Thermo Scientific System Solutions for Acids

## Complete solution for testing

# Acids in Wine and Juice

Automated Discrete Analyzers • System Reagent Kits • Standard Solutions

Thermo SCIENTIFIC

# About Acids

Acids are an important component in wine and contribute to its crisp, tart flavor. Alcohol, sugars, minerals, and other components balance the sourness of the acids (tartaric, malic, and citric acids), are naturally present in grapes and provide the freshest, purest tastes. Lactic, acetic, and other acids also play a minor role in fermentation and contribute milder, more complex flavors.[1]

Tartaric and malic acid comprise over 90% of the total acids within must or wine in a tartaric to malic acid ratio of 1:1 to 1:3. The actual acid concentration is influenced by varietal, region, and farming practices. Since the presence of acids contributes to the flavor, stability, color, and pH of wine, knowledge of acid concentrations in wine or must provides the winemaker with valuable information that contributes to the optimization of flavor and stability.[2]

During the growing phase, acids accumulate. When the grapes are ripe, total acidity in the fruit decreases because of a reduction in malic acid. At harvest, more tartaric acid is present. Grapes are among the few fruits that naturally contain tartaric acid, which is microbially stable and normally present at a concentration between 2.5 to 5 g/L at harvest. Malic acid is metabolized during ripening and at harvest, its concentration declines to between 1 to 4 g/L.[2]

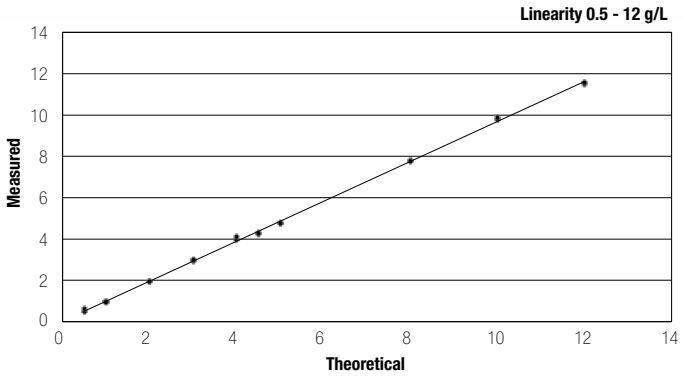
Citric acid often acts as a preservative in commercial juice production. Levels can be measured to authenticate commercially produced juices in order to meet international standards. Alone or in combination with tartaric or malic acids, citric acid may be added to adjust the profile of grapes deficient in organic acids by increasing acidity, complementing the flavor, and preventing ferric haze in the finished product.

Tartaric acid is the predominant acid in grapes and controls the effective acidity (pH) of wine. An insufficient amount could affect the color, stability, and taste of a particular wine. Excess malic acid, on the other hand, tends to impart a sharp “greenish” taste. It is possible to reduce elevated levels by inducing malolactic fermentation to convert malic acid to the weaker lactic acid. Lactic acid contributes a mild, sour taste that counteracts the harsh bitterness associated with malic acid, but may also induce lactic acid bacteria to grow, producing a sauerkraut-like odor. The presence of acetic acid is recognized as a vinegary smell and is an indication of spoilage.[2]

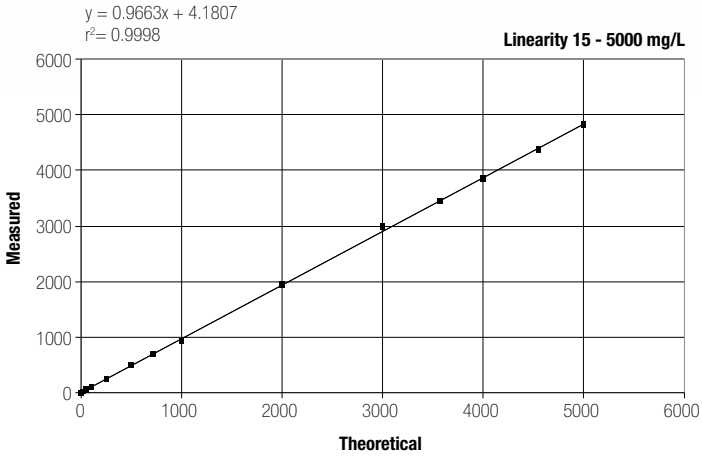
## System Reagent Solutions for Acids

It is important to understand the role that acids play in winemaking. Some acid is desired by yeast during fermentation, but more importantly, the final level of acids will contribute to the flavor complexity of wine and stop the growth of potentially harmful microorganisms that may spoil the end product.[1]

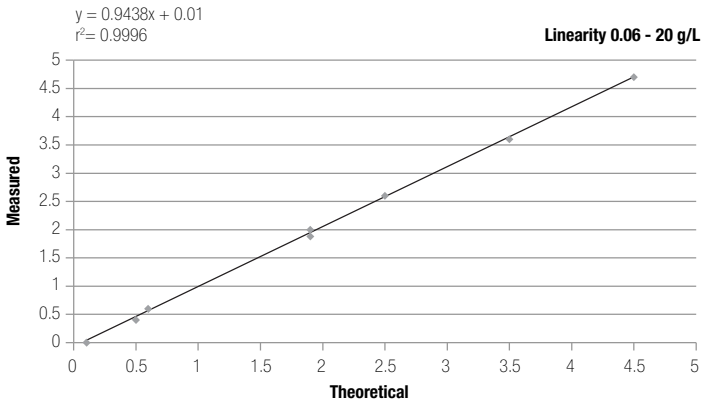
Monitoring acid levels during various production stages improves productivity and ensures a high quality finished product. Thermo Scientific™ system reagents for different acids are specifically optimized for cost efficient juice and wine analysis and quality control. Designed for use with the automated Thermo Scientific™ Gallery™ and Arena™ discrete photometric analyzers, they ensure speed, flexibility, and precision for colorimetric and enzymatic testing.



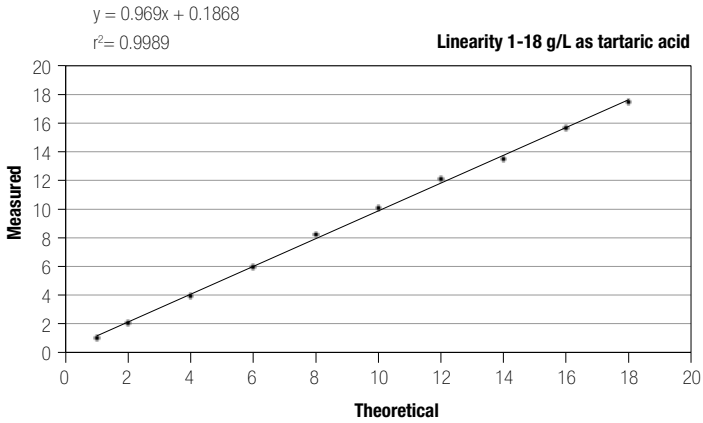

Tartaric acid




Citric acid




L-Malic acid




Total acids (Wine pH 7) measured as tartaric acid

The tartaric acid kit, for example, uses a colorimetric method based on the formation of a complex between tartrate and vanadate. This solution kit includes all required reagents and can complete up to 480 individual tests at an average cost of 25 cents per test. From 30 to 50 results are available in less than 40 minutes with a demonstrated precision of less than 3.5%.

Along with quality control samples an acid standard ensures that results are accurate and repeatable. The analysis methods used with discrete analyzers are based on well known colorimetric and enzymatic tests and have been validated according to international reference methods.

# Ordering Information

| System Reagent Kits | Test Range | Precision CV% | Reference Standard Followed |
|---|---|---|---|
| Acetic acid (Juice) | 0.04 – 3.0 g/L | 0.9 – 2.4 | H.U.Bergmayer, Principles of Enzymatic analysis (1978) |
| Acetic acid (ACS) (Wine) | 0.04 – 3.0 g/L | 0.6 – 2.4 | H.U.Bergmayer, Principles of Enzymatic analysis (1978) |
| Citric acid | 15 – 5000 mg/L | 0.5 – 2.3 | IFU 22, AOAC 985.11, OIV-MA-AS313-09, ISO2963, EN1137 |
| D-Isocitric acid | 10 – 600 mg/L | 0.7 – 3.4 | IFU 54, OIV-MA-AS313-09, ISO2963, EN1134 |
| D-Lactic acid | 25 – 1600 mg/L | 0.2 – 3.8 | IFU 21, OIV-MA-AS313-07, EN 12631 |
| L-Lactic acid | 20 – 1600 mg/L | 0.9 – 4.0 | IFU 53, OIV-MA-AS313-07, EN12631 |
| Tartaric acid | 0.5 – 12 g/L | 1.5 – 3.2 | AOAC 962.12, OIV-MA- AS313-01 |
| L-Malic acid | 0.05 – 20 g/L | 0.6 – 1.8 | IFU 21, AOAC 993.05, OIV-MA-AS313-11, EN1138 |
| Total acids (Wine pH 7)<br><br>Total Acids (Juice pH 8) | 1 – 18 g/L as tartaric acid<br>0.5 – 12 g/L as sulfuric acid<br>0.5 – 15 g/L as citric acid | 0.5 – 2.3 | AOAC 962.12, OIV-MA- AS313-01<br><br>AOAC 950.15 |

| System Reagent Kits | Part Number |
|---|---|
| **Acetic acid (Juice)**<br>This method is based on a reaction using acetate kinase.<br>Acid combination standard, available in 3 x 3 mL, 0.2 g/L. | 984318, 300 tests<br>984303, 1000 tests<br>984382 |
| **Acetic acid ACS (Wine)**<br>This method is based on a reaction using acetyl-coenzyme A synthetase.<br>Acid combination standard for quality control, available in 3 x 3 mL, 0.2 g/L. | 984356, 150 tests<br>984382 |
| **Citric acid**<br>This method is based on a reaction using citrate lyase. | 984327, 250 tests |
| **D-Isocitric acid**<br>This method is based on a reaction using isocitrate-dehydrogenase. | 984322, 300 tests |
| **D-Lactic acid**<br>This method is based on a reaction using D-lactate dehydrogenase.<br>Acid combination standard, available in 3 x 3 mL, 220 mg/L. | 984306, 300 tests<br>984382 |
| **L-Lactic acid**<br>This method is based on a reaction using L-lactate dehydrogenase.<br>Acid combination standard, available in 3 x 3 mL, 220 mg/L. | 984308, 300 tests<br>984382 |
| **L-Malic acid**<br>This method is based on a reaction between L-Malate-dehydrogenase and glutamate-oxalacetate-transaminase.<br>Acid combination standard, available in 3 x 3 mL, 0.5 g/L. | 984310, 300 tests<br>984311, 1000 tests<br>984382 |
| **Tartaric acid**<br>This method is based on a reaction between tartrate and vanadate. | 984309, 480 tests |
| **Total acids (Wine pH 7)**<br>**Total acids (Juice pH 8)**<br>This method is based on a reaction using bromothymol blue. | 984632, 400 tests<br>984633, 400 tests |

Individual system reagent kits and standards may be ordered separately. For more information, please visit:
**www. thermoscientific.com/discreteanalysis**


1 Leonardelli, M. Acidity in Wine: The Importance of Management through Measurement, HYPERLINK **http://www.gwi.missuri.edu/publications/2013spring.pdf** (accessed March 30, 2105)

2 Acids and Wine, HYPERLINK **http://www.winemaking.jackkeller.net/acid.asp** (accessed March 30, 2015)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