

An Update on Storage, Scald Prevention and SmartFresh™ Use

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With changes in varieties we grow and with the adoption of new storage tools, the techniques we employ to store apples will also change. Many of us now grow Honeycrisp, and soon the production capacity will be large enough so that storage of this variety will be needed. Another important change is the use of SmartFresh™ which has altered how we treat apples after harvest.

Honeycrisp is quite different in how it tolerates storage conditions compared to McIntosh. Cold temperatures are meant to keep apples crisp and free of decay, but Honeycrisp is chilling sensitive so we recommend a storage temperature of 37 °F. Honeycrisp has good resistance to the other scald – superficial scald, so postharvest drenches not needed, but are useful when Honeycrisp will be placed in for controlled atmosphere (CA) storage. Recent research has shown that Honeycrisp is sensitive to high carbon dioxide and will display internal injury when concentration exceeds a threshold somewhere above 1%. Postharvest drenches that contain diphenylamine give apples protection against high carbon dioxide injury. Not much else is known at this time about its carbon dioxide sensitivity, but it's an ongoing area of research. SmartFresh can worsen carbon dioxide injury so pay close attention to gas concentrations when storing Honeycrisp fruit treated with SmartFresh.

Other varieties that are relatively new are Fuji, Gala and Empire. Although they are not without storage problems, they are easier to store than Honeycrisp, so we have not done any studies on their storage problems in Maine. Other new varieties we are currently evaluating for good storage potential are SnowSweet and Autumn Crisp (NY 674).

Empire and McIntosh Firm Flesh Browning

The occurrence of firm flesh browning is on the rise because of the longer storage durations, particularly with SmartFresh. It is the longer storage duration that directly causes the browning and not SmartFresh. Symptoms are browning in the flesh with no clear cut margin and in severe cases, browning in the core. Empire is more prone than McIntosh, and apples harvested at later dates are more prone to this disorder. Apples from a late harvest are at risk of breakdown when they remain in storage longer than four months. ReTain and CA storage cannot always overcome the adverse effects of a late harvest. With this year's large volume of apples, carefully consider the storage durations and harvest dates. Colder storage temperatures also worsen symptoms of firm flesh browning, so keep temperatures in CA storage around 35 to 36 °F. Warmer temperatures are not recommended for these varieties which can rapidly lose firmness or condition. Keep carbon dioxide below 2% in CA storage and below 1% during the first month. A

recent article published in the New York Fruit Quarterly was published on this subject last October (<http://www.nyshs.org/fq.php>).

Superficial Scald (also called storage scald)

This type of scald is different from soft scald in how it develops and the varieties likely to get it. Fruit picked at early stages of maturity are more prone to scald, and it takes at least three months of cold storage for it to development. Symptoms are well defined patches of brown discoloration in the skin than can be solid or splotchy. Varieties vary in susceptibility with Cortland being extremely susceptible, and Honeycrisp and Gala being resistant. Susceptible fruit that will be stored longer than three months should be treated with a scald inhibitor prior to cold storage.

Diphenylamine (No-Scald) and ethoxyquin are two materials that prevent scald, but SmartFresh has replaced them for most varieties. Drenching bins of fruit with a scald inhibitor is cumbersome, time consuming and requires that a fungicide be added to the drench to prevent decay. Field drenching of bins is replacing the recycling drench, but is still considered experimental. Those of you who are trying the nonrecycling field drench should remember to add only diphenylamine and fungicide, NOT calcium. This technique is currently being researched by Dave Rosenberger at Cornell University.

SmartFresh is effective in preventing scald in most varieties, so fruit that receive a standard application of SmartFresh do not require drenching. Cortland is an exception because SmartFresh will not completely prevent scald in this highly susceptible variety. Empire will also benefit from drenching with diphenylamine because of its susceptibility to carbon dioxide injury when treated with SmartFresh.

Carbon Dioxide Injury

Injury can occur to the skin and flesh of apples in CA storage if the carbon dioxide concentration is too high. Traditionally, the initial concentration was held at or below 3% in the first month or so of the storage period and then allowed to increase up to 5%. Drenching with diphenylamine protects apples from the high carbon dioxide concentrations that occur in CA storage. Where apples are not drenched, carbon dioxide should be kept at 1% or lower, especially in the first month. SmartFresh slows down respiration, so carbon dioxide concentrations should be easier to manage.