Optimizing CA and Air Storage for Honeycrisp

Randy Beaudry[1] and Carolina Contreras[1], Department of Horticulture, Michigan State University, East Lansing, MI 48824 USA

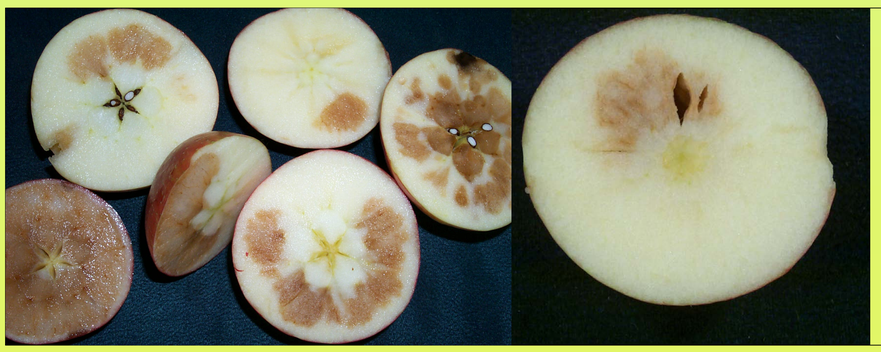
Introduction - Honeycrisp apple fruit develop chilling injury in response to low temperature storage and develop CA injury due to both low O_2 and elevated CO_2. Over the last few years, we have been working on preconditioning protocols to prevent these injuries.

Chilling injury control - Holding fruit at 38 to 40 °F reduces this disorder. Control is further improved by preconditioning treatments in which harvested fruit are held 5 to 7 days at temperatures of 50 °F or above. Higher temperatures and longer durations are associated with loss in flavor and textural quality. Diphenylamine (DPA) reduces this disorder slightly.

CA injury control - The preconditioning treatments that reduce chilling injury also provide some protection against this injury. However, higher a temperature (70 °F) was found necessary for adequate control. DPA treatment gave nearly complete control of CA injury. CA injury takes place very early in the storage, so low CO_2 at this time would be prudent. Good storage without CA is possible using 1-MCP (SmartFresh).

Soft scald or ribbon scald - caused by exposure to temperatures below 38 °F. Can occur in the field. Fruit have a fermented aroma

Soggy breakdown - caused by exposure to temperatures below 38 °F. Can occur in the field. Brown lesions often have smooth edges.



CA injury - largely caused by CO_2, but markedly enhanced by low oxygen. Patchy areas are irregular and lens-shaped openings are often seen.

THE PROBLEM

Although we can prevent or avoid CA injury, the most important characteristics of texture and flavor, may be compromised. Some research suggests that preconditioning at high temperatures or for extended periods reduce tartness and reduce flavor quality. It would be helpful to know more precisely which combination of time and temperature during preconditioning provides the greatest degree of protection. We propose to:

- Determine the extent to which preconditioning treatments compromise storability in terms of flavor and texture.
- Determine the optimal time/temperature combination needed to control CA injury without yielding loss in acidity.

Our treatments included:

Air
Air with 1-MCP
CA (with preconditioning)
CA (with DPA)
CA with 1-MCP (with preconditioning)
CA with 1-MCP (with DPA) [not tested in consumer panels due to limitations of consumer panel capacity]

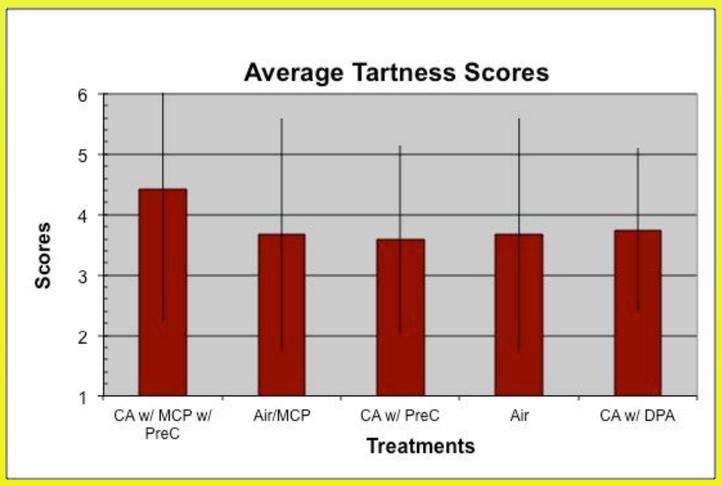
PROGRESS

At this point, in the study, we have only evaluated the fruit after one month of storage. Additional evaluations will take place in January and March of 2013.

So far, the CA and air storage treatments have all prevented or avoided the development of CA injury symptoms.

A 90-member consumer panel was not able to distinguish differences in the quality of the various treatments.

A trained panel determined that the tartness of the 1-MCP treatment in combination with CA storage was higher than the other treatments evaluated.



Likely, as storage duration increases, we will find that the quality of fruit in CA and given 1-MCP treatment will be preserved. It is possible that the preconditioning treatment may compromise CA storage without the addition of 1-MCP.

Acknowledgments

We are grateful to Michigan State Horticulture Society, Michigan Apple Research Committee, and AgBioResearch for their financial support.
We would also like to acknowledge the technical contributions from Matt Alt, Sarah Lott, Alyssa Schaefer, Kristin Schaefer, and Dan Zemaitis.