Relationship of Must pH and Acidity to the Level of Soluble Solids in Six French-American Hybrid Grapes

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THE MOST COMMON indicators of grape must quality are soluble solids, acidity and pH. Until recently, changes in soluble solids and titratable acidity were used to follow grape maturation and identify the optimum harvest date. However, pH is becoming increasingly recognized for its important contribution to wine quality. In wine, pH plays an important role in the occurrence of malolactic fermentation, prevention of microbial spoilage, stability of soluble grape proteins, solubility of potassium bitartrate and calcium tartrate, and color stability of red wines.

A four-year study was conducted on three red wine grape cultivars (Chancellor, Chelois, Villard Noir) and three white wine grape cultivars (Seyval, Aurore, and Verdelet) to examine the changes in pH and acidity in relation to increases in the percent soluble solids. Representative samples of three clusters from count nodes, which were counted during balanced pruning, were selected from 36 vines of each cultivar. Samples were taken across two pruning levels (10 + 10 and 20 + 10), two training systems (BC and GDC) and two spur lengths (2 and 4) and at three separate stages of fruit maturity. The first fruit sample from each cultivar was taken when the soluble solids percentage was approximately 12.5. The next sample was taken about seven days later, and the final sample was taken about 14 days later. Samples were placed in nonvented polyethylene bags and frozen for later analysis. Acidity and pH were analyzed after thawing the frozen samples in a cold room at 2°C overnight. Berries were separated from the stems, and samples were blended for 15 seconds in a laboratory blender and allowed to warm to 20°C. Percent soluble solids was determined using a Bausch and Lomb Abbe refractometer. Beakers containing the blended samples were covered with watch glasses, placed in a water bath at 85°C for one hour, and then allowed to cool to 20°C. To remove pulp and seeds, samples were strained through two layers of grade 50 cheesecloth. A 5 ml aliquot of centrifuged juice was diluted to approximately 150 ml with deionized water, the initial pH was recorded, and the samples were titrated to pH 8.4 with 0.1 N NaOH. Titratable acidity was recorded as ml of 0.1 N NaOH used per 5 ml of juice and converted to percent tartaric acid.

The changes in must pH and acidity with an increase in soluble solids during fruit maturation for each of the six cultivars are shown in the figure. The increase in pH with each increase in percent soluble solids was similar in all red cultivars and for the Seyval cultivar as indicated by regression analysis. However, Aurore and especially Verdelet had a more rapid increase in pH with an increase in percent soluble solids. The decline in acidity with each increase in percent soluble solids was greater in Verdelet than in the other five cultivars. By the time the Verdelet cultivar develops a soluble solids level of 15% an excessive pH has developed (above 3.40). For good wine stability the upper limit of pH of white wines should be 3.40 and for red wines 3.50. The other cultivars decreased in acidity at about the same rate as the percent soluble solids increased.

It is important that the wine industry begin to use pH as one of their major indices of harvest. Sugar and acid adjustments can be made at the winery, but usually it is more difficult to make adjustments in pH due to the buffering capacity of the must. Therefore, it is important that as wine grape growers and wineries monitor fruit pH change during maturation that they be aware that certain cultivars such as Verdelet and Aurore can develop a higher pH at a given percent soluble solids than other cultivars.

Graph on next page.
Relationship Between % Soluble Solids, pH and Acidity in Must of Six French-American Hybrid Grapes (4-year mean).