AN UPDATE ON HARVEST AND STORAGE OF HONEYCRISP

Sarah A. Weis
Department of Plant & Soil Sciences, University of Massachusetts Amherst

Honeycrisp is an important new apple variety. Storage characteristics have not been of great concern up to now as there has been enough demand for the apple in the fall that not many have been stored. That will change as the many Honeycrisp that have been planted in the past few years come into full bearing. We at the University of Massachusetts have been assessing quality of air stored Honeycrisp for the past five growing seasons, and report here on our findings.

Positive characteristics of Honeycrisp include its flavor and texture and its retention of firmness in storage. It has sold well, and it produces high quality fruit under New England growing conditions.

There are some potential problems as well. The fruit is ready for harvest at about the same time as McIntosh. It may develop soft scald, decay, "off" flavors, and bitter pit in storage. Fruit size and thinning need to be addressed. Also, in our plantings at the University of Massachusetts orchard in Belchertown, there has been variability in fruit characteristics as a function of the tree source.

Time of harvest is an issue for at least two reasons. The competition for harvest of McIntosh may make it difficult to pick both cultivars at the optimum time. Honeycrisp, like McIntosh, can fail to develop its best color until after the optimal harvest time for storing fruit has passed. Succumbing to the temptation to wait for color (or simply not finding time to pick) can result in having fruit which develop excessive storage disorders.

We recommend harvesting Honeycrisp when it has reached 5.5 to 6.0 on the Cornell Generic Starch Chart. September 7 has been a "target" date at the UMass research facility in Belchertown. The color can be less than optimal at this time, and later harvest may be preferred for fruit which will be consumed in the fall. However, if fruit are harvested too late, they are more likely to develop physiological disorders. Soft scald, decay, "off" flavors, and internal browning are some of these potential disorders.

Soft scald appears as a surface browning. As its name suggests, the browned area tends to be soft. It also has a well defined or sharp edge. Soft scald typically develops during the first 60 days of storage and it is later harvested fruit which are susceptible. We have not seen much soft scald on fruit grown at the UMass orchard, but it has been a devastating problem in other areas of the country. Chris Watkins of Cornell University has suggested that delaying cold storage following harvest or storing at 34F rather than 32F will control soft scald. We do have one year's data showing the effect of delayed storage on Honeycrisp and this is shown in Table 1.

Decay is perhaps the most serious of the storage disorders of Honeycrisp grown in our area because it is the disorder for which there is seemingly no adequate solution. Up to 30% of some of our research sample fruit have developed decay during 5 months of cold storage. Decay is often related to stem punctures and bitter pits which can be controlled, but even so, there is still significant decay which occurs. Decay is one disorder which is not substantially reduced by early harvest.

Bitter pit development does not appear to be related to time of harvest, but it is interconnected with postharvest decay. At the time of harvest in 2002, 7% of apples in a sample of harvested Honeycrisp had bitter pit. After 90 days in 32F air storage, 13% of apples had bitter pit. Following 5 months of cold storage and one week at room temperature, fruit were rated for bitter pit and decay, and the combination of the two. Some fruit had been discarded at 90 and 150 days because of decay, but of the fruit remaining at 157 days, 73% of those with decay also had

bitter pit. Thus it appears that controlling bitter pit would substantially reduce decay. Application of calcium sprays during the growing season and avoidance of high nitrogen situations are two actions which will reduce bitter pit.

Table 1. Percent of fruit developing soft scald during the first 60 days of 32F cold storage.

Harvest Date	Days at room temperature before cold storage			
	none	1 day	4 days	6 days
9/21/00	0	0	0	0
9/26/00	34	5	1	0

Fruit size is a factor in bitter pit development, as well as a factor influencing other storage disorders. Larger fruit do tend to be lower in calcium and develop more bitter pit. Large fruit are often softer than small fruit, but in one Honeycrisp study in 1998 the small fruit from heavily set trees was softer than the larger fruit from trees with more moderate set. Soluble solids were higher on the fruit from trees with lighter set, and flavor was judged to be superior. Size can be a mixed blessing as shown in Table 2. Chemical thinning has been effective on Honeycrisp (Sevin™ at 1/2lb ai/100 gal at 2X was used at petal fall in 2002). It should be noted that Honeycrisp can become a biennial bearer.

Table 2. Effects of crop load on Honeycrisp apples grown at UMass' orchard in Belchertown, 1998

	Light set	Optimal set	Heavy set
Fruit size	252 g	229 g	158 g
Soluble solids at harvest	14.1 %	12.1 %	10.6 %
Firmness at harvest	17.6	16.2	15.5
Bitter pit after storage	33 %	21 %	6 %
Decay after storage	22 %	18 %	4 %

One last concern about Honeycrisp is that the fruit coming from different areas/trees within the orchard may not be as alike as one might expect fruit of the same cultivar to be. Table 3 shows some of the block-to-block variation observed in the 2002-2003 harvest and storage season. These differences may be due to budwood source, rootstock, tree age, soil differences (the blocks are close to one another), or, most likely, a combination of all.

It was usually possible to guess which group of trees an apple came from just by looking at it. The NE183 fruit were the brightest and smoothest. The Block A fruit tended to start out striped and develop a deeper red than the NE183 fruit. The block E fruit were very prone to bitter pit and seemed slightly more elongated. Trees in Block A are on M9 rootstock, and came from NY State Fruit Testing in 1994. The Block E trees which were planted in 1989 and are on M26 rootstock came from the Minnesota program which developed Honeycrisp. The NE183 trees were planted as part of a multistate research project in 1995. They are on M9 rootstock and

came from Adams County Nursery in Pennsylvania. These are all reputable sources of plant material, but the fruit are clearly different, more different than might be expected from trees in nearby blocks. Some differences may be related to differences in ripening. For example, the starch score of the later NE183 harvest indicates that the fruit were overripe. Overripe fruit might well be more prone to developing internal browning at harvest. Only 2% of Block A fruit harvested September 5 and 10, 2002 developed internal browning even after 5 months of 32F air storage. Some differences are harder to explain. There was no size difference at all in the 9/16 harvest, yet the ripest fruit (NE183) were also the firmest.

Table 3. Differences in late-harvested Honeycrisp apples from three sources at the UMass research facility in Belchertown, MA, 2002.

	Harvest Date	Block A	Block E	NE183	Significance[z] of:	
					Harvest	Block
Grams per fruit	9/16	237	235	236	ns	ns
	9/23	240	277	184		
Red color, percent of surface	9/16	64	46	70	*	***
	9/23	69	64	76		
Firmness at harvest (lbs)	9/16	14.9	14.5	16.8	***	***
	9/23	14.4	13.1	14.8		
Starch index[y]	9/16	6.7	6.5	7.0	***	***
	9/23	7.4	7.0	8.0		
Internal browning[x] at harvest	9/16	0	0	0	***	***
	9/23	0	0	60		
Internal browning[x] following storage	9/16	4	19	16	***	ns
	9/23	38	41	53		
Bitter pit[x] following storage	9/16 & 9/ 23	7	33	12	ns	***

[z] ns, *, ***, = not different at odds of 1:20 or statistically different at odds of 1:20 or 1:1000, respectively.
[y] Starch index according to the Cornell Generic Starch Chart
[x] refers to percent of fruit in the sample which developed the disorder

Grow Honeycrisp! Honeycrisp is an apple taht consumers ask for. Harvest at a starch score of 5.5 to 6.0. Do not wait too long for color. Early harvested fruit are unlikely to develop internal browning, soft scald, or “off” flavors. Apply calcium. Sufficient calcium will control bitter pit, which will in turn reduce decay. If you do harvest late, don’t store the fruit, and do cut a subsample of fruit to make sure they haven’t developed internal browning, and taste a subsample to make sure they haven’t developed an “off” flavor.