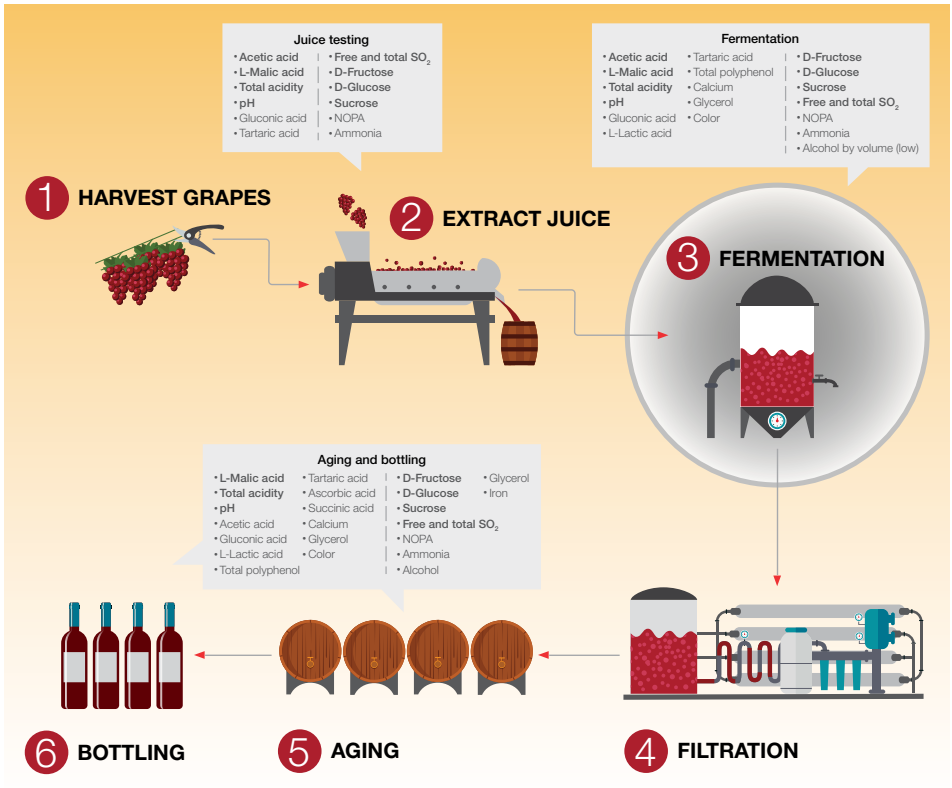
Smart Note

Top six wine spoilers

Why is accurate and reliable wine analysis important?

Wine is a product which dynamically evolves throughout the entire production process, starting from the grape harvest, fermentation process to bottling. Correct maturation of the grapes and management of alcoholic fermentation are two basic requirements to produce a quality wine. Rapid, real-time results are essential for ensuring a quality product. The list of necessary parameters for the oenologist to monitor the wine production from the juice to the bottling stage, is very long and discussed in detail in the Analytical Guide for Beverage Testing eBook.



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The top six chemical parameters that ruin wine, if they are not monitored and corrected, are listed below.

1 pH

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

The pH is a measure of how strong the acids are in relation to all of the other compounds in a wine or must. While the total acidity will tell you how much physical acid there is in the wine or must, pH gives you an idea of how the wines acidity will be perceived when we drink it. The effectiveness and amount of free SO_2 needed to protect the wine is directly tied to wine pH: lower pH require less free SO_2, and higher pH needs more free SO_2 to achieve the same amount of protection.

For accurate pH measurement in wine, electrochemistry method using pH electrode is recommended.

2 Volatile acidity—acetic acid

Acetic acid is the main component of wine's volatile acidity (VA). Acetic acid causes a sour taste to the wine and a constant monitoring of it during the fermentation process is critical. High levels of acetic acid will indicate a level of spoilage bacteria and can render the wine as of low quality. Acetic acid is involved in the metabolic processes during the ripening of fruit and is a key indicator of wine quality. Small amounts of acetic acid are always produced during and subsequent the alcohol fermentation which adds to the complexity of the wine production process.

Volatile acid analysis, historically required distillation, can now be carried out reliably and accurately by the enzymatic photometric method.

3 Total acidity

Total acidity measures total available hydrogen ions in solution in wine or must. This measurement includes both the free hydrogen ions and the undissociated hydrogen ions from acids that can be neutralized by sodium hydroxide. Acids play a significant role in the taste, color and microbial stability of wine.

Total acidity tells us if the wine will likely be in balance with itself or how much the pH can be adjusted (if needed). In Europe, total acidity in musts and wines is defined by the Office International de la Vigne et du Vin (OIV) as the sum of titratable acids up to pH 7.0 using a NaOH solution. Neither carbonic acid nor sulfur dioxide are included in the expression of total acidity. In the U.S., the Association of Official Analytical Chemists (AOAC) has established a pH of 8.2 using a titration indicator with phenothalein as the end point. Total acidity is usually expressed as grams of tartaric acid per liter.

4 Residual sugar

Monitoring of sugar levels at each stage of the winemaking process helps producers to make decisions that will influence the final composition and texture of the wine. For example, around grape ripeness, and when to stop fermentation. The total glucose and fructose concentration that remains after fermentation—the residual sugar—indicates how "dry" the finished wine is likely to be. Residual sugar is an important parameter to know, because wines that contain residual sugar need to be stabilized before being bottled to eliminate wine spoilage.

5 Residual L-Malic acid

L-Malic acid is the most commonly-assayed acid in winemaking, allowing the winemaker to assess grape ripeness and to quantify the progress of malolactic fermentation. Accurate determination of L-Malic acid is very important for monitoring the malolactic process and is the direct indicator of the completion of the process. L-Malic acid occurs naturally in grape must and is used as an indicator of ripeness. Malolactic fermentation (MLF) is a winemaking process involving a special bacterial strain that metabolizes the malic acid naturally found in grapes into lactic acid. The concentration below 1g/L can make the malolactic process very difficult, and it is for this very reason that an accurate analytical assay of this acid in the pre-fermenting phase is very important.

L-Malic acid is used to monitor the completion (or presence of) of malolactic fermentation in the wine. The decrease in L-Malic acid concentration needs to be monitored until its virtual disappearance is below a threshold of about 0.2 g/L. Any wine that has residual Malic acid is considered unstable and will need to be stabilized correctly before being bottled or you run the risk of possible renewed fermentation after the wine is in the bottle which spoils the wine.

Modern malolactic fermentation control methods are based on assaying the two organic acids involved in the process, that is L-Malic and L-Lactic acids. The main analytical methods are the enzymatic spectrophotometric and the HPLC (High Performance Liquid Chromatography) methods.

6 SO_2

SO_2 is added to control the process of winemaking and serves many useful functions. It affects microbial growth, malolactic fermentation process and prevents wine from oxidation.

Having the right amount of SO_2 in the wine prevents enzymatic browning and guards against premature oxidation. SO_2 preserves freshness and color and it helps stabilize a wine against microbial spoilage. If a wine does not contain the required amount of SO_2, chances are it won't gracefully make it past one year in the bottle (depending on the wine pH). It is a process-critical parameter to being able to properly protect wine from oxidation and spoilage organisms. SO_2 levels should be properly maintained, monitored and accurately determined throughout the entire aging period right up until the wine is bottled. SO_2 testing is an integral part of winemaking and SO_2 management begins as soon as the sulfite is added to the wine.

Total and free SO_2: sulfite in wine combines with acetaldehyde to form the hydroxyl/sulfonate adduct with only a small proportion of the sulfite present as free sulfite. Because the concentration of free sulfite is an important parameter in the wine industry, an analysis method is needed that accurately differentiates free from bound sulfite. Total sulfur dioxide (free and bound) in wines is regulated by legislation since it is an allergen.

An automated discrete analysis method, which compares well with the reference Aeration Oxidation (AO) method, is fast, simple to use, and carried out on equipment used for other wine analysis—proving itself to be a significant benefit for oenologists.

How does consolidated wine analysis help prevent wine spoilage?

The ability to measure and manage the levels of wine spoilers in juice or wine ensures a good final product. Effective quality monitoring during different production stages improves productivity and ensures consistent product. For this reason, for effective vinification process control, a tight quality control through in-house laboratory is recommended.

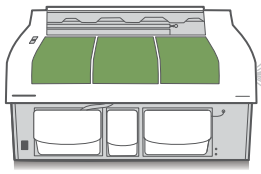
Accurate determination of wine process critical and spoiler's analysis involves several analytical techniques such as titration, spectrophotometer, pH meter and HPLC, that requires highly skilled operators for day to day operation. It is important to use reliable analytical instrumentation which enables lab personal without technical or chemistry knowledge to carry out the routine juice and wine analysis.

Thermo Scientific™ Gallery™ discrete analyzers together with ready to use system reagents makes the overall wine analysis simple, accurate and reliable. The ready to use wine reagents are specifically developed for cost efficient and juice and wine analysis quality control.

Why operate multiple analyzers, when you can do all your essential wine testing with one?

Multiple parameters, multiple instruments

Acetic acid	pH/Conductivity Meter
Gluconic acid	
Ammonia	
Tartaric acid	
Succinic acid	
Citric acid	
L-Malic acid	Auto Titrator
D/L-Lactic acid	
pH	
Free SO_2	
Total SO_2	HPLC
Ascorbic acid	
Nitrogen (YAN)	
Alcohol	
D-Fructose, D-Glucose, Sucrose	
Glycerol	
Total Iron	Spectro-photometer
Calcium, Magnesium	
Potassium	



Single instrument, multiple parameters

Acetic acid
Gluconic acid
Ammonia
Tartaric acid
Succinic acid
Citric acid
L-Malic acid
D/L-Lactic acid
pH
Free SO_2
Total SO_2
Ascorbic acid
Nitrogen (YAN)
Alcohol
D-Fructose, D-Glucose, Sucrose
Glycerol
Total Iron
Calcium, Magnesium
Potassium

Simplified wine analysis for walkaway efficiency

The Gallery discrete analyzer's high throughput multitasking feature allows the technician to determine up to 20 different assays at the same time, even on different wine samples. The Gallery discrete analyzer is capable of measuring a wide range of applications including the pH of wine samples with integrated electrochemical unit (ECM).

The Gallery discrete analyzer together with the ready to use system reagents simplifies the overall wine testing quality control using a single instrument with a walkaway efficiency. The Gallery discrete analyzer with ready to use reagents are optimized for speed, flexibility, and precision for juice and wine analysis, that enables the oenologists to improve the quality control through consolidated testing.

Load cuvettes

Insert samples

Insert reagents

Run analytes
Import sample table from LIMS
Create run table
Start analysis

Parallel pH/conductivity
Dispensing
Mixing
Incubation
Photometric measurement

Consolidated report
PDF
LIMS export
Spreadsheet

Walk away from the Gallery discrete analyzer

Find out more at **thermofisher.com/discreteanalysis**

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