

POSTHARVEST QUALITY AND HANDLING OF 'HONEYCRISP' APPLES

Dr. Jennifer R. DeEll

Ontario Ministry of Agriculture, Food, and Rural Affairs

Simcoe, Ontario, Canada

Jennifer.DeEll@omaf.gov.on.ca

The juicy texture of 'Honeycrisp' has exploded in the Northeast apple market. Grower interest and consumer demand has made this cultivar more readily accepted than most and it continues to increase in popularity. 'Honeycrisp' is a bi-color apple and the flesh is cream colored with a juicy crisp texture. It has outstanding flavor characteristics and can remain crisp for several months during storage. Unfortunately, there are also several maturity and storage problems associated with 'Honeycrisp'.

'Honeycrisp' fruit have an attractive red blush, coarse stripes, poor coloration, and/or blotchy coloration. This suggests that multiple strains of 'Honeycrisp' may already exist in the market place. More red color develops in cooler regions (50-90%), but the red does not develop uniformly (Cline and Gardner, 2005). In addition, fruit mature very unevenly, so multiple harvests are necessary. 'Honeycrisp' has a thin skin and therefore stem punctures and bruising can cause large losses. Stem puncturing can be reduced by careful handling and clipping the long stems at harvest.

Determining the optimum maturity of 'Honeycrisp' is difficult. Standard maturity indices, such as internal ethylene concentration, starch index, soluble solids concentration and fruit firmness are not always consistent. Current recommendations suggest that harvest should occur when the ground color changes from green to yellow and the starch index is <6 (Cornell chart). The best eating quality has been associated with 13.5 lb minimum firmness and at least 13% soluble solids (Watkins et al., 2004). There has been no consistent relationship of internal ethylene to harvest date and differences in maturity do not always exist among apples with varying levels of red color. For example, the brilliant red fruit in Figure 1 exhibited very similar internal ethylene concentrations, starch content, and firmness values as those with only slight red coloration (DeEll and Murr, unpublished data).

Immature 'Honeycrisp' may never mature and thus remain of poor eating quality. Fruit harvested too early do not develop varietal flavor and are almost tasteless. If harvested too late, 'Honeycrisp' can develop fermentation products, such as ethanol and acetaldehyde, which cause undesirable flavors. The onset of such off-flavors is difficult to predict, as there are no associated visual symptoms. Harvesting at optimum maturity is the best way to achieve the characteristic flavor of 'Honeycrisp'.



Figure 1: Brilliant red (left) and slight red coloration (right) in Honeycrisp' apples.

'Honeycrisp' is extremely susceptible to bitter pit and more than 50% of the fruit can be unmarketable due to this disorder. The first symptoms of bitter pit are usually darkened, slightly depressed small spots under the skin. Small, brown, dry, slightly bitter tasting lesions of 3 to 5 mm in diameter develop in the apple flesh (Figure 2). Bitter pit does not directly affect the peel, but with time lesions at the skin will darken and become sunken. Lesions may appear prior to harvest or during storage, and usually develop in the calyx end of the fruit. The cause for bitter pit is a mineral imbalance in the apple flesh, associated with low levels of calcium. Using calcium sprays and avoiding excessive nitrogen can help to reduce bitter pit development in 'Honeycrisp' (Cline and Gardner, 2005; Rosenberger et al., 2004).



Figure 2: Bitter pit in 'Honeycrisp'.



Figure 3: Soft scald in 'Honeycrisp'.

Up to 100% of 'Honeycrisp' fruit may develop soft scald during storage under certain conditions. Soft scald is a low-temperature disorder of apples that is characterized by sharply defined, irregularly shaped, smooth, brown lesions of the skin (Figure 3). Peel tissue is initially affected and then hypodermal tissue is damaged as the disorder continues to develop. Skin

lesions are often invaded by secondary pathogens, such as *Alternaria* or *Cladosporium*, resulting in diffuse black spots (Figure 4). Soft scald may develop rapidly in storage between mid November and late December, but development stops when the fruit is removed from cold storage. Factors that have been implicated in soft scald development include: over-mature fruit at harvest, climate (dull, cool, and wet summers), light crops, large fruit, and low temperatures in storage.

‘Honeycrisp’ is also very susceptible to low temperature breakdown or soggy breakdown. Soft, brown, spongy tissue develops within the fruit cortex. In general, both soft scald and soggy breakdown appear to be more common in Ontario and New York, compared to Michigan and Massachusetts (Watkins et al., 2004; DeEll, personal observations).



Figure 4: Storage rot in ‘Honeycrisp’.



Figure 5: ‘Honeycrisp’ held in 2.5% O₂ + 2.5% CO₂ at 1.5 to 2 °C for 3 months.

As a compromise to the several postharvest problems of ‘Honeycrisp’, the current storage recommendation is 3 to 4 °C. Cooling delays of 1 week at 10°C have been shown to reduce soft scald (Watkins et al., 2004), but this can also increase bitter pit and rot development (DeEll and Murr, unpublished data). Controlled atmosphere storage of ‘Honeycrisp’ is not currently recommended in Ontario (DeEll and Murr, 2003). However, limited success has been observed using 2.5% O₂ and <2% CO₂ at 3 to 5 °C (DeEll, personal observations). Severe internal browning develops when ‘Honeycrisp’ is held in 2.5% O₂ + 2.5% CO₂ at 1.5 to 2 °C for 3 months (Figure 5).

Trials using SmartFresh™ (1-MCP) on ‘Honeycrisp’ have shown little response in comparison to other apple cultivars (DeEll, 2004). There is insignificant firmness loss in ‘Honeycrisp’ during storage, and thus any improved firmness retention caused by SmartFresh™ treatment is difficult to discern. However, ethylene production, respiration, and greasiness can be reduced by treatment with SmartFresh™ (DeEll and Murr, unpublished data).

LITERATURE CITED

- Cline, J., and J. Gardner. 2005. Commercial production of 'HoneycrispTM' apples in Ontario. Ontario Ministry of Agriculture, Food, and Rural Affairs, Factsheet Order No. 05-047, AGDEX 211/32.
- DeEll, J.R. 2004. Storage and handling of Honeycrisp in Ontario. Presentation and hand-out at the Apple Storage Clinic, Simcoe, Ontario.
- DeEll, J.R., and D.P. Murr. 2003. CA storage guidelines and recommendations for apples. Ontario Ministry of Agriculture and Food, Factsheet Order No. 03-073, AGDEX 211/66.
- Rosenberger, D.A., J.R. Schupp, S.A. Hoying, L. Cheng, and C.B. Watkins. 2004. Controlling bitter pit in 'Honeycrisp' apples. HortTechnol. 14: 342-349.
- Watkins, C.B., J.F. Nock, S.A. Weis, S. Jayanty, and R.M. Beaudry. 2004. Storage temperature, diphenylamine, and pre-storage delay effects on soft scald, soggy breakdown and bitter pit of 'Honeycrisp' apples. Postharvest Biol. Technol. 32:213-221.