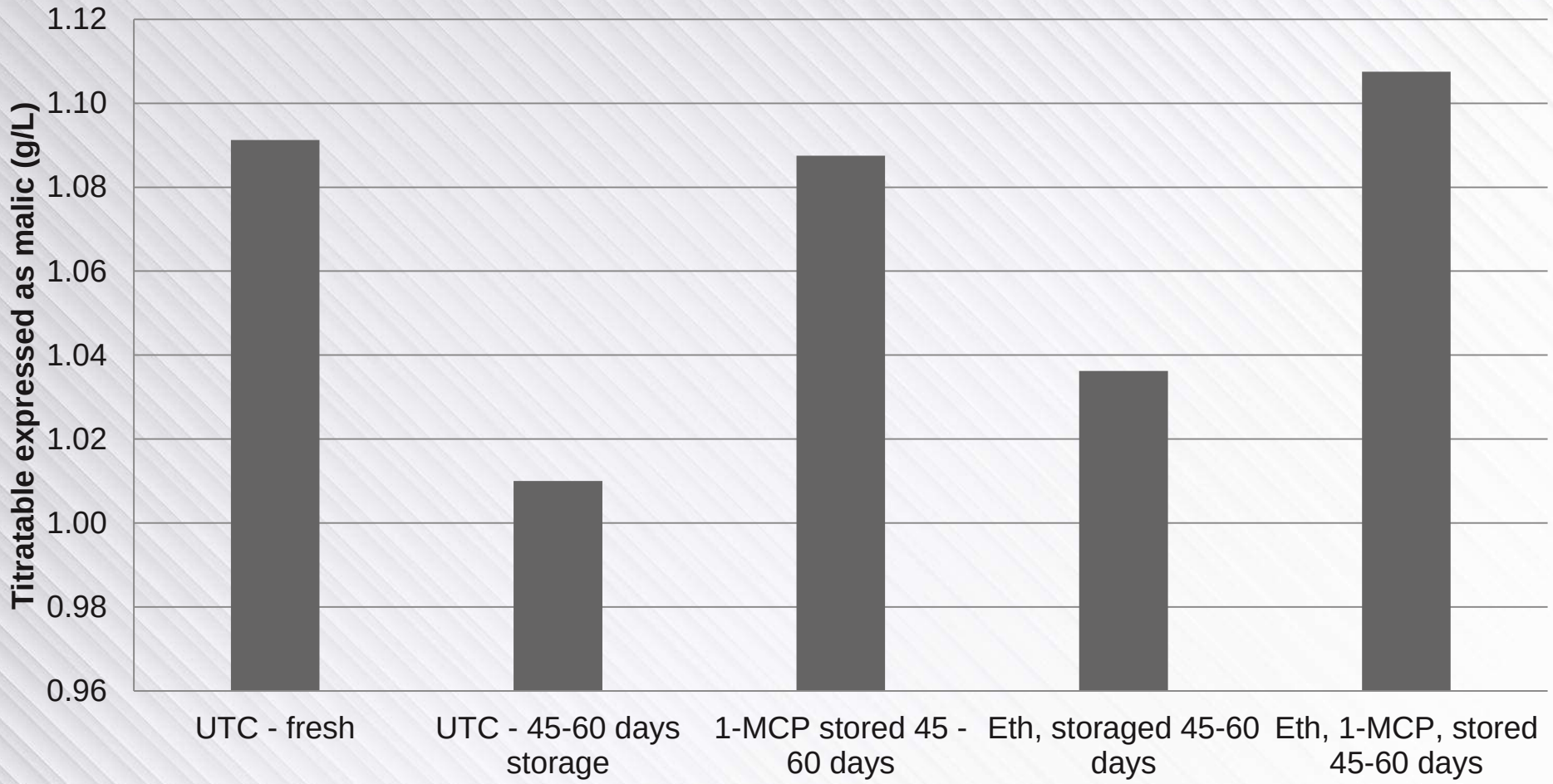
Acidity



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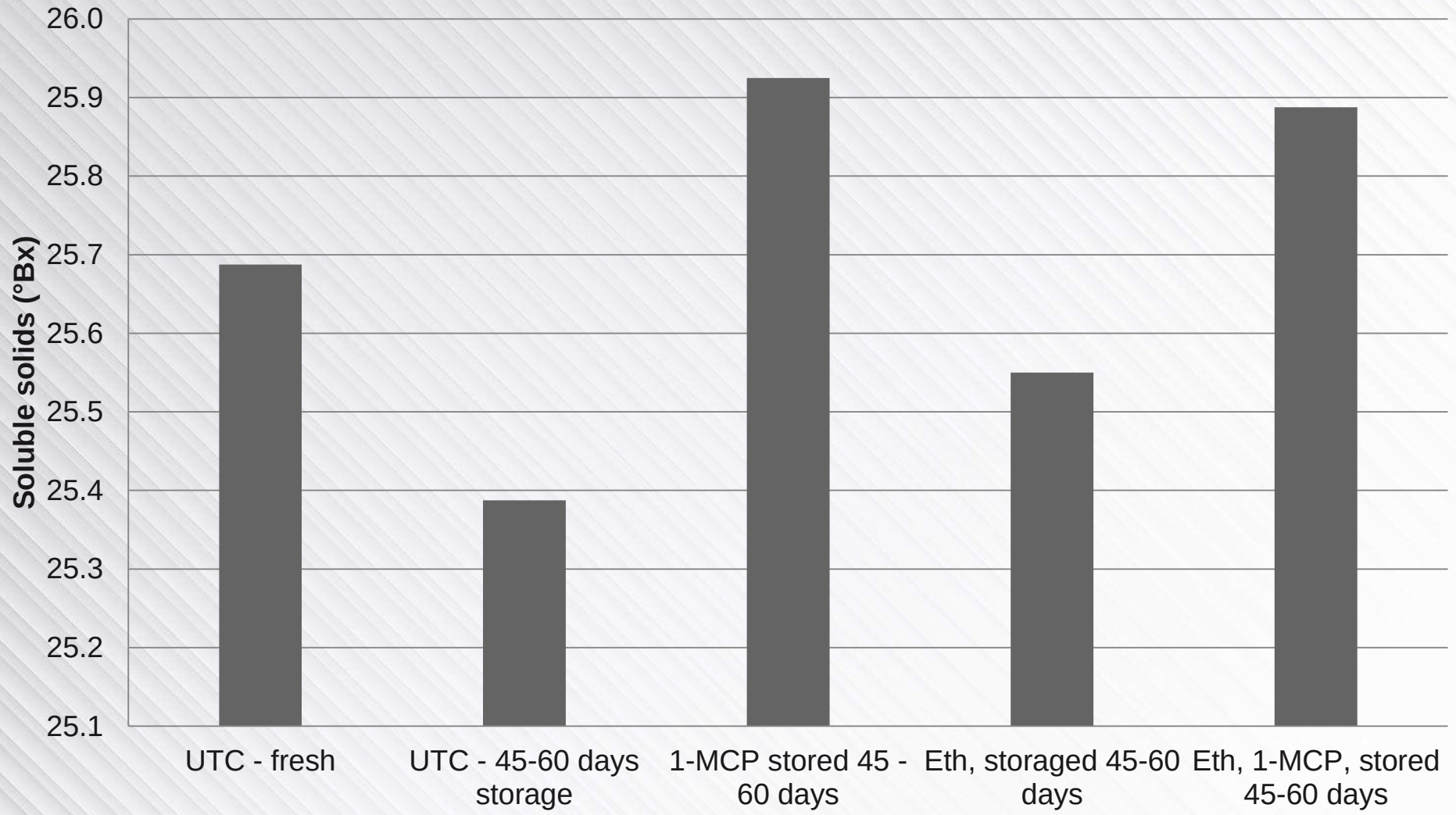
Brix



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Juice quality

- All treatments produced high-quality cider juice
  - High brix
  - High polyphenol content
  - High acidity
  - High “character”
- Treatments with ethephon resulted in better fruit capture
- Treatments with 1-MCP resulted in maintenance of acidity, polyphenol content, and soluble solids after 45 – 60 days of storage
- No treatments led to collapse of fruit quality

Effect of 1-MCP on Cider Aroma and Taste: an Update

- Fruit were selected and divided into two identical treatment batches
  - Golden Delicious, York Imperial, Dabinett, Fuji
  - Half of the samples were initially treated with 1-MCP, half were untreated
  - All samples were stored in refrigerated air for 50 days
- Samples were juiced and fermented in 5 replicates
- After fermentation, ciders were subjected to
  - solid phase microextraction headspace analysis with gas chromatography
  - Sensory analysis with 125 volunteers (pending)

Effect of 1-MCP on Cider Aroma and Taste: an Update

Preliminary results

- 1-MCP ciders had more ethanol than untreated ciders
  - Untreated ciders 6.9% Ethanol
  - 1-MCP treated ciders 8.3% Ethanol
- 1-MCP ciders had lower aroma peaks for 17 isolated aromas.
- 1-MCP had higher aroma peaks for only 1 isolated aroma: ethyl alcohol
- Tasting with 125 blindfolded volunteers will take place in the coming weeks to determine whether differences in aroma and taste are detectable by a general population.

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Acknowledgments

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  - The Department of Food Sciences

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