

MSU Fruit Team 2012 Apple Maturity Report

Northwest Region Reports

During the harvest season, apples from different regions are collected for maturity testing. The data is then compiled by MSU Extension educators into recommendations for harvest and storage of the most commonly grown apple varieties. Growers use this information as guidance for scheduling harvest on their farms.

The following pages contain helpful resources and **2012 reports from August and September (begin on page 4)**.

The MSU Apple Maturity Team:

Southwest Michigan - Bill Shane, MSU Extension

Southeast Michigan - Bob Tritten, MSU Extension

Northwest Michigan - Nikki Rothwell, MSU Extension

Grand Rapids Area - Phil Schwallier and Amy Irish-Brown, MSU Extension

Apple Post Harvest Laboratory – Randy Beaudry, MSU Dept. of Horticulture

HOW TO INTERPRET MATURITY INDICES

http://msue.anr.msu.edu/news/checking_apple_maturity_what_to_look_for

PREDICTED 2012 APPLE HARVEST DATES

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We have the least confidence in our predicted harvest dates for 2012 more than any other year of previous predictions. The winter was warm and the spring early with full bloom being as much as 5 weeks ahead on normal in the south and 4 weeks ahead on normal in the north. Numerous nights of frost and freeze events killed primary bloom (bloom born of 2 year wood and older) and most of any secondary bloom (bloom born of 1 year old wood) in most of the state, particularly the south half to the state. Some areas however had apples survive these adverse conditions. Frost and freeze events moved in around the bloom period for most of the state and thus most primary bloom were killed. These cold conditions stretched out the bloom period over 2 to 3 weeks. The predicted harvest dates are based on primary full bloom dates and not secondary bloom dates. Fruit of secondary bloom will mature up to 7 days after these dates.

2012 predicted harvest dates (Table 1) are between 14 and 30 days ahead of normal. These predicted harvest dates are for the center or peak harvest of these varieties for CA storage. Since these predicted harvest dates are based on primary bloom, growers with bloom that survived the frost may mature this early, however, most frost surviving fruit is from bloom at least a week later than these dates. Thus, the predicted dates have been adjusted by 7 days later and listed in Table 3 (adjusted 2012 predicted date).

Gala is notorious for ripening early when late summer temperatures are above normal. Light crops will mature a few days earlier. Other varieties are less prone to hot temperatures advancing fall maturity. Still other varieties ripen when cold temperatures occur near harvest time.

The normal harvest dates for other varieties are listed in Table 3 for the Grand Rapids area. This year's 2012 predicted dates and adjusted predicted dates are a rough estimate based on the McIntosh, Jonathan and Red Delicious predicted dates. Other areas of the state should adjust non-predicted varieties based on their own history. Using a 30 days before harvest 2012 predicted harvest date to time applications of ReTain should be adjusted a few days later for fruit from secondary bloom and heavy crop-loads. Light crop-loads, hot summer weather, and fruit from primary bloom should be

adjusted earlier.

Table 1. 2012 predicted peak harvest dates

Full bloom date				Predicted harvest date			
Station	McIntosh	Jons	Reds	McIntosh	Jons	Reds	Observer
SWMREC	3/31	4/2	4/3	8/9	8/28	9/4	Shane
Deerfield	4/12	4/15	4/15	8/19	9/13	9/19	Tritten
Romeo	4/17	4/19	4/20	8/23	9/15	9/21	Tritten
Peach Ridge	4/11	4/14	4/15	8/20	9/11	9/20	Schwallier
Hart	4/15	4/18	4/19	8/23	9/18	9/23	Schwallier
NWMHRS	4/25	4/30	5/1	8/30	9/20	9/27	Rothwell

Table 2. 2012 predicted peak harvest dates compared to normal and last year

Days ahead of normal				Days ahead of last year		
Station	McIntosh	Jons	Reds	McIntosh	Jons	Reds
SWMREC	29	24	24	34	29	28
Deerfield	20	8	13	27	16	16
Romeo	21	10	12	25	17	17
Peach Ridge	25	15	14	27	18	16
Ludington	26	15	21	28	16	17
NWMHRS	23	16	20	25	20	19

Table 3. Normal peak harvest dates for varieties for the Grand Rapids area.

Variety	Normal date	2012 predicted date	Adjusted 2012 predicted date
Paulared	8/24	7/29	8/5
Gingergold	8/26	7/31	8/7
Gala	9/10	8/15	8/22
McIntosh	9/15	8/20	8/27
Honeycrisp	9/18	8/23	8/30
Empire	9/22	8/27	9/3
Jonathan	9/28	9/11	9/18
Jonagold	9/28	9/11	9/18
Golden Delicious	10/2	9/15	9/22
Red Delicious	10/5	9/20	9/27
Idared	10/10	9/25	10/2
Rome	10/15	9/30	10/7
Fuji	10/25	10/10	10/17
Braeburn	10/25	10/10	10/17
Goldrush	11/1	10/17	10/24

NW MICHIGAN APPLE MATURITY REPORT #1
August 21, 2012

The NWMHRC will be testing apples for maturity for 2012, and results will be sent via fax and email to past apple maturity list subscribers. Reports for other regions around the state can be viewed at http://msue.anr.msu.edu/news/apple_maturity_reports_for_making_harvest_decisions.

With the lack of rainfall in July and August, fruit size is smaller than in past years. Color has not developed in most varieties, but the cool evenings and sunny days are helping with coloring and maturation.

Summary of northwest Michigan apple maturity samples taken on 20 August, 2012

Variety	Color % (range)	Firmness lbs. pressure (range)	Starch (range)	Brix (range)
Gingergold	20	18 (13 - 22)	2.7 (2-5)	14.6 (14-15.5)
Gala	45 (10 - 70)	21.7 (19 - 23.5)	1.1 (1 - 2)	10.8 (10 - 11.6)
McIntosh	78 (40 - 95)	19.2 (16.5 - 20.5)	1	10.2 (9.5 - 11)
Honeycrisp	30 (10 - 50)	18.5 (16 - 23)	1	11.5 (9.5 - 13)

PaulaRed - None tested, should be mature.

Gingergold - Nearing mature (2 samples). Firmness at 18.0 lbs. Starch index at 2.7. Spot picking has begun in the area. Background color should just be starting to turn yellowish at the time of harvest. Fruit that ripens to the point of full yellow will not hold up well in storage.

McIntosh - Immature (1 sample). Firmness at 19.2 lbs. Starch index at 1.0. Brix level at 10.2. Color is at 78%.

HoneyCrisp - Immature (2 samples). Firmness at about 18.5 lbs. Starch index at 1.0. Brix level at 11.5. Color is at 30%. This variety needs multiple pickings over several weeks for premium quality fruit. Watch for first 2 to 3 apples per tree to color for the first picking.

Gala - Immature (2 samples). Firmness at 21.7 lbs. Starch index is at 1.1 and brix levels are at 10.8. Color is nearing 45%.

NW MICHIGAN APPLE MATURITY REPORT #2
August 29, 2012

The NWMHRC will be testing apples for maturity for 2012, and results will be sent via fax and email to past apple maturity list subscribers. Reports for other regions around the state can be viewed at http://msue.anr.msu.edu/news/apple_maturity_reports_for_making_harvest_decisions.

Predicted apple harvest dates are put out by MSU Extension Educators each year and the dates for 2012 are about 3 weeks ahead of normal averages. As we begin to harvest the earliest cultivars, we get a chance to compare actual harvest dates to predicted dates. It appears that our predicted harvest dates for 2012 are on target with what is actually happening in the orchards. That table is calculated for the Grand Rapids area and you can adjust the dates for your location based on distance from mid-Michigan. You can find the table at http://msue.anr.msu.edu/news/predicted_2012_apple_harvest_dates.

See the Michigan State University apple website (<http://apples.msu.edu/>) and the MSU News for Ag website (<http://msue.anr.msu.edu/topic/info/fruit>) for more information, including reports from past seasons and much more information about apple maturity and apples in general.

Apple Maturity and Harvest Status by Region

Southwest Michigan (Bill Shane). Gala harvest is complete for most growers in SW Michigan and McIntosh varieties are nearly done. Honeycrisp is being spot-picked now, usually will take 2 or 3 picks. There is quite a bit of tree to tree variability for this variety. The skin of some of the more mature Honeycrisp fruit is starting to feel waxy/greasy. Size of Honeycrisp is generally good with very good flavor. The fruit disorder lenticel spot is common this year and bitter rot, usually rare in Michigan, is showing up because of the hot mid-season (see article). Varieties that are on the horizon for testing and potential harvesting in the lower SW Michigan region are Jonagold, Golden Delicious, and Jonathan.

Southeast Michigan (Bob Tritten). Apple harvest is moving along quickly in the region, due to the early start to the season. There are so few apples in the region that the information for this report is hard to gather. Gala and McIntosh have been harvested, and growers are starting to do a very light first picking of Honeycrisp. Gala were ready to harvest 16 days ahead of normal, and McIntosh were 12 days ahead of normal. Honeycrisp seem to have a wider range of maturity than any other year than I have seen. Growers are looking 'down the road 'at the maturity of Empire, Jonathan and Jonagold, and even a few are eyeballing Golden Delicious. Where there is a crop, harvest is very slow because the crop is so light and spread out, so this makes harvest much more expensive than most years. There are many farms where apple quality is a problem, mostly due to freeze damage, resulting in many small misshapen fruit. Fruit size has stalled at many farms due to drought stress.

West Central Michigan (Phil Schwallier and Amy Irish-Brown). Apple maturity is all over the board. There is a considerable variation in maturity from block to block, tree to tree and even limb to limb. Some fruits are mature and others are quite immature, especially where crop load is variable. In general, growers are reporting smaller fruits than expected with such a light crop. Fruits are marred up with frost marks and lenticel damage. Bitter pit is present in some areas, but less than expected so far. Brix levels are very much above normal. Growers are picking Macs, Galas, Honeycrisp and Golden Supreme. Gala fruit size is small to medium especially when fruits have few to no seeds and are born from one-year old wood. Gala are getting a greasy feel most likely due to the hot and dry summer weather. These fruit can hang longer on trees to pick up more size and yield. Most growers are not planning any CA storage of these fruit and thus there is not the rush to get the fruit off the tree. Macs, Gala and Honeycrisp are all ready for harvest but with quite a mix of maturity so spot picking would be best. Fruit drop is starting to occur. Be ready to apply NAA as a stop drop with or without ReTain or start harvest. It appears predicted harvest dates are quite good guidelines. We expected the mixed maturity, small fruit size, internal and external problems with the fruit, considering the frost, heat, and drought this year.

Northwest Michigan (Nikki Rothwell). Although the apple crop is smaller in northwest Michigan than in typical years, growers are pleased with fruit quality at this point. Growers with irrigation systems are running them often to help size the fruit and to reduce the stress on the trees from the extremely dry conditions. Overall, fruit size for all varieties is smaller this season. Gingergold harvest is underway. Some growers are spot picking Galas, but our limited maturity sampling shows that starch indexes are still quite low and firmness is still high; color on Galas has improved in the last week. McIntosh is still a week and a half off before harvest can be expected, and again, the color on this variety has improved in the past week. Recent cool nights will improve color in all varieties. Honeycrisp are sizing better than other varieties, and brix levels have risen in the past week; color on this variety is still minimal. Bitter pit in Honeycrisp is less than anticipated with the lighter crop.

Summary of northwest Michigan apple maturity samples taken on 27 August, 2012

Variety	Color % (range)	Firmness lbs. pressure (range)	Starch (range)	Brix (range)
Gala	64 (20 - 100)	21.9 (19 - 23.5)	1.2 (1 - 4)	11.7 (10.5 - 13)
McIntosh	78 (60 - 100)	17.3 (15 - 20)	1.5 (1 - 3)	11.5 (11 - 12.2)
Honeycrisp	48 (25 - 80)	17.4 (14.5 - 23)	2.1 (1 - 6)	13.0 (11 - 16.4)

Apple Post Harvest Laboratory (Randy Beaudry) Comments. Based on samples sent to the lab from the Grand Rapids area, Gala ethylene levels are normal and typical. McIntosh ethylene levels are considerably higher this week than last week. Honeycrisp ethylene and starch clearing are right on target with the fact that harvest is just beginning.

NW MICHIGAN APPLE MATURITY REPORT #3 September 6, 2012

The NWMHRC will be testing apples for maturity for 2012, and results will be sent via fax and email to past apple maturity list subscribers. Reports for other regions around the state can be viewed at http://msue.anr.msu.edu/news/apple_maturity_reports_for_making_harvest_decisions.

Predicted apple harvest dates are put out by MSU Extension Educators each year and the dates for 2012 are about 3 weeks ahead of normal averages. As we begin to harvest the earliest cultivars, we get a chance to compare actual harvest dates to predicted dates. It appears that our predicted harvest dates for 2012 are on target with what is actually happening in the orchards. That table is calculated for the Grand Rapids area and you can adjust the dates for your location based on distance from mid-Michigan. You can find the table at http://msue.anr.msu.edu/news/predicted_2012_apple_harvest_dates.

See the Michigan State University apple website (<http://apples.msu.edu/>) and the MSU News for Ag website (<http://msue.anr.msu.edu/topic/info/fruit>) for more information, including reports from past seasons and much more information about apple maturity and apples in general.

General Comments

Harvest of McIntosh and Gala is taking place in most areas of the state this week. Growers are in no hurry to get over blocks as the crops are so light. However, we have noticed a significant amount of drop in most apple cultivars this year - more than typical and surprising given the light crop situation. We have observed this in just about every variety picked so far and it's most likely attributed to the higher overall level of ethylene in apples this year due to frost cracking, high temperatures, drought, etc. The take-home message is that while you might have more time this year to let apples hang for color or size, be aware of this tendency for drop for 2012. Either apply stop drop materials to hanging fruits or harvest quickly.

Apple Maturity and Harvest Status by Region

Southwest Michigan (Bill Shane). Comments from SW Michigan: Local businesses are actively searching for sources of apples to satisfy needs of local farm stands and farmers markets. Harvest of Honeycrisp is continuing for 2nd week—eating quality and demand have been very good. Empire, Jonagold, and Jonathan should be tested now. Typically, Jonathan and Jonagold mature about 4 days after Honeycrisp and Golden Delicious 8 days after Honeycrisp. Tests of Golden Delicious picked on September 4, 2012 at the SW Michigan Research and Extension Center showed average flesh firmness

of 19.4 lb firmness, starch removal index of 1.2, and brix of 15.2, with green skin color and dark pits. General target for Golden Delicious apples for local sales is a starch index of 3 and firmness of 17 lbs or less firmness. Typically, Golden Delicious picked for processing as slices for pies and cobbler are harvested at a less mature state.

Southeast Michigan (Bob Tritten). Apple harvest is very different this year for the few growers with a crop. Varieties are not ripening in the usual order of ripening, as some varieties have jumped ahead of others in terms of maturity. Apple harvest is very slow this season because the crop is so early, light and maturity from tree to tree and even limb to limb so spread out.

Growers are finishing picking full rate Retain treated Gala, Honeycrisp are being spot picked for the second or third time, Empire are being harvested, and growers are looking at the maturity of Jonathan and Jonagold (some earlier strains are ready). Golden Delicious is still eating on the green side.

West Central Michigan (Phil Schwallier and Amy Irish-Brown). Growers are finishing up with Honeycrisp and Gala this week. Harvest is going very slowly as no one seems to be in a big hurry (or do they need to be). There has been a high amount of fruit drop in Paula Reds, Macs, Gala and Honeycrisp so far this year which suggests this might be a trend for the season. Fruit size is small in most cases. Flavor and sugar levels are excellent for Gala and Honeycrisp this week. Golden Delicious will be the next variety harvested perhaps next week.

Northwest Michigan (Nikki Rothwell). No commentary from NW Michigan this week, only the maturity data in the table below.

Summary of northwest Michigan apple maturity samples taken on 4 September, 2012

Variety		Color % (range)	Firmness lbs.		
			pressure (range)	Starch (range)	Brix (range)
Gala	(3 samples)	92% (70 - 100)	19.7 (17 - 23)	2.8 (1 - 6)	13.6 (12.4 - 15)
McIntosh	(2 samples)	65% (30 - 100)	16.5 (14 - 19)	2.5 (1 - 6)	13.0 (12 - 14)
Honeycrisp	(3 samples)	60% (20 - 85)	16.1 (14 - 18.5)	3.8 (1 - 6)	13.4 (10 - 17.2)
Jonagold	(2 samples)	49% (5 - 70)	19.8 (15.5 - 23)	1.5 (1 - 3)	13.3 (11.6 - 15.6)
Golden Delicious	(1 sample)	2% (0 - 10)	16.5 (14.5 - 18)	1.2 (1 - 2)	12 (10.5 - 13.4)

NW MICHIGAN APPLE MATURITY REPORT #4 September 12, 2012

The NWMHRC will be testing apples for maturity for 2012, and results will be sent via fax and email to past apple maturity list subscribers. Reports for other regions around the state can be viewed at http://msue.anr.msu.edu/news/apple_maturity_reports_for_making_harvest_decisions.

Predicted apple harvest dates are put out by MSU Extension Educators each year and the dates for 2012 are about 3 weeks ahead of normal averages. As we begin to harvest the earliest cultivars, we get a chance to compare actual harvest dates to predicted dates. It appears that our predicted harvest dates for 2012 are on target with what is actually happening in the orchards. That table is calculated for the Grand Rapids area and you can adjust the dates for your location based on distance from mid-Michigan. You can find the table at http://msue.anr.msu.edu/news/predicted_2012_apple_harvest_dates.

See the Michigan State University apple website (<http://apples.msu.edu/>) and the MSU News for Ag website (<http://msue.anr.msu.edu/topic/info/fruit>) for more information, including reports from past seasons and much more information about apple maturity and apples in general.

General comments

Growers are moving very quickly through harvest this season and it seems that our predicted harvest dates are on target for most cultivars. For all varieties tested by the MSU apple maturity team in 2012, the brix levels are very high, most likely due to the lighter cropland and the very sunny summer weather.

We continue to hear of unexpected fruit drop in all areas of the state. The surprise is Gala, which usually does not exhibit much drop, but is this year. This is most likely due to the unusual 2012 growing season and the fact that much of the Gala fruit was set on 1-year-old wood this season with low to no seed counts.

Apple Maturity and Harvest Status by Region

Southwest Michigan - Bill Shane. Honeycrisp harvest is mostly done. Tests of Golden Delicious 'Smoothie' picked on September 11 at the [Southwest Michigan Research and Extension Center](#) showed average firmness of 18 lbs. compared to 19.4 for last week. The target firmness for long-term controlled atmosphere storage for Golden Delicious is 17 lbs. Starch conversion index for this site was 3.0 (mature) compared to 1.2 for last week. Skin color of Golden Delicious was breaking on a few, from uniform green to light green with a hint of yellowish-green. Brix tested at 16.1 compared to 15.2 for last week.

Red Delicious 'Red Chief' strain, also from [SWMREC](#) on September 11, tested 17 lbs. flesh firmness – about the same as last week – and starch conversion of 4.4 compared to 2.8 for last week and currently with brix of 11.5. Approximately 20 percent of the Red Delicious fruit had moldy core. Target firmness for Red Delicious for long-term controlled atmosphere storage is 18 lbs. The presence of moldy core in the Red Delicious may have pushed maturity earlier. Predicted peak harvest date for 2012 Red Delicious for Berrien County was September 8.

Southeast Michigan - Bob Tritten. Apple harvest is moving along quickly this season for the few apple growers with a crop to harvest. Honeycrisp are being harvested for their final pick with quality an issue on many of these remaining fruit. Many are over-mature. Empire and Jonathon have been harvested and growers are working on finishing up Jonagold harvest.

Drop continues to be an issue at many farms. Golden Delicious skin color is beginning to break to a lighter green or even a few yellow. They will be next in line to harvest. Growers are looking at Red Delicious maturity; the predicted harvest date for the region is September 19 for Deerfield, Mich., and September 21 for Romeo, Mich. I am seeing a fair number of Red Delicious with moldy core as was reported in southwest Michigan.

West Central Michigan - Phil Schwallier and Amy Irish-Brown. Honeycrisp, Gala and McIntosh are harvested now, for the most part. If you still have Honeycrisp to harvest, it's time to get them off the tree; they are testing out with starch clearing at 8 and very high ethylene levels. Pressure and brix are still good for Honeycrisp, but don't wait too long to finish them up or they will drop. Non-harvested Galas continue to drop at excessive amounts; for example, in our untreated trees (no Retain or NAA), we had 15 percent fruit drop last week and another 15 percent drop this week. This is very unusual for Gala especially, and is likely due to the weather of 2012 in some way.

Jonathan, Jonagold and Golden Delicious are now entering the harvest window; ethylene levels are low, but changing and firmness is 13 to 17 pounds, which is a little lower than expected. Next week, Red Delicious and Empire should be harvested. Red Delicious samples are starting to show some internal ethylene and the predicted harvest date of late September appears to be accurate for the Ridge.

Fruit brix levels continue to be excellent. Color is good to very good, especially on red strains. Firmness is less than expected on nearly every variety tested. Moldy core is present in Red Delicious.

Northwest Michigan – Nikki Rothwell. Apples throughout the region have colored up in the past week with the cooler nights. Growers are starting to harvest the different strains of McIntosh. This

variety still eats a little green, but we have seen some drop of McIntosh in the past few days and growers are trying to get the fruit off in those blocks. Galas have been improving in size despite the dry conditions, but are still firm and need more color.

Honeycrisp starch indexes are variable, but the fruit eat pretty well at this time. Honeycrisp harvest is anticipated to begin with spot-picking next week. Jonagolds still have time before they are harvested; firmness levels and starch indexes suggest a week and a half to two weeks before harvest. Golden Delicious firmness is lower than expected at this time.

Summary of northwest Michigan apple maturity samples taken on 10 September, 2012

Variety		Color % (range)	Firmness lbs. pressure (range)	Starch (range)	Brix (range)
Gala	(2 samples)	90% (70 - 100)	21.5 (15.5 - 22.5)	2.6 (1 - 8)	12.9 (11.5 - 14)
McIntosh	(2 samples)	83% (60 - 100)	16.6 (14 - 19.5)	2.5 (2 - 5)	13 (10.8 - 15)
Honeycrisp	(2 samples)	66% (40 - 90)	15.4 (14 - 18.5)	4.5 (1.5 - 6)	13.4 (11 - 15.5)
Jonagold	(3 samples)	60% (40 - 90)	18.7 (12 - 23)	2.8 (1 - 8)	14.3 (11.6 - 15)
Golden Delicious	(2 samples)	8% (0 - 30)	15.5 (13 - 19)	2.0 (1 - 4)	12.6 (11 - 14.8)
Macoun	(1 sample)	65% (40 - 85)	15.9 (15 - 18)	1.7 (1 - 2)	12.5 (11.6 - 13.8)
IdaRed	(1 sample)	68% (50 - 100)	19.3 (17 - 22)	1.2 (1 - 2)	13.8 (13 - 15)

Apple post-harvest laboratory comments – Randy Beaudry, MSU Department of Horticulture

We are noticing some variability with the Red Delicious samples that are coming in from the Ridge/Belding, Mich., area. This is perhaps due to the various maturity levels with individual fruits on the same tree this year.

NW MICHIGAN APPLE MATURITY REPORT #5 September 19, 2012

The NWMHRC will be testing apples for maturity for 2012, and results will be sent via fax and email to past apple maturity list subscribers. Reports for other regions around the state can be viewed at http://msue.anr.msu.edu/news/apple_maturity_reports_for_making_harvest_decisions.

Predicted apple harvest dates are put out by MSU Extension Educators each year and the dates for 2012 are about 3 weeks ahead of normal averages. As we begin to harvest the earliest cultivars, we get a chance to compare actual harvest dates to predicted dates. It appears that our predicted harvest dates for 2012 are on target with what is actually happening in the orchards. That table is calculated for the Grand Rapids area and you can adjust the dates for your location based on distance from mid-Michigan. You can find the table at http://msue.anr.msu.edu/news/predicted_2012_apple_harvest_dates.

See the Michigan State University apple website (<http://apples.msu.edu/>) and the MSU News for Ag website (<http://msue.anr.msu.edu/topic/info/fruit>) for more information, including reports from past seasons and much more information about apple maturity and apples in general.

General comments

Great variability in maturity continues to be reported across the state's apple growing regions. There are great differences in maturity block to block and even in fruits on the same tree. Fruit size and color are less than a normal year. Fruit finish is also less than perfect due to frost marks, with the exception of Golden Delicious which is surprisingly very nice looking for 2012. Brix levels of all varieties tested by the MSU Fruit team members across the state continue to be at very high levels.

Fruit drop continues to be higher than expected given the light crop set.

2012 is certainly a year for the record books - earliest green tip ever recorded, record warm temperatures and a drought. At the end of the regional reports, Dr. Randy Beaudry has summarized the effect that a warm year has had on the maturity of Michigan apples.

Apple Maturity and Harvest Status by Region

Southwest Michigan (Bill Shane): Golden Delicious 'Smoothee' picked on September 17 at the Southwest Michigan Research and Extension Center showed average firmness of 16.8 compared to 18 lbs. for last week. The target firmness for long-term controlled atmosphere storage for Golden Delicious is 17 lbs. Starch conversion index for this site was 2.8, compared to 3.0 for last week, and 1.2 for the week before that. Skin color of Golden Delicious was breaking on most fruit. Brix tested at 17.3 compared to 16.1 for last week. Red Delicious 'Red Chief' strain, also from SWMREC on September 17, tested 19 lbs. flesh firmness, compared to last week's average of 17 lbs. Starch conversion this week tested 3.2 compared to 4.4 for last week, and currently with brix of 11.8. We are seeing some variability of maturity among these Red Delicious. Last week our samples had some moldy core which may have resulted in more mature readings than this week's samples. Predicted peak harvest date for 2012 Red Delicious for Berrien County was September 8. We tested Fuji (main season variety Autumn Rose) for the first time this week. Fuji was very firm at 20.1 lbs, with starch index of 3.4, and brix of 14.8. Background color of Fuji was still relatively green.

Southeast Michigan (Bob Tritten): Apple harvest is very different this year, even for the few growers with a crop to harvest. Growers are harvesting many strains of Red Delicious, and are starting to harvest Idared. Fiji is not ready yet, but is closer than what growers might expect for this third week in September. Golden Delicious and Jonagold harvest finished last week. Overall, fruit finish is a challenge this year on most varieties, except Golden Delicious that had excellent finish. Brix levels are generally higher this year than most years. Finally, apple cider tastes very good this year, with a sweet, rich, full bodied flavor, even though most cider makers do not have their normal mix of varieties to blend this season.

West Central Michigan (Phil Schwallier and Amy Irish-Brown): Jonagold are ready for harvest now when red color is adequate. Red Delicious are also ready but not quite as far along as Jonagold. Reds will still be excellent early next week. Romes are still immature but are approaching long term CA storage. We expect them to be ready in about 1 week. Romes have very low ethylene and low starch index. Fuji are still immature and in the same state as Romes. I expect Fuji to be ready in about 2-3 weeks.

Northwest Michigan (Nikki Rothwell): Growers are moving quickly through apple harvest with the light crop this year. The most notable characteristic of 2012 fruit is the high brix values with all varieties. Growers are hoping for more color in this coming week. Most Galas are off the trees at this time, and no samples were available for testing. We were still able to find some McIntosh for testing—a bit of a surprise, and these fruits still exhibited variability among the samples. Firmness in Macs is higher than anticipated for this time in the season, and starch removal numbers varied from 3 to over mature at 8. Honeycrisp harvest has begun this week, but color is variable even on trees that have been pruned to provide adequate sunlight. Firmness remains constant in this variety, and all starch removal indices show this variety is almost at peak ripeness. Jonagold brix levels are also high with some fruit coming in at 17 and 18. Color on Jonagold is all over the board, but starch removal is fairly constant in the 5-6 range. Golden Delicious are still a ways off before harvest, but brix levels are up

into the 13-15 range. We tested a sample of each of the later ripening varieties: Northern Spy, IdaRed, and Romes. Northern Spies are the furthest along with starch removal readings ranging from 2 to 7, with an average of 4.3. This variety is still firm and has fairly high brix levels. Both Romes and IdaReds have some time to go before harvest; starch removal levels are still low

Summary of northwest Michigan apple maturity samples taken on 18 September, 2012

Variety		Color % (range)	Firmness lbs. pressure (range)	Starch (range)	Brix (range)
Rome	(1 sample)	100%	21.7 (21 - 23)	1.9 (1 - 2)	12.5 (12 - 13)
McIntosh	(1 sample)	82% (65 - 95)	16.7 (14 - 19)	4.7 (3 - 8)	13.5 (12 - 15)
Honeycrisp	(2 samples)	43% (15 - 75)	16.3 (13 - 23)	5.4 (4 - 6)	13.8 (11 - 16)
Jonagold	(2 samples)	29% (10 - 75)	17.3 (15 - 22)	5.6 (2 - 8)	15.4 (12.5 - 18)
GoldenDelicious	(1 sample)	3% (0 - 5)	18.8 (17 - 21)	3.4 (2 - 4)	13.5 (13 - 15)
Macoun	(1 sample)	26% (10 - 60)	15.9 (14 - 18)	1.8 (1 - 4)	12.4 (12 - 13.8)
IdaRed	(1 sample)	67% (40 - 85)	20.7 (19 - 23)	1.4 (1 - 3)	15 (14 - 18)
Northern Spy	(1 sample)	8% (0 - 20)	19.8 (18 - 21)	4.3 (4 - 7)	14.9 (13 - 17)

Apple Post Harvest Laboratory Comments (Randy Beaudry): The maturation and development of all apple varieties on the extremely warm 2012 season continues, with late varieties maturing 2 to 3 weeks ahead of their normal harvest schedule. In mid-September, we would normally be finishing off Macs in the southwest, we are now nearly finished harvesting Red Delicious. The same trend is apparent across the length and breadth of Michigan this year. The limited maturity data we have been able to generate this year suggests that the apple harvest will be complete about three weeks early.

To put the temperatures we have experienced in perspective, we can compare the number of cumulative days for which the temperature exceeded a high temperature, say 80 F. Using temperature data for the Sparta weather station, we would learn that last year, 2011, yielded 56 growing degree days above 80 F; in 2010, the previous hottest year on record in the U.S., there were 52 GDD above 80; in 2009, there were 17; in 2008, there were 23; in 2007, there were 72. 2012 is now the warmest year on record, **this year the Sparta weather station had 113 growing degree days above 80 F!**

Needless to say, apple fruit across the state are responding to these excessively high temperatures with early maturation. However, another concern is that different tissues within each fruit also respond to these high temperatures. Keep in mind that temperature affects the rate of cellular expansion in the fruit, the rate of respiration, the rate of transpiration, and the rate of wound healing.

This year, we have seen an unusually high incidence of excessively rough fruit surfaces, expanded lenticels, russeting and fruit cracking that are likely partly due to the warm temperatures in the orchard. Problems have been especially apparent on Minneiska, Gala and Honeycrisp, although, oddly, not so much on Golden Delicious.

Uneven growth of the fruit shoulders and calyx are linked to surface cracking, a feature which is also exacerbated by uneven water availability (water availability was an issue this year as well). High temperatures can alter the makeup of the cuticle and, as the fruit expands, can alter its ability to stretch, resulting in small surface cracks that can contribute to russeting. Further, lenticels are, in actuality, wounds created by the death of cells around stomatal tissue in young fruits and subsequent wound-healing. Factors that influence wound healing, including some field applied chemicals, may migrate more readily at high temperatures, damaging cells directly or sensitizing them further to environmental stresses. In any case, the lesson we may be learning is that we need to minimize

chemical and environmental stresses that affect fruit finish during warm years to the fullest extent possible. In that eight of the top ten hottest years have occurred in the last 10 years, there is no reason to believe that the next few years will be substantially cooler. Perhaps this year can be used to help direct our focus on future crops, larger crops, where preserving fruit finish will be of significantly greater economic importance.

NW MICHIGAN APPLE MATURITY REPORT #6 September 26, 2012

The NWMHRC will be testing apples for maturity for 2012, and results will be sent via fax and email to past apple maturity list subscribers. Reports for other regions around the state can be viewed at http://msue.anr.msu.edu/news/apple_maturity_reports_for_making_harvest_decisions.

Predicted apple harvest dates are put out by MSU Extension Educators each year and the dates for 2012 are about 3 weeks ahead of normal averages. As we begin to harvest the earliest cultivars, we get a chance to compare actual harvest dates to predicted dates. It appears that our predicted harvest dates for 2012 are on target with what is actually happening in the orchards. That table is calculated for the Grand Rapids area and you can adjust the dates for your location based on distance from mid-Michigan. You can find the table at http://msue.anr.msu.edu/news/predicted_2012_apple_harvest_dates.

See the Michigan State University apple website (<http://apples.msu.edu/>) and the MSU News for Ag website (<http://msue.anr.msu.edu/topic/info/fruit>) for more information, including reports from past seasons and much more information about apple maturity and apples in general.

General comments

Across the state, apple harvest is going very quickly. Some larger producers report that they will be done by the weekend with very little left to harvest in the month of October which is normally our busiest harvest time. Blocks are generally picking out shorter than expected and fruit finish is poor resulting in poor pack-outs.

Apple Maturity and Harvest Status by Region

Southwest Michigan (Bill Shane): Most apples for wholesale markets have been picked in SW Michigan. A few apples remain in the tops of trees and are supplying the local retail sales. Golden's, red delicious, macs, and fuji apples in general had a nice finish this year. Honeycrisp and Jonagold suffered from lenticel disorders, leading to rot problems. This is the last report for 2012.

Southeast Michigan (Bob Tritten): Apple harvest is moving along very quickly this season; growers with a crop are saying that they will be wrapping up harvest in the next week or two. This could be the earliest end of harvest that we have ever seen in the region. Growers are working their way through the later maturing strains of Red Delicious and are picking Idared at the same time. Northern Spy has mostly been harvested. Golden Delicious harvest ended late last week for most growers, they had the nicest finish that growers have ever seen this season. Fuji is not quite ready yet, but will be so over the weekend and early next week. Rome's are also very close to being mature. Most growers report that they do not have enough Braeburn this year to worry about, but those that do will be picking them in about 10 to 14 days.

Lastly, apple cider continues to taste very good this season, with a sweet, rich, full bodied flavor. In general brix levels are up this season in most apple varieties; this is helping to make the blending easier and cider with a good taste. I have had many growers comment on the tremendous amount of sediment in cider this season, especially from apples that have been transported a long distance. This has been true for most varieties, but especially McIntosh.

This will be the final Apple Harvest Report for the 2012 growing season. I hope that you have found them to be helpful.

West Central Michigan (Phil Schwallier and Amy Irish-Brown): Harvest of Fuji and Rome is finishing up with many growers stating that harvest should be complete by the end of September. There are a few Granny Smiths that need to be harvested. Other very late harvested varieties such as Braeburn were severely hurt by the frost and there are very few in this region.

Northwest Michigan (Nikki Rothwell): Apple harvest continues throughout the region, and quality has been excellent. The recent weather has been unusual (not a surprise this season), and we have had many bouts of hail and sleet. We have not observed substantial damage from the hail events, but fruit has been likely impacted with the multiple days of rain and hail. We were again a bit surprised this week as there are a few McIntosh orchards that have yet to be harvested. The limited testing showed that the starch is still in the 3.5 range, but color has improved markedly in the past week. Honeycrisp harvest is underway, and color of this variety has also improved this week; however, firmness has dropped substantially. Some Jonagold orchards have been harvested, but we did test one block, and Jonagold brix is extremely high this year. We have tested apples with an average of 16 brix but some fruits have been in the 18 range. Starch indexes are approaching overmaturity in Jonagold. Golden Delicious is still testing in the mid-2 range for starch, but the green color is fading to yellow. Ida Red and Rome are still a ways off before harvest. Starch indexes are in the 2 range, and the firmness of both is high. Ida Red color has improved this past week. Empire is in the mature range, and starch is at an average of 5.3 and brix levels are in the mid-13s.

Summary of northwest Michigan apple maturity samples taken on 24 September, 2012

Variety		Color % (range)	Firmness lbs. pressure (range)	Starch (range)	Brix (range)
Rome	(1 sample)	100%	20.7 (19 - 23)	2.4 (1 - 6)	12.4 (11.5 - 15)
McIntosh	(1 sample)	96% (90 - 100)	15.4 (14 - 16.5)	3.5 (2 - 6)	14.3 (13.2 - 15.5)
Honeycrisp	(1 sample)	64% (50 - 85)	12.9 (12 - 14)	5.3 (5 - 6)	12.2 (11 - 13.6)
Jonagold	(1 sample)	90% (60 - 100)	15.7 (12 - 19)	6.1 (5 - 8)	16.1 (15 - 17.2)
Golden Delicious	(1 sample)	18% (0 - 40)	14.8 (13 - 16.5)	2.4 (2 - 3)	13.1 (12 - 14.2)
Empire	(1 sample)	89% (60 - 100)	16.4 (15 - 18.5)	5.3 (4 - 8)	13.2 (12 - 15)
Ida Red	(2 samples)	92% (70 - 100)	16.9 (15 - 20)	2.5 (2 - 3)	14 (12.8 - 15.5)
Red Delicious	(1 sample)	98% (95 - 100)	16.9 (14.5 - 19)	1.6 (1 - 2)	12.5 (11.2 - 15.5)

Notes from the 2012 CA Clinic

(Randy Beaudry, MSU Department of Horticulture):

The MSU Controlled Atmosphere and Storage Clinic was held in Grand Rapids at the Amway Grand on August 8. The Clinic was sponsored by AgroFresh (who co-organized the event), Storage Control Systems, Pace and Decco. We were very fortunate to have two excellent invited speakers in for the event: Jennifer DeEll from Ontario (OMAFRA, Simcoe) and James Mattheis of Washington State (USDA, Wenatchee). Both speakers spoke on two topics. Dr. DeEll spoke on combining CA and SmartFresh to control storage disorders in Empire and on multiple applications of SmartFresh for Northeast apples. Dr. Mattheis spoke on internal browning in Gala and on CA storage of Honeycrisp apple fruit. Here are a few highlights from their talks.

Dr. DeEll showed that fruit are sensitive to SmartFresh throughout the storage period. Using examples of Empire and McIntosh apples, she showed that a second application of SmartFresh after CA storage could markedly improve fruit firmness retention during the retail holding period. She also

showed that a second treatment would reduce internal ethylene content and suppress senescent breakdown in McIntosh. Dr. DeEll also evaluated the effect of delayed CA storage on CO₂ injury susceptibility in Empire. She found that a delay of 1 to 2 months reduced CO₂ injury and could reduce core browning in apples as long as the fruit were not previously treated with SmartFresh, however, these fruit were at greater risk of softening. SmartFresh treatment just after harvest in combination with a delay in the establishment of CA, resulted in firm fruit with low incidence of CO₂ injury.

Dr. Mattheis findings on options for Honeycrisp storage revealed that 7 days at 50 °F followed by storage at 36 or 39 °F almost completely suppressed chilling injury on early harvested fruit, and was also very effective for more mature fruit. Mature fruit benefitted more from the higher storage temperature of 30 °F in terms of reduced soggy breakdown and soft scald. Dr. Mattheis also shared that CA (2% O₂ and 1% CO₂) storage was very effective at reducing greasiness and maintaining high titratable acidity. Treatment of the fruit with a 7-day storage delay at 50 °F was used for all stored fruit. SmartFresh tended to reduce internal browning after long-term (6 months) CA storage as well. Oxygen levels below 1.5% were found to be damaging, leading to more internal browning. CO₂ levels above 1% also caused internal browning and an increase in the internal cavities associated with CO₂ injury. Dr. Mattheis recommended harvest at a starch index of 5 to 6, and the use of 7 days delay at 50 °F to suppress chilling disorders. He also suggested that a CA atmosphere of 2% O₂ and 1% CO₂ was near optimal, with storage temperatures maintained between 36 and 39 °F. He noted that SmartFresh worked very well with Honeycrisp and could be used in air storage or in combination with CA.