

# An Appeal for Early Harvest of Honeycrisp

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It has been proposed by Dr. Chris Watkins of Cornell University that soft scald in Honeycrisp may be avoided, or at least substantially reduced, by delaying cold storage. Soft scald has been a serious problem on Honeycrisp grown in some areas of the US, one of which being New York. He found that if harvested fruit are kept at room temperature for a period of time (perhaps 1-7 days) before being transferred to cold storage temperatures, development of soft scald can be reduced or eliminated. It has always been recommended that harvested fruit be placed in cold storage as quickly as possible in order to maintain high quality for consumers. If cold storage is delayed in order to avoid soft scald, it is important to consider possible negative effects on other fruit qualities such as firmness and development of

disorders such as decay (to which Honeycrisp is quite susceptible), senescent breakdown, and internal browning.

This study looked at the effects of delaying cold storage on these qualities. Honeycrisp fruit were harvested from three orchard blocks at the University of Massachusetts Cold Spring Orchard Research & Education Center in Belchertown, MA on September 16 and 23, 2002. Fruit were divided into three groups. One group was placed in cold storage at 32F immediately following harvest, one group was kept at room temperature for 1 day prior to cold storage, and the third group was kept at room temperature for 4 days before being placed in 32F air storage. Fruit were removed for observation (for about 10 minutes) after approximately 90 days of cold storage and then

Table 1. Effects of delaying cold storage of Honeycrisp harvested September 16 and 23, 2002.

Percent of fruit developing:	Days from harvest (approximate)	Delay to 32F cold storage			Signif <sup>z</sup>
		None	1 Day	4 Days	
Soft scald (%)	90 <sup>y</sup>	4	0.5	0.5	*
Decay (%)	90	8	10	14	ns
	150 <sup>x</sup>	14	18	23	ns
	157 <sup>w</sup>	20	23	27	ns
Internal browning (%)	157	31	19	32	ns
Senescent breakdown (%)	157	7	4	4	ns
Skin greasiness (%)	157	20	20	20	ns
Off taste (%) <sup>v</sup>	157	12	0	25	ns
Average flesh firmness (lbs)	157	13.6	14.1	13.9	ns

<sup>z</sup> ns, \* Differences statistically nonsignificant or significant at odds of 19:1, respectively.

<sup>y</sup> Observations made at 90 days were on cold fruit just removed from storage.

<sup>x</sup> Observations made at 150 days were on cold fruit just removed from storage.

<sup>w</sup> Observations made at 157 days were on fruit which had been at room temperature for one week. Note that the same fruit were being repeatedly observed.

<sup>v</sup> Off taste has been described as an aldehyde or fermentation flavor with corresponding odor.

Table 2. Effects of delaying harvest of Honeycrisp, 2002.

Percent of fruit developing:	Days from harvest (approximate)	Date of harvest		Signif <sup>z</sup>
		September 16	September 23	
Soft scald (%)	90 <sup>y</sup>	3	0	**
Decay (%)	90	8	13	ns
	150 <sup>x</sup>	12	25	ns
	157 <sup>w</sup>	21	35	ns
Internal browning (%)	157	13	42	***
Senescent breakdown (%)	157	1	9	ns
Skin greasiness (%)	157	0	40	**
Off taste (%) <sup>v</sup>	157	0	25	*
Average flesh firmness (lbs)	157	14.5	13.3	***

<sup>z</sup> ns, \*, \*\*, \*\*\* Differences statistically insignificant or significant at odds of 19:1, 99:1, or 999:1, respectively.

<sup>y</sup> Observations made at 90 days were on cold fruit just removed from storage.

<sup>x</sup> Observations made at 150 days were on cold fruit just removed from storage.

<sup>w</sup> Observations made at 157 days were on fruit which had been at room temperature for one week. Note that the same fruit were being repeatedly observed.

<sup>v</sup> Off taste has been described as an aldehyde or fermentation flavor with corresponding odor.

Table 3. Effects of delaying harvest of Honeycrisp, 2002.

Percent of fruit developing:	Days from harvest (approximate)	Date of harvest				Signif <sup>z</sup>
		9/5	9/10	9/16	9/23	
Soft scald (%)	90 <sup>y</sup>	0	0.6	8.0	0	**
Decay (%)	90	6	7	1	15	*
	150 <sup>x</sup>	13	13	4	25	ns
	157 <sup>w</sup>	10	21	8	35	ns
Internal browning (%)	157	2	2	19	43	***
Senescent breakdown (%)	157	0	0	2	12	**
Skin greasiness (%)	157	0	0	0	40	***
Off taste (%) <sup>v</sup>	157	0	0	0	25	**
Average flesh firmness (lbs)	157	16.0	15.6	14.2	13.1	***

<sup>z</sup> ns, \*, \*\*, \*\*\* Differences statistically insignificant or significant at odds of 19:1, 99:1, or 999:1, respectively.

<sup>y</sup> Observations made at 90 days were on cold fruit just removed from storage.

<sup>x</sup> Observations made at 150 days were on cold fruit just removed from storage.

<sup>w</sup> Observations made at 157 days were on fruit which had been at room temperature for one week.

Table 4. Averages of some qualities of Honeycrisp at harvest, 2002.

Characteristic	Harvest Date				Signif <sup>z</sup>
	9/5	9/10	9/16	9/23	
Percent Red Color	51	46	58	68	***
Firmness (lbs)	17.0	16.8	15.1	14.0	***
Starch <sup>y</sup>	5.7	6.0	6.7	7.6	***
Internal Browning (%) <sup>x</sup>	-	-	0	12	-

<sup>z</sup> \*\*\* Differences statistically significant at odds of 999:1.

<sup>y</sup> Starch index is from Cornell Generic Starch Chart.

<sup>x</sup> Internal browning is percent of fruit which had internal browning. Fruit from the first two harvests were not cut to observe internal disorders.

replaced in cold storage for another 60 days. Following the 150 days, fruit were again removed for observation, kept at room temperature for 7 days to approximate conditions to which they might be subjected prior to consumption, and then pressure tested and tasted.

Table 1 shows the storage disorders observed on the fruit following cold storage, as well as the flesh firmness at the end of the 150 days of cold storage and week at room temperature. The only disorder which was significantly influenced by the delay of cold storage was soft scald. Delaying cold storage essentially eliminated soft scald; however, soft scald was not much of a problem. Only 4% of fruit developed the disorder even when cold storage was not delayed. Delaying storage would be recommended if soft scald were a problem, but it did not appear to be a problem for us (at least in 2002). Decay, internal browning, skin greasiness, and off flavor development were much greater problems, but treatments did not influence these problems differently.

Delaying cold storage did not appear to have a significant negative effect on quality of stored Honeycrisp fruit. The storage problems that were evident were not made worse by delaying storage up to 4 days, so that if soft scald were a problem, this solution would not have a substantial down side, other than that of the inconvenience of moving the fruit an

extra time. This is not to suggest that it is not generally important to cool fruit as quickly as possible, but to suggest that in the case of Honeycrisp the benefit of delay may outweigh the risks.

More important to us than soft scald have been decay and internal browning. Internal browning is especially problematic, since it is not visible on the packing line, and therefore seen first by the consumer. The browning tends to show up as a light brown sponginess of a large portion of the cortex of the apple. Overall, 25% of the fruit harvested September 16 and 23, 2002 suffered

from internal browning after 5 months of cold storage and 1 week at room temperature.

Time of harvest had a powerful effect on internal browning as well as other qualities of stored fruit (Table 2). Decay was not affected by time of harvest, but internal browning, skin greasiness, and off flavors of fruit were significantly reduced less frequent in fruit harvested on September 16 compared to those harvested on September 23. The earlier harvested fruit were also firmer.

In another experiment including two earlier harvest dates but no storage delay, the effect of time of harvest on post-storage fruit quality was even more dramatic (Table 3). The only storage disorder that developed on fruit harvested on September 5 or 10 was decay, plus a trace of internal browning. It should be noted, too, that while superficial scald can be a post-storage problem on early-harvested fruit, it did not develop on these Honeycrisp.

It is possible to use measurements of fruit ripening to assess a harvest date for Honeycrisp that will result in fewer storage problems (Table 4). A starch index of 5.5 to 6.0 has been recommended for Honeycrisp. In 2002, harvest of Honeycrisp fruit with starch index values in this range would have resulted in little development of storage disorders. Further, fruit were significantly firmer at the earlier harvests. Lack of red color is the only negative aspect of early harvest.

