TECHNICAL BULLETIN

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Tools for Grape and Must Analysis

Prompt, Precise, Time-proven Analyses for Essential Production Decisions

Winemakers rely upon ETS grape and must analyses for a more complete picture of must composition that goes beyond TA, pH, and ºBrix. A thorough analytical picture is needed to plan appropriate winemaking strategies in response to changing must compositions.

The Basic Juice Panel is just one of many tools that ETS has developed to provide wineries with prompt, precise, and time-proven analyses to meet production demands. Fluoride analysis and agrochemical residue analysis supplement the Basic Juice Panel.

The Basic Juice Panel

Sugar Content

ºBrix is a measure of soluble solids in juice and must. The soluble solids in grape juice are primarily sugars. Organic acids, however, have a significant impact on brix with unripe grapes.

Sugar concentration increases rapidly in grapes as they mature. This increase is usually due to sugar movement from the leaves to the fruit. During the final stages of berry development, berry dehydration may also contribute significantly to the final sugar concentration.

ºBrix is used as an estimate of sugar concentration and often as a predictor of potential alcohol. ºBrix is not a true measure of fermentable sugar. Two juices with identical ºBrix may have very different final alcohol concentrations due to varying amounts of fermentable sugars. Yeast strains with different efficiencies also affect final alcohol concentration.

ºBrix is expressed as % by weight. Sugar measurement is typically expressed as % by volume. A must with 23.3 ºBrix will not have 23.3% by volume fermentable sugar.

- ***Analytical results now include an estimation of Yeast Assimilable Nitrogen (YAN) based on NH_3 and assimilable alpha amino nitrogen.***
- ***Same day results for most samples***
- ***Courier Service is available for many regions in northern and central California, Oregon and Washington***

Fermentable sugar (the sum of glucose and fructose) provides a sound basis for estimates of potential ethanol in the wine. This additional analysis is useful when final ethanol predictions are critical.

Acid Balance

The acid composition of must is a complex balance of free hydrogen ions, acids, acid salts, and cations. Concentrations of these various components and their interactions influence many winemaking parameters.

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The principal objective of acid management is to achieve and maintain a pH favorable to optimum wine balance and stability.

pH is a measure of free hydrogen ions in solution (which corresponds to the chemical definition of acidity) and is used as a gauge of wine acidity.

pH is critical in relationship to microbial stability, interactions of phenolic compounds, and color expression. Wine color stability, potassium bitartrate stability (cold stability), calcium stability, and molecular SO_2 level are directly related to wine pH.

Titratable acidity (TA) measures total available hydrogen ions in solution. This measurement includes both the free hydrogen ions and the undissociated hydrogen ions from acids that can be neutralized by sodium hydroxide.

TA is the most widely used measurement of acidity in wine. Although generally considered a simple parameter, titratable acidity is actually a reflection of complex interactions between the hydrogen ions, organic acids, organic acid-salts, and cations in solution. Often there is no direct correlation between TA and pH. Two musts with similar titratable acidity may have very different pH values.

ETS Basic Juice Panel

ºBrix, pH
Fermentable Sugar
Titratable Acid (TA)
Tartaric & Malic Acid
Potassium
Ammonia
Alpha Amino Nitrogen

Supplemental Tests

Fluoride
Residual Agrochemicals

Tartaric acid is one of the two major organic acids found in grapes. It accumulates in grape tissue early during development and declines during ripening due to berry growth and dilution. Tartaric acid is not usually metabolized in grapes. It is present in grapes, must, and wine as a free acid and weak acid-salt complex. Tartaric acid-salts may precipitate, primarily as potassium bitartrate and calcium tartrate.

Both the formation and solubility of salts are affected by a balance of components that are in flux throughout the early life of a wine. An increase in the ratio of the free tartaric acid to the tartaric acid salts will cause a decrease in pH. This will affect the flavor, balance, and stability of the final product. Tartaric acid is commonly used to adjust the acid balance of juices and wines. Understanding tartrate interactions is important in designing appropriate acidification strategies.

Malic acid accumulates early in berry development and declines during ripening due to dilution and respiration. Viticultural practices and grape cluster environments may directly affect respiration rates of malic acid. Malic acid levels affect pH and titratable acidity.

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Malic acid is converted to lactic acid during malolactic fermentation, causing the loss of an acid group. The effect of this acid reduction on pH depends upon the initial amount of malic acid and buffer capacity of the wine. Malolactic fermentation in wines containing low levels of malic acid and high buffer capacity will have little impact on wine pH. Malolactic conversion in wines with high malic acid and low buffer capacity can result in a substantial pH increase.

Potassium is the primary cation present in grape tissue. Potassium concentration in the berry is a function of root uptake and translocation. Both are strongly affected by viticultural factors including choice of rootstock, potassium fertilization, and canopy management. Potassium moves into cells in exchange for hydrogen ions from organic acids. Potassium concentration is highest near the grape skin. Crushing, skin contact, and pressing all influence potassium levels. Potassium is a critical factor in acid salt formation, tartrate precipitation, and buffer capacity.

Nitrogen Compounds

Sluggish and stuck fermentations, coupled with serious sulfide formation, have become increasingly common and are often associated with deficiencies of yeast assimilable nitrogen in the must. However, excessive concentrations of certain nitrogen compounds have been associated with elevated levels of ethyl carbamate and other fermentation problems.

Knowledge of nitrogen status is essential for effective fermentation management. Nitrogen compounds are essential macronutrients for yeast, and are required for cell growth, multiplication, and yeast activity.

Yeast assimilable nitrogen includes both alpha amino nitrogen (NOPA) and ammonia. Analysis of only alpha amino nitrogen or only ammonia nitrogen does not provide an accurate indication of total nitrogen status for a given must.

NEW - Analytical results now include an estimation of Yeast Assimilable Nitrogen (YAN) based on results from analysis of NH_3 and assimilable alpha amino nitrogen.

ETS Grape and Must Analysis	Common Related Issues: Fermentable Sugar	Ethanol Prediction	Acid Balance	Acid Addition	pH Effects of MLF	Buffering Capacity	Tartaric Acid Stability	Fermentation Inhibition	Sulfide Formation	Ethyl Carbamate	Microbial Stability	Regulatory Issues	Commonly Observed Values: Units	Low	High
Standard Tests															
Brix	X												%w/w	19	30
Fermentable Sugar HPLC	X	X											g/100mL	19	30
pH			X	X	X	X	X				X			2.9	4.2
Titratable Acid (TA)			X	X	X	X	X						g/100mL	0.35	1.20
Tartaric Acid			X	X	X	X	X						g/L	1	11
Malic Acid			X	X	X	X							g/L	0.5	11
Potassium			X	X	X	X	X						mg/L	500	4000
NOPA								X	X	X			mg/L	50	400
Ammonia								X	X	X			mg/L	20	400
Supplemental Tests															
Fluoride								X				X	mg/L	0.1	10
Agrochemical Residues								X				X	mg/L	na	na