



## Assessment of the validity of maturity metrics for predicting the volatile composition of Concord grape juice

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**Background.** The most common metric for berry maturity in Concord grapes is the concentration of total soluble solids, with 15 Brix (i.e., 15% sugar by weight) being a typical minimum accepted by the juice industry. Although soluble solids are well correlated with sugar content and juice color, it is not known if soluble solids can be used to predict other commercially important aspects of ripeness, such as aroma. Minimizing unripe, herbaceous off-aromas at harvest would help to optimize the aroma of the finished juice. Our goal was to determine if total soluble solids, pH, titratable acidity, or the ratio of total soluble solids to titratable acidity could be used to predict the concentration of aroma compounds in Concord grapes across multiple sites.



**Experimental design.** We sourced grapes from nine sites in the Lake Erie Concord Belt. The grapes were harvested at three different maturity points for each site. Juice was processed using the hot press method (heating of crushed grapes to 60°C for 30 minutes with pectin added, then heating to 85°C for one minute) and cold-stabilized at 1°C for six days. pH, total soluble solids, titratable acidity, and anthocyanins were measured. The concentrations of aroma compounds, including trans-2-hexenol (“green”), hexanal, trans-2-hexenal, methyl anthranilate (“grapey”), and  $\beta$ -damascenone (“fruity”), were also measured.

**Results.** As expected, soluble solids were a good predictor of anthocyanin pigments (correlation of 0.81), likely because anthocyanin and sugar accumulation are both well

correlated with photosynthesis throughout the growing season (Table 1). However, the other metrics (titratable acidity, pH, and the ratio of soluble solids to titratable acidity) were not correlated with anthocyanin concentration.

**Table 1. Correlation of maturity metrics with color and aroma compounds.**

Metric	Anthocyanins	Methyl anthranilate (grapey)	B-damascenone (fruity)	Trans-2-hexenal (green)	Trans-2-hexenol (green)
Total soluble solids (TSS)	0.81	-	-	-	-
Ratio of TSS to titratable acidity	0.56	0.77	-	-0.51	-
pH	0.36	0.72	-	-0.56	-
Titratable acidity	-	-0.75	-	0.45	-

In contrast, total soluble solids measurements were poorly correlated with the concentration of aroma compounds. However, pH, titratable acidity, and the ratio of soluble solids to titratable acidity were significantly correlated with certain aroma compounds, including trans-2-hexenal (green) and methyl anthranilate (grapey) (Table 1). These two compounds represent the undesirable and desirable ends of the spectrum for grape juice aroma. No metric was significantly correlated with B-damascenone (fruity).

### Conclusions

Soluble solids are not a good predictor of aroma compounds in Concord grapes across multiple sites, but parameters that reflect acidity are better predictors of aroma composition. This suggests that volatile development in Concord grapes is related to the temperature around and after veraison. The use of titratable acidity or pH to evaluate the aroma potential of Concord grapes could help ensure that the resulting juices have an appropriate balance between fruity and herbaceous aromas.

**The bottom line:** Juice parameters that account for acidity (titratable acidity, pH, or the ratio of soluble solids to titratable acidity) are better predictors of juice aroma composition, and their utilization may assist in reducing the incidence of herbaceous off-aromas in Concord grape juice.