Prediction of bitter pit in 'Honeycrisp' using the passive method

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Bitter pit







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Bitter pit

Soft scald





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Bitter pit is exacerbated by conditioning

- Conditioning reduces/eliminates soft scald and soggy breakdown.
- Conditioning exacerbates bitter pit.
- Soft scald/soggy breakdown does not always occur (lowest in HV)
- Can we avoid conditioning?



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Based on \$700 per bin





How can we predict bitter pit risk?

Mineral analyses have a long history of research but an equally long history of failure or lack of adoption by industry.

- Relationships between minerals and bitter pit can be highly variable.
- Labor, cost and management for most fruit analyses (sap method is an exception because of its simplicity).





1. To evaluate non-mineral prediction methods to induce bitter pit in 'Honeycrisp' apples.

2. To use these predictions to reduce economic losses by modifying postharvest fruit management.





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The Passive method

Fruit harvested three weeks before anticipated commercial harvest

Kept at 68°F (room temperature) for 3 weeks

Bitter pit incidence measured

Recommended procedures later in the presentation



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Results: 'Actual' against 'predicted' for 38°F, Conditioning + 38°F, and 33°F



All further data today based on conditioning + 38°F



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Results: NY 'actual' against 'pedicted0



Note

- All 'actual' is for conditioning followed by 38°F storage.
- R², which is an assessment of reliability of prediction is high.
- Not a 1:1 ratio, and generally the prediction under-estimates the actual bitter pit.
 - Varies a little by region

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'Actual' against 'predicted' for each region



Note: underestimation of actual bitter pit



Comparison with minerals and mineral ratios

	2017		2019	
	ЗШВН	н	ЗШВН	н
Р	0.35	0.23	0.36	0.34
К	0.58	0.19	0.50	0.27
Са	-0.48	-0.41	-0.67	-0.59
Mg	0.16	0.15	0.06	0.19
Mg/Ca	0.75	0.55	0.84	0.66
K/Ca	0.75	0.49	0.75	0.64
P/Ca	0.69	0.43	0.72	0.62
(K+Mg)/Ca	0.75	0.49	0.77	0.66
(K+Mg+P)/Ca	0.76	0.15	0.77	0.68



Applies to other regions, but not always well.

PA

WA - ?





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Bitter pit (HV): 2013 harvest

HV





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Soft scald (HV): 2013 harvest

HV



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Bitter pit (WNY): 2013 harvest



Soft scald (WNY): 2013 harvest



Dynamics of change

- Large orchard block variation.
- Bitter pit usually near maximum after a month of storage.
- Soft scald does not become apparent until after 1 month of storage.
- Safe to store at 38F without conditioning in high pit orchards
- There may be a 'safe' time period when fruit can be kept at 33 °F without conditioning for short time periods without soft scald developing.



Is there a safe period of time to use 33°F



WNY

The correlation between soft scald at 33°F and bitter pit at 38°F after 1 week of conditioning at 50°F for 'Honeycrisp' apples from different orchard blocks in WNY after 4 months of storage.

Not perfect, but short term? Dynamics of development are important

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Conclusions

• Passive prediction method is one that you as growers can start using now.

• Results will allow you to save money by avoiding conditioning

Losses on a \$700 per bin basis



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Recommendations - preharvest

 Do not spray PGRs on bitter pit susceptible blocks

Western NY

Control 9% b

Harvista 19% a

ReTain 20% a



Control 9% b



Recommendations - postharvest

- If the predicted bitter pit risk is greater than 30%, fruit should <u>not</u> be conditioned. Fruit should be cooled rapidly and stored at 38°F. This is especially true if you have used ReTain or Harvista.
- 2. Only fruit with a predicted bitter pit risk of less than 10% should be marketed immediately.



- 3. Do <u>not</u> market fruit with higher than 10% bitter pit risk within the first month as it continues to develop over time, with negative effects in the marketplace (Conditioning immediately after harvest will cause rapid development of bitter pit and therefore is recommended to allow the bitter pit to express before marketing.)
- 4. Consider storing fruit at 33°F without conditioning (if bitter pit risk is high, e.g. > 50%) to further reduce bitter pit development for short term periods (less than a month), but only in fruit from the HV (and PA). Note that while this is a possible approach, careful monitoring of fruit, e.g. eating several fruit from each block for any hint of alcoholic off-flavors, must be carried out at weekly intervals. There is a risk but likely less than with ongoing bitter pit development.



Recommended sampling regime

• Pick 100 fruit from trees that are representative of the block. The ideal is to harvest less fruit from as many trees as possible as opposed to more fruit from fewer trees. The minimum number of trees should be 10. Where blocks have wide variations in crop load, we suggest that separate representative samples are taken from these trees.

- Place the fruit at room temperature (approx. 68°F) for three weeks.
- Assess bitter pit incidence (external and internal) of each sample and express as % of the total fruit number.

THIS IS THE YEAR TO TEST!



Questions?