

VERAISON TO HARVEST

Statewide Vineyard Crop Development Update #3



Cornell University
Cooperative Extension

September 10, 2010

Edited by Tim Martinson and Chris Gerling

Around New York...

Statewide (*Tim Martinson*).

Fruit maturity samples (pp 3-6) show impressive gains in brix, and acids down in the single digits for many early season and red varieties – undoubtedly reflecting the hot weather the week preceding our September 7 sample date. It's cooled down – and more moderate temperatures throughout this week should slow ripening down a bit. Meanwhile, throughout New York, we are into the thick of the harvest season. The numbers speak for themselves.

Long Island (*Alice Wise and Libby Tarleton*).

Fortunately, the storm that started out as Hurricane Earl fizzled as it passed south of Long Island on September 3. It provided intermittent, gentle rainfall ranging from 1-3". Growers considered this a benefit as the season long drought has been tough on vines. Wind and sun the next day dried everything out nicely. Warm, dry weather has since continued. The weather is so nice it is almost surreal. Even if rains materialize as harvest progresses, the majority of blocks are proceeding through ripening with good fruit integrity and should hold up nicely. There is some shrivel in the usual suspects Pinot Noir and Gewürztraminer. It seems more related to a varietal tendency to do this as well as cluster compactness. A small percentage of berries are shriveled but remain sweet with no rot.

Harvest of whites including Chardonnay, Pinot Gris, Riesling and Sauvignon Blanc has started. Fruit is a little more advanced in blocks with younger vines and/or lighter crops. Where vines are mature and crops a little heavier, growers are waiting a little longer for acids to moderate and flavors to intensify. Even the reds are racing along - Malbec sugars are high and acids are dropping out. In the research vineyard, only Albariño has been harvested with 22°Brix and 9.6 g/l TA. The vines were 3 yrs old, we were fearful that the fruit would not make it through a storm. Otherwise, we will be harvesting many whites and a few reds such as Pinot Noir,



*NY95.0301.01, a selection from Bruce Reisch's breeding program, harvested today from Justine Vanden Heuvel's training trial at the New York State Agricultural Experiment Station. NY95 has wild *Vitis cinerea* in its background, and is highly resistant to powdery mildew.*

Photo by Tim Martinson

Dornfelder and Malbec next week.

Wildlife pressure is problematic in some areas with birds, deer, critters and turkeys all feasting on ripening fruit. With so much deer fence on the East End now, the non-fenced growers are under more pressure than ever. Many have heavy duty netting and/or 8 ft steel mesh fence leaning against the ends of rows in an effort to deter deer. We have noticed in the research vineyard that birds are really keying in on red varieties more than ever this year. We have losses in Cabernet Sauvignon throughout the vineyard, with adjacent plots of whites such as Chardonnay almost untouched. Our $\frac{3}{4}$ " mesh nets and the fine mesh loosely stitched side nets are not doing the job, even with two layers of net. Only the fine mesh lock-stitched side net is relatively unscathed though we are noticing attempts by robins to pull berries through the fine mesh. In some cases, the berries are getting stuck. It would be comical if it weren't so aggravating to have to constantly battle the birds. (AW)

Lake Erie (Tim Weigle).

If it's raining, it must be the start of harvest. While Constellation Wine Company, Walker's Fruit Basket and many of the small wineries in the area have been harvesting early varieties for some time now, National Grape Cooperative started Niagara harvest this past Wednesday. Right on cue, remnants of a strong cold front that pushed through on Tuesday night continued to produce scattered showers on Wednesday. Despite the showers, the crew of the Cornell Lake Erie Research and Extension Laboratory (CLEREL) in Portland, NY joined area growers in getting their first Niagara load harvested and off to the processing plant. Another area juice processor, Cliffstar Corporation, has plans to start their Niagara harvest on September 13. All juice processors in the area will be gearing up for full scale Concord harvest starting throughout next week.

Although the area has seen more clouds and rain in the past week, sugar accumulation continues at a rapid rate and fruit quality continues to be excellent. While disease levels have been very low for the majority of the year in most vineyard blocks, Botrytis is starting to show up in just the past week in the wine variety block at the Fredonia Vineyard Lab. The weather forecast for the area will continue to favor sugar accumulation with cooler temperatures but with more sunshine than rain forecasted over the next ten days.

Finger Lakes (Hans Walter-Peterson)

While harvest has been going on for a couple of weeks already, things really seemed to ramp up this week in the Finger Lakes. A lot of different varieties were starting to come off the vines this week, including Niagara and early Concord, Seyval and Cayuga White, Foch, Pinot noir and Chardonnay. Pinot noir berries in some vineyards were showing signs of shriveling, not due to disease but more likely due to this week's heat and perhaps some drier conditions in those certain spots. Botrytis infections are showing up a little bit more in tight clustered varieties, but in most cases things are still looking pretty clean.

The cooler weather that has moved into the area is quite a departure from what we have become accustomed to over most of the season, but may actually be a welcome arrival to some extent at least with regards to it helping to retain some acidity in the fruit. The next week or two of sampling should give us a better idea of what is going on with acid levels.

According to our records, growing degree day accumulation is currently well ahead of both 2007 and 2005, our two most recent "warm" years, and are almost dead on with 1991, our warmest growing season in almost 40 years. As long as we don't enter into an overly wet period, the potential quality of this year's crop should continue to remain very high.

Hudson Valley (Steven McKay & Steve Hoying).

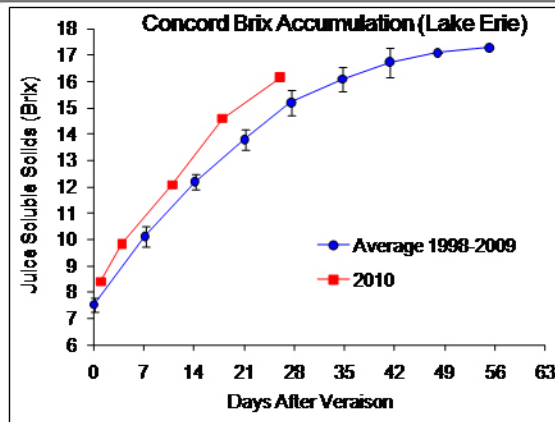
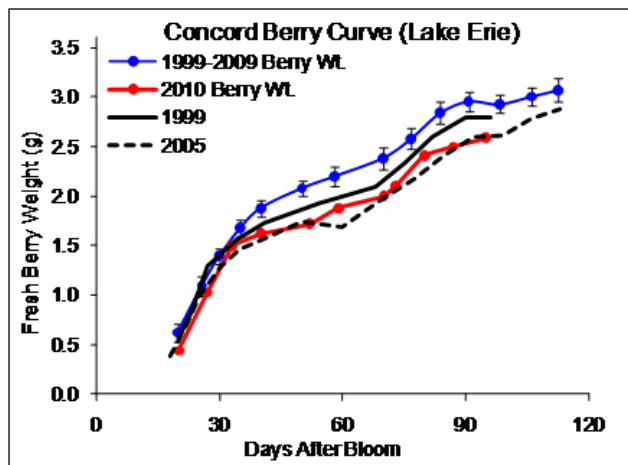
The weather has continued to be generally dry and warm for the past week, and forecasts for the next couple of weeks show dry and mild temperatures. Ripening conditions have been quite good, and it appears they will continue. Pinot Noir was just harvested with good numbers (22 brix, 3.3pH, and acids running about 8). Three growers noted that the fruit was ripe to the point that some berries were a bit desiccated. So far yields have been down in vineyards that were affected by the spring frost, and by the dry summer. Those who have drip irrigation have notably better yields. One vineyard reported that frost thinned his Seyval making it unnecessary to thin fruit, and yields came out normal. Seed development in Noiret, Frontenac, and Merlot is almost complete, and it will be necessary to wait a couple of weeks more to develop flavor and get lower acid readings. Acids are still high in Reisling. Cayuga White will be ready to pick by Monday.

LAKE ERIE CONCORD RIPENING PROFILE

Terry Bates

Cornell Lake Erie Research and Extension Laboratory

Ripening conditions for Concord in the Lake Erie region continue to be terrific with higher than average rates of juice soluble solids accumulation. Average fresh berry weight was 2.6 g and the berry curve continues to track similar to 2005.



MANAGING ACID IN 2010 -STEP 1: FORGET 2009

Chris Gerling
Statewide Enology Extension Associate
Dept of Food Science

As each winemaking season throws the inevitable curve ball, we promise ourselves that we'll be ready for it next year. The only problem is that when next year turns into this year, we don't get the curve-we get a knuckleball. Last year we wanted the acid out. Here in Geneva, we cooked up all sorts of plans for trials in 2010 based on chemical deacidification, aiding malolactic fermentations and so forth. Now, here we sit with the most degree days since 1991. Acid is a concern, but not in the way we expected. Acting on last year's impulses is not going to help (thank goodness), and we need to think about a new challenge: high pH

First we need to consider the two primary measures of acidity and what they can tell us at this time of year.

pH: The concentration of free protons, or the "strength" of the acid/ base. pH is important in grapes and wine for a number of reasons. During ripening, the rising pH is an indicator of relative maturity or cation (read potassium) uptake. In tanks, pH becomes important for microbial and color stability and relative efficacy of SO₂.

TA: The titratable acidity is the total concentration of titratable protons, free or not, and for our purposes serves as the "amount" of acid. We express this in grams per liter or percent of the total, and use TA when adjusting acid for mouthfeel later in the wine-making process. TA will decrease as ripening proceeds, and we can get more information from TA at harvest time, also.

Why are we interested in both of these numbers? They each are giving a measure relating to the level of acid, right? The problem is that there are multiple organic acids in grapes, and they are not equal. A winemaking example showing the difference between pH and TA is malolactic fermentation. During this process, malic acid is converted to lactic acid. The TA remains the same, meaning we still have the same amount (grams/ liter) of acid, but the pH changes.



Using both the TA and the pH, can give a rough idea of which organic acids may be present in the sample.

Back to harvest, and harvest in 2010 in particular. Across the board, pH levels are higher than we're used to seeing. Step one is to determine whether or not the pH is high and the TA is low, indicating an overall low acid situation, or the pH is high and the TA is high, indicating karma has caught you for stealing your neighbor's newspaper. Given the range of cultivars and growing conditions across New York, we will likely find both situations, but given the extreme amounts of heat we've experienced, we'll be expecting the former (high pH/ low TA) to be more common.

There are two primary modes of pH increase in grapes-malic acid degradation and cation (potassium) uptake. Malic acid degradation will lower the TA as well as raise the pH, while higher potassium levels will only move pH. Weather that is cool and wet will favor cation transport but not malic acid removal. In a warm season like 2010, malic acid should vamoose much more readily, while potassium levels are more likely to stay lower. We can't necessarily rule potassium out, however, because of both the variation in grapes and vineyards and also the more plentiful rain-falls this year when compared with the prototypical "hot and dry" year (whatever that is).

So what is a high pH and why do we care? A microbiologist from a cool place will say above 3.5. On Long Island and in the Hudson Valley, where the degree days have accumulated to stunning levels this year, we might say 3.7 or even 3.9. We have a few reasons for concern when we see high pH: 1) spoilage organisms are much happier above pH 3.5. Think *Brettanomyces* and *Acetobacter*. 2.) The amount of

Continued on page 7

FRUIT MATURATION REPORT - 9/10/2010

Samples reported here were collected on **Tuesday, September 7, 2010**. Where appropriate, sample data from 2009, averaged over all sites is included. Tables from 2009 are archived at www.cals.cornell.edu/cals/grapesandwine/veraison-to-harvest/2009.cfm

Cabernet Franc

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Seneca	1.30	19.2	3.51	7.4	77
	9/7/2010	E Seneca	1.22	19.5	3.34	8.4	36
	9/7/2010	W Cayuga	1.27	18.2	3.40	8.1	130
	9/7/2010	E Seneca	1.50	18.6	3.46	7.6	63
	9/7/2010	W Cayuga	1.62	18.8	3.34	9.3	110
Hudson Valley	9/7/2010	HV Lab	1.33	20.4	4.01	4.4	160
Lake Erie	9/7/2010	Fredonia	1.56	20.7	3.55	6.3	45
Long Island	9/7/2010	N Fork Riverhead	1.80	19.0	3.89	5.8	96
<i>Average</i>			<i>1.45</i>	<i>19.3</i>	<i>3.56</i>	<i>7.2</i>	<i>90</i>
<i>Prev Sample</i>	<i>8/30/2010</i>		<i>1.45</i>	<i>17.0</i>	<i>3.41</i>	<i>10.2</i>	<i>80</i>
<i>'09 Average</i>	<i>9/08/09</i>		<i>1.25</i>	<i>12.4</i>	<i>3.04</i>	<i>21.1</i>	

Cabernet Sauvignon

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Lake Erie	9/7/2010	Fredonia	1.39	19.9	3.37	8.5	111
<i>Prev Sample</i>	<i>8/30/2010</i>	Fredonia	<i>1.29</i>	<i>19.0</i>	<i>3.34</i>	<i>11.1</i>	<i>90</i>

Catawba

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Cayuga	2.27	15.0	3.17	14.5	165
<i>Prev Sample</i>	<i>8/30/2010</i>	<i>W Cayuga</i>	<i>2.11</i>	<i>12.0</i>	<i>3.13</i>	<i>18.1</i>	<i>196</i>
<i>'09 Sample</i>	<i>9/08/09</i>		<i>2.02</i>	<i>9.3</i>	<i>2.97</i>	<i>24.0</i>	

Cayuga White

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	Harvested	W Keuka	-	-	-	-	-
-	Harvested	W Cayuga	-	-	-	-	-
<i>Prev Sample</i>	<i>8/30/2010</i>		<i>2.91</i>	<i>15.4</i>	<i>3.30</i>	<i>12.1</i>	<i>201</i>
<i>'09 Sample</i>	<i>9/08/09</i>		<i>2.69</i>	<i>12.3</i>	<i>3.03</i>	<i>15.4</i>	<i>9/08</i>

Chardonnay

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Seneca - Shoot Thin	1.41	19.6	3.42	8.9	246
	9/7/2010	W Seneca - No Thin	1.63	19.2	3.41	9.8	286
	9/7/2010	W Cayuga	1.30	20.6	3.38	8.5	132
Hudson Valley	9/7/2010	HV Lab	1.24	22.4	3.79	5.3	192
Long Island	9/7/2010	N Fork Peconic 2	1.57	20.1	3.84	5.9	314
	9/7/2010	N Fork Riverhead	1.53	20.6	3.95	5.6	193
<i>Average</i>			<i>1.45</i>	<i>20.4</i>	<i>3.63</i>	<i>7.3</i>	<i>227</i>
<i>Prev Sample</i>	<i>8/30/2010</i>		<i>1.46</i>	<i>18.1</i>	<i>3.52</i>	<i>9.6</i>	<i>235</i>
<i>'09 Average</i>	<i>9/08/09</i>		<i>1.48</i>	<i>14.4</i>	<i>3.13</i>	<i>16.2</i>	

Concord

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Keuka	3.01	14.6	3.38	8.5	109
<i>Prev Sample</i>	<i>8/30/2010</i>	<i>W Keuka</i>	<i>3.05</i>	<i>11.9</i>	<i>3.31</i>	<i>10.3</i>	<i>116</i>
<i>'09 Sample</i>	<i>9/08/09</i>		<i>3.24</i>	<i>10.3</i>	<i>3.06</i>	<i>13.2</i>	

Corot Noir

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Cayuga	2.21	15.5	3.48	9.0	207
<i>Prev Sample</i>	8/30/2010	W Cayuga	2.10	14.7	3.35	10.8	149
<i>Average</i>	9/08/09		1.80	11.1	3.03	19.1	

Delaware

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Lake Erie	9/7/2010	Portland Lab	1.47	20.0	3.51	9.0	154
<i>Prev Sample</i>	8/30/2010	Portland Lab	1.47	18.4	3.40	10.9	147

Lemberger

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Seneca	2.01	0.5	3.36	8.6	46
<i>Prev Sample</i>	8/30/2010	W Seneca	1.89	19.8	3.29	10.4	67

Leon Millot

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Keuka - Shoot Thin	0.81	28.0	3.41	12.9	130
	9/7/2010	W Keuka - No Thin	0.71	27.9	3.39	11.9	102
<i>Average</i>	9/7/2010		0.76	27.9	3.40	12.4	116
<i>Prev Sample</i>	8/30/2010		0.75	25.8	3.36	14.1	121
<i>'09 Average</i>	9/08/09		1.00	19.9	3.02	18.0	9/08

Merlot

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Hudson Valley	9/7/2010	HV Lab	1.32	20.0	4.32	3.9	151
Long Island	9/7/2010	N Fork Peconic 1	1.78	21.2	3.98	4.8	132
	9/7/2010	N Fork Southold	1.87	18.5	3.86	6.1	203
<i>Average</i>	9/7/2010		1.66	19.9	4.05	4.9	162
<i>Prev Sample</i>	8/30/2010		1.73	18.4	3.65	8.0	150
<i>'09 Average</i>	9/08/09		1.71	14.0	3.23	14.1	

Noiret

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Seneca	2.17	15.3	3.28	10.1	99
	9/7/2010	W Seneca	1.72	19.1	3.35	8.4	96
Hudson Valley	9/7/2010	HV Lab	1.46	19.7	3.75	5.8	230
	9/7/2010	W HV	1.47	18.1	3.34	11.0	132
Lake Erie	9/7/2010	Fredonia	1.54	19.4	3.35	8.9	109
<i>Average</i>	9/7/2010		1.67	18.3	3.41	8.8	133
<i>Prev Sample</i>	8/30/2010		1.65	18.2	3.45	11.6	162
<i>'09 Average</i>	9/08/09		1.65	13.5	3.07	17.0	

Pinot Noir

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Seneca	1.25	23.2	3.64	7.2	159
Hudson Valley	9/7/2010	HV Lab	1.32	22.8	3.83	7.2	278
	9/7/2010	Hudson Valley	1.22	22.2	3.90	6.1	216
<i>Average</i>	9/7/2010		1.26	22.7	3.79	6.8	218
<i>Prev Sample</i>	8/30/2010		1.36	19.7	3.54	9.5	167.2
<i>'09 Average</i>	9/08/09		1.61	16.0	3.18	13.2	

Riesling

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Seneca - leaf rem, shoot thin	1.43	19.2	3.24	9.6	55
	9/7/2010	W Seneca - no leaf rem, no thin	1.15	19.0	3.18	10.9	21
	9/7/2010	E Seneca	1.51	18.9	3.18	11.0	88
	9/7/2010	E Seneca-shoot thin	1.37	18.1	3.24	11.1	106
	9/7/2010	E Seneca - no thin	1.24	17.9	3.25	10.5	89
	9/7/2010	W Cayuga	1.38	17.7	3.24	11.9	222
	9/7/2010	W Cayuga	0.59	17.4	3.20	12.6	176
Hudson Valley	9/7/2010	HV Lab	1.57	16.9	3.63	5.9	173
Lake Erie	9/7/2010	Fredonia	1.46	17.3	3.24	8.9	73
Long Island	9/7/2010	N Fork Riverhead	1.63	17.3	3.54	6.6	123
Average	9/7/2010		1.33	18.0	3.29	9.9	113
Prev Sample	8/30/2010		1.38	16.2	3.22	14.8	96
'09 Average	9/08/09		1.28	11.5	3.00	24.0	

Sauvignon Blanc

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Long Island	9/7/2010	N Fork Riverhead	1.84	19.8	3.64	8.0	242
Prev Sample	8/30/2010	N Fork	1.88	17.1	3.54	17.0	202
'09 Sample	9/08/09		1.46	13.4	3.00	23.7	

Seyval Blanc

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Cayuga - cluster, shoot thin	1.54	21.5	3.49	7.7	175
	9/7/2010	W Cayuga - no cluster, no thin	1.60	21.5	3.49	8.1	226
Hudson Valley	9/7/2010	HV Lab	1.25	18.3	3.60	6.4	181
	9/7/2010	W HV	1.47	17.9	3.39	8.0	153
Average	9/7/2010		1.47	19.8	3.49	7.5	184
Prev Sample	8/30/2010		1.64	18.3	3.46	9.3	170
'09 Average	9/08/09		1.77	16.4	3.16	11.1	

Traminette

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Keuka - Shoot Thin	1.76	15.3	3.07	16.5	182
	9/7/2010	W Keuka - No Thin	1.74	14.9	3.13	15.1	265
Hudson Valley	9/7/2010	HV Lab	1.76	21.2	3.65	5.8	192
	9/7/2010	W HV	1.44	20.6	3.50	9.8	108
Lake Erie	9/7/2010	Fredonia	1.70	21.4	3.27	8.7	46
Average	9/7/2010		1.68	18.7	3.32	11.2	158.6
Prev Sample	8/30/2010		1.61	17.0	3.27	14.2	113
'09 Average	9/08/09		1.54	10.5	3.00	25.2	

Vidal

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	E Seneca	1.38	17.5	3.30	10.0	125
Prev Sample	8/30/2010	E Seneca	1.49	16.2	3.24	13.8	103

Vignoles

Region	Harvest Date	Description	Ber. Wt. g.	% Brix	pH	TA g/L	YAN (ppm)
Finger Lakes	9/7/2010	W Keuka-VSP, Shoot thin	1.66	20.8	3.19	15.9	263
	9/7/2010	W keuka-VSP, No Thin	1.37	20.8	3.26	13.2	200
	9/7/2010	W keuka-high cordon, sht thin	1.56	20.7	3.21	18.4	405
	9/7/2010	W keuka-high cordon, no thin	1.53	20.0	3.23	14.5	282
Average	9/7/2010		1.53	20.6	3.22	15.5	288
Prev Sample	8/30/2010		1.54	19.3	3.21	17.2	220
'09 Average	9/08/2009		1.32	15.0	3.03	18.6	

Continued from page 5

free SO₂ required to achieve 0.8 molecular SO₂ and successfully inhibit microbial growth increases as pH increases. 3.) Color stability and browning become concerns at higher pH. Another problem at pH 3.7 or above is that bitartrate removal (cold stabilization) will increase pH.

The simple answer to the problem of high pH is to add acid. Adding tartaric acid will get the pH down and help protect the wine from the above maladies

(Gavin Sacks also describes adding tartaric as “potassium fining”). Whether TA is high or low, the pH needs to be addressed at some point and, all things considered, sooner seems better than later. Fermentation, MLF, and cold stabilization will all most likely increase pH. When vineyard folks talk about spray protection from diseases and bugs, they talk about sprays having a persistent or residual effect. Low pH is residual, persistent, natural protection from spoilage organisms. In a year like 2010, high TA is unlikely to be a problem, or at least a big one. For the newspaper

stealers (high pH/ high TA)- the added tartaric can be removed later, like a raincoat, once you’ve reached the dry shelter of filtration. There is also the whole area of ion exchange. This article is already too long as it is, however.

What does this mean for harvest decisions? That’s a good question. My inclination would depend on the variety. I would want to make sure Bordeaux varieties got ripe, and if the pH crept up in the vineyard, so be it. This was an excellent year for methoxy-pyrazine accumulation, and there hasn’t been much degradation time yet. On the other hand, I wouldn’t want to see a Riesling TA drop down too low, even if that meant the brix wasn’t stellar (whatever that is for Riesling). These are mostly my feelings however, and you may feel differently. For sparkling wine-oh, wait-sparkling wine is done. Now If you’ll excuse me, I’ve got to go order five bags of tartaric acid and an electro-dialysis machine- you know, so I can be ready for next year.



This newsletter was made possible with support from the New York Wine and Grape Foundation, the J. M. Kaplan Fund, and USDA Federal Formula funding through the Cornell and New York State Agricultural Experiment Stations.

Veraison to Harvest is a joint publication of:

Cornell Enology Extension Program

Statewide Viticulture Extension Program

Long Island Grape Program

Finger Lakes Grape Program

Lake Erie Regional Grape Program

Hudson Valley Regional Fruit Program

Copyright 2010 © Cornell University



Cornell University
Cooperative Extension

The information, including any advice or recommendations, contained herein is based upon the research and experience of Cornell Cooperative Extension personnel. While this information constitutes the best judgement/opinion of such personnel at the time issued, neither Cornell Cooperative Extension nor any representative thereof makes any representation or warranty, express or implied, of any particular result or application of such information, or regarding any product. Users of any product are encouraged to read and follow product-labeling instructions and check with the manufacturer or supplier for updated information. Nothing contained in this information should be interpreted as an endorsement expressed or implied of any particular product.