New England Grape Notes
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General Vineyard Management:

Determining Grape Maturity and Fruit Sampling

Imed Dami, Ohio Agricultural Research and Development Center

It is that time of the year when every grape grower and vintner asks the never-ending question: to pick or not to pick. Time of harvest is probably the most important and challenging viticultural decision for grape producers due to the difficulty of assessing grape maturity in the vineyard and predicting wine quality. The yearly dilemma is whether to delay harvest until desired quality parameters are reached since, once picked, grapes do no improve in flavor, color, or sugar content. On the other hand, if the grapes are left hang too long on the vine, the berries may shatter, get damaged by wildlife, insects, or break down due to rot; and yields and quality are negatively affected. During the past 10-15 years, we have come a long way from the days of determining time of harvest by simply going out to the vineyard with a refractometer. Today, overall ripeness evaluation involves much more than an analysis of °Brix, titratable acidity and pH; and some winemakers use flavor/aroma assessment in addition to the routine standards.
In this article, I have highlighted considerations to take into account when deciding on time of harvest and described objective and subjective methods to determine optimum fruit maturity, which is a balance between the two methods. Sampling methods are also described. The information is especially useful for new growers/vintners and is a refresher for seasoned producers.

Factors affecting time of harvest

Under our unpredictable environmental conditions, time of harvest is a complex compromise since it is affected by several factors including:

- Season
- Weather (daily and diurnal temperature, rainfall)
- Likelihood of pest, disease, and wildlife damage
- Vintner preference
- Communication and mutual agreement between grower and vintner
- Labor availability
- Grape composition
- Viticultural characteristics: variety (early vs. mid- vs. late season ripening), crop load (heavy vs. light load), sun exposure (exposed vs. shaded fruit), vine health, and vine vigor.

Objective criteria for estimating grape maturity

At maturity, grape juice is generally composed of the following: water (74%), sugars (25%, primarily fructose and glucose), organic acids (0.8%, primarily tartaric and malic acids), minerals (0.5%, mainly potassium), and phenolic, aromatic and nitrogenous compounds (0.2%). Due to their abundance, and ease of measurement, it is no wonder that the primary fruit maturity indicators and "industry standards" are sugar and acid contents, and pH. Flavor and aroma compounds are laborious and expensive to quantify and thus are not commonly measured and winemakers assess them subjectively instead.

Sugar Content: A large portion of the soluble solids in the grape juice is sugars. Glucose and fructose are the main sugars in the juice. At ripening, glucose and fructose are usually present in equal amounts. Both fructose and glucose are fermentable sugars and during fermentation, yeast converts these sugars to alcohol and carbon dioxide. Generally, sugar levels are expressed in degree Brix (a scale to measure total soluble solids) which represents grams of sugars per 100 grams of juice. Levels between 18 and 24 °Brix are desirable, depending on variety and wine style. Sugar level is measured with a refractometer. Juice is placed on a refractometer glass and light travels through the juice to register on a degree scale. The thicker the juice, the sweeter it is, the more it bends the light, and the higher the °Brix that registers on the scale.

Acid Content: Next to sugars, organic acids are the most abundant solids present in grape juice. They are responsible for the tart taste of juice and wine and have marked influence on wine stability, color, and pH. The predominant acids found in grapes are tartaric, malic, and citric acids. Malic and tartaric acids account for more than 90% of the total acids present. During the early period of berry growth, concentration of both acids increases in the fruit. During ripening and initiation of veraison, the sugar accumulates in the fruit and the acid concentration decreases. Total acidity (TA, also referred to as titratable acidity) is the actual amount of acid reserve in the wine. Acid levels generally should fall between 0.6 – 0.8 grams tartaric acid/100 ml (%TA) at harvest. TA is measured by titrating sodium hydroxide into a sample of grape juice to neutralize the acid in the juice. This amount of sodium hydroxide is then used in a formula to determine how much total acid in the juice.

Level of pH: Acids upon dissociation in a juice solution liberate H+ ions, which are measured and expressed in terms of pH. The pH is a measure of active acidity in the juice and wine, and thus acidity and pH are related. The pH level influences a wide range of factors in the wine including microbial stability (spoilage), physical stability (protein, tartrate), oxidation level, SO_2 activity, color and flavor. Generally, white grapes harvested at a pH of 3.1 to 3.3 and red grapes at a pH of 3.3 to 3.5. A pH meter is used to measure pH and assesses the strength of H+ ions in solution and registers the number on a scale of 1 (acid H+) to 7 (neutral) to 14 (basic OH-).

Subjective criteria for estimating grape maturity

It is a good practice for growers and vintners to periodically check berry skins and seeds and taste the juice collected to measure °Brix, pH, and TA. It is a subjective way to monitor the development of color, flavor and aromas of a given variety. Research and experience have shown that optimum °Brix don't always match optimum flavors and aromas in white or red varieties. For example, grapes may measure 18 °Brix and flavor and aroma are fully developed in one year. In another season, °Brix may be at 22 and the grapes have not fully developed the typical varietal character. The same is true for acid and pH levels. Since this is subjective, it is difficult to have "hard numbers" to make proper decisions. A scorecard was developed to aid with this process using a check list for subjective criteria for assessing grape maturity as follows:

Attribute	Level of Attribute	Points Awarded
Color	Green (lack of color)	0
	Color change; translucent	1
	Fully-matured color	2
	Over-mature color	1
Ease of berry removal from pedicel	High resistance	0
	Moderate resistance	1
	Little/no resistance	0
Texture upon touch	Firm	0
	Soft/elastic	1
	shriveled; loss of shape	0
Texture - initial bite; ease of skin collapse	High resistance	0
	Moderate resistance	1
	Low resistance	2
Mechanical features of the pulp	Thin; watery	0
	Viscous	2
	Jelly-like	1
Aroma	None	0
	Recognizable varietal aroma	2
Flavor upon chewing		
Initial character (upon chewing)	Unripe; green; bland	0
	Some varietal character	1
	High varietal character	2
Release from skin	None	0
	Typical varietal character	1
After taste	None	0
	Bitter; astringent	0
	Typical varietal character	1
Maximum Total		15

Considerations for fruit sampling

In order to determine harvest date, grapes are sampled periodically before harvest to see how the levels of sugar, pH acids and flavor compounds are progressing through the season. The determination to pick grapes is based on a small sample. Therefore, it is important that a sample is collected properly so that will reflect the level of maturity of the entire crop. It is also important that sample preparation and juice extraction mimic the juice obtained from an actual winery crush. The goal is to have vineyard samples accurately reflect must composition at the winery. There are two types of grape sampling: cluster sampling or berry sampling. With either method, it is critical to collect a "representative" sample with a minimum number of berries or clusters from a large number of vines.

Sampling guidelines: A proper sampling procedure is listed as follows:
• Begin berry sampling at 15 °Brix or weekly after veraison. Sample daily when close to harvest.
• Sample at least 200 berries per block and per variety. At least 10% of the vines should be sampled. You could use a grid sampling approach; for example, berry samples are collected from every 10th vine in every 10th row.
• If the vineyard has a high degree of variation among the vines, for example, after severe winter injury, disease infestation, or other type of stress, increase the number of berries
collected per sample.

• Sample from both sides of the trellis. If the rows run north and south, for example, take half the berries from the east side and half from the west side.
• Pick "random" berries as you walk down the row. There should be an equal chance of a berry being picked anywhere on the bunch or anywhere in the fruiting zone of the vine
from both the sun and shade side of clusters. Don't favor colored berries over green. Collect berries from top, middle, and bottom of selected clusters.
• Avoid row end plants, outside rows and off-type or otherwise unusual plants.
• Early morning sampling is preferred. If you are tracking the sugars, pH and TA through the season, the samples should be collected at the same time of day if possible.
• Store berries in a sealed plastic bag or container in the refrigerator until processing. If you will be out in the field sampling for a while, store samples in a cooler. Try to process berries within the next 24 hours.

Things to remember and consider when sampling:
• With berry sampling, in order to be within 1.0 °Brix of actual sugars at harvest, you need to collect 2 samples of 100 berries. To further increase the accuracy within 0.5 °Brix, you need to collect 5 samples of 100 berries. With cluster sampling, you need to collect 10 clusters to be within 1.0 °Brix.
• Realize that 90% of the variation in berry sampling is believed to come from variation in the position of the cluster on the vine and the degree of sun exposure.
• Juice sample collected in the morning can be 1 °Brix lower than juice sample collected in the afternoon.
• Rate of °Brix increase is usually 1 °Brix per week.
• Sugars of crushed must at harvest are usually lower than those of the sample juice. Therefore, you need to check harvest sample with crushed must to see how far off and take that into account in future sampling.
• Standardize a sampling method and apply it all season and use same sampler(s) if possible.
(***Source**: Ohio Grape-Wine Electronic Newsletter, No. 13, August 28, 2009*)

Disease Management:

Infection Periods and Disease

Bryan Hed, Lake Erie Regional Grape Program

The threat of downy mildew continues, warranting regular scouting for leaf infections. High humidity and overnight dew periods generate new sporulation on the undersides
of infected leaves and cluster stems. The spores are spread by air currents and may fuel new infections when they land on wet leaves. Powdery mildew is building gradually on leaves in juice vineyards. Fortunately, its appearance comes late in the season this year. However, every day is a powdery mildew infection period, and the pathogen causing this disease does not require leaf wetness to infect. With the potential for a late harvest this season, susceptible varieties, particularly *vinifera,* may need continued leaf protection from both powdery and downy mildew.

For bunch rot prone wine varieties, a Botrytis spray at veraison and again 2-3 weeks later would be prudent. Botrytis has been developing in our Chardonnay and Vignoles clusters for several weeks, even before ripening. The frequent and abundant rain has provided excellent conditions for new Botrytis infections. Bunch rot does not always develop exclusively in the form of *Botrytis*. Other fungi and bacteria can cause or exacerbate bunch rot development, particularly in varieties with compact clusters. Good cultural practices are your best defense against these 'other rot' organisms that will not be controlled by *Botrytis* specific fungicides. If you haven't removed leaves from the fruit zone on these varieties yet, it's not too late to benefit from it. In our trials, leaf removal at veraison, while not as effective as earlier leaf removal, still reduced bunch rots when compared to no leaf removal. Unfortunately, with maximum canopy density, hand leaf removal at this time is likely to be more expensive than when performed earlier in the season. Just keep in mind that fruit are more apt to suffer sunburn when leaf removal is delayed until veraison. Leaf removal only or primarily on the east (on north-south rows) or north side (on east-west rows) will minimize damage from sunburn. If practical, the culling of bunch rot infected clusters may help to reduce further spread of bunch rots, and help speed the ripening of the remainder of the crop. Also keep in mind that excessive upright oriented shoot growth that flops over will greatly reduce spray, air, and sunlight penetration into the cluster zone. Shoot trimming and tucking before your veraison Botrytis spray will improve fungicide efficacy and reduce humidity in the fruit zone that contributes to bunch rots. (***Source**: LERGP Electronic Crop Update, 9/3/09*)

To view the disease model predictions for southern New England go to
http://www.hort.uconn.edu/ipm/grapes/htms/09diseaseriskupd.htm.
Vermont's IPM Updates can be seen at http://pss.uvm.edu/grape/newsletters/.
New York has some grape disease models available at http://newa.nrcc.cornell.edu/newaDisease/grape_dis.
For those interested in organic disease management in grapes, a good resource can be found at:
http://www.oardc.ohio-state.edu/fruitpathology/organic/grape/index.html.

General:

Sun Scald

Rufus Isaacs Paul Jenkins, Michigan State Univ.

Sun scald causes grape berry surfaces to become brown and possibly shriveled. These symptoms appear on the portions of the cluster exposed to direct sunlight. This injury often occurs when fruit that has developed in shade is exposed to direct sunlight, such as when leaf removal, summer pruning, shoot positioning or other canopy management practices occur in mid-to late season. Fruit exposed to sunlight for the entire growing season may also develop sun scald when drought conditions develop. Fruit

damaged by sun scald may develop various fruit rots and deteriorate further. See: http://grapes.msu.edu/sunscald.htm.

Grower Feedback:

This is a good time to get feedback from recipients of this newsletter to find out the condition of the crop this year. Please share with me your observations and/or data (brix, TA, etc.) from your vineyards. Please indicate the variety you are reporting on. I'll compile this for the next issue.

Weather data: compiled from http://www.weather.com/outlook/agriculture/growing-degree-days.

Region/Location	Degree Day Accumulation Base 50°F from March 1, 2009	Degree Day Accumulation Base 50°F from March 1, 2008
Cape Cod (Truro)	1,873	2,099
Southeast MA (Westport)	2,064	2,219
North East MA (Ipswich)	2,005	2,120
Metro West (Lincoln) MA	2,154	2,318
Central MA (Hardwick)	1,963	2,098
Pioneer Valley MA (Belchertown)	2,146	2,249
Berkshires MA (Gt. Barrington)	1,718	2,046
Southern NH (Kingston)	2,121	2,346

*Reported from groundbased weather station.
Vermont Weather Data can be found at: http://pss.uvm.edu/grape/2009DDAccumulationGrape.html.
Connecticut Weather Data can be found at: https://www.hobolink.com/s/d0696313715dd96f86b25f3552cc1f47

Meetings:

New England Vegetable & Fruit Conference in Manchester NH - all day Viticulture Program on Thursday December 17, 2009.

Program details:

Morning Viticulture Session
9:30 Managing Insect Pests in Grapes - *Greg Loeb, Cornell University*
10:00 Powdery and Downy Mildew; major problems in eastern vineyards - *Peter Oudemans, Rutgers University*
10:30 Wine and Table Grape Varieties for New England -*Bruce Reich, Cornell University*
11:00 Winegrape Cultivar Trials in CT - *William Nail, Connecticut AG Experiment Station*
11:30 New Technology in Vineyard Spraying -*Andrew Landers, Cornell University*

Mid-Day Farmer to Farmer Session (and tasting?): "Viticulture is a rapidly expanding sector of New England agriculture. New grape growers and winery operations benefit from networking with existing vineyard/wineries. This farmer-to-farmer session will offer a valuable opportunity for new and established viticulture enterprises to discuss ways we can work together to strengthen community as a whole. We will discuss ways individuals and state associations can work together to support and encourage this expanding community of growers."

Afternoon Viticulture Session
2:00 Canopy Management for Quality - *Justine Vanden Huevel, Cornell University/NY Ag Exp Station*
2:30 Table Grapes- a growing market - *Dennis Rak, Double A Vineyards*
3:15 Vine Training and Pruning for New England - *William Nail, CT Ag Exp Station*
3:45 IPM for Cold Climate Viticulture - *Sonia Schloemann, University of Massachusetts*

FYI - check out the newly formed Massachusetts Farm Winery and Growers Association and New Hampshire Winery Association and the Vermont Grape and Wine Council. These associations are of, by and for you! Join today!!

For Massachusetts residents, check out the new Massachusetts "Ag Tag" license plate. Each purchase can yield $15 for the Massachusetts Farm Winery and Grower's Association through a check-off plus pooled funds available for various programs or competitive grants. Get yours today!

This message is compiled by Sonia Schloemann from information collected by:
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and Frank Ferrandino from Connecticut Ag Experiment Station. We are very grateful for the collaboration with UConn.

We also acknowledge the excellent resources of Michigan State University, Cornell Cooperative Extension of Suffolk County, and the University of Vermont Cold Climate Viticulture Program. See the links below for additional seasonal reports:

University of Vermont's Cold Climate Grape Growers' Newsletter
UConn Grape IPM Scouting Report

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