Thermo Scientific System Solutions for Sugars

Complete solution for testing

Sugars in Wine and Juice

Automated Discrete Analyzers • System Reagent Kits • Standard Solutions

Thermo SCIENTIFIC

About Sugars

Grape juice is composed of 70 to 80% water, 20% carbohydrates, and 1% organic acids, phenolics, vitamins, minerals, and nitrogenous compounds. Sugars, organic acids, and phenolics provide flavor while the vitamins, minerals, and nitrogenous compounds are essential participants in the successful growth of yeast and the process of fermentation. Finished wine has a similar composition to unfermented juice, but contains much lower levels of sugar, approximately 8 to 14% alcohol, and a wider range of minor components.[1]

Sugars are a chemical subgroup of carbohydrates, are sweet tasting, water soluble, and good sources of energy. Two six-carbon sugars, glucose and fructose monosaccharides, are the most important sugars in grape juice. They provide sweetness to the juice and will be consumed by yeast during the fermentation process.[1]

Sugar content in the juice of ripe grapes varies from 150 to 200 g/L. In unripe grapes, glucose is predominant. In ripe fruit, glucose and fructose are generally present in equal amounts with a slight variation depending upon the particular varietal. In overripe grapes, the level of fructose exceeds the concentration of glucose.[2]

During fermentation, yeast converts glucose and fructose into alcohol and carbon dioxide. The amount of alcohol produced is roughly related to the sugar content present in the original juice. Refined sugar, the disaccharide sucrose, is sometimes added during fermentation or secondary fermentation to provide additional sweetness and structure.

System Reagents Solutions for Sugars

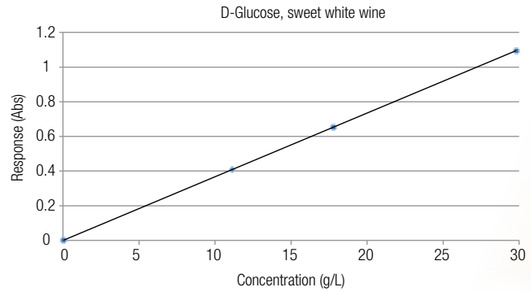
The ability to measure and manage levels of sugar in juice or wine ensures a good final product. In wine and juice production, the amount of fructose or glucose is an indicator of quality. In wine, the content of D-glucose and D-fructose (total sugar) represents the amount of sugar available for fermentation by yeast. Too little glucose and fermentation will not happen properly. In addition, the authenticity of fruit juice is often checked using the ratio of fructose/glucose as specific natural sugar ratios exist for many fruits.

Measuring sucrose can also be used to indicate total glucose, because during fermentation, yeast breaks down sucrose into glucose and fructose then consumes the glucose followed by fructose. The amount of sucrose is calculated by subtracting the amount of free glucose from total glucose.

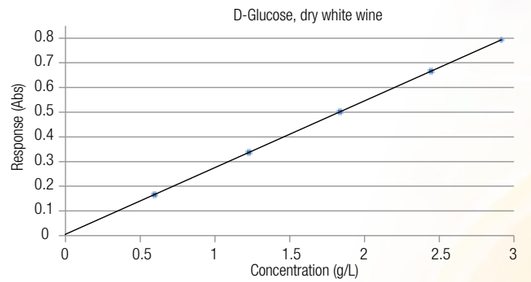
Effective quality monitoring during different production stages improves productivity and ensures consistent products. Thermo Scientific™ System Reagents for Sugars are specifically developed for cost efficient juice and wine analysis as well as quality control. Optimized for the automated Thermo Scientific™ Gallery™ and Arena™ discrete photometric analyzer series, they offer flexibility, speed, measurement accuracy, and precision for enzymatic or colorimetric testing.




System Solution Kits for Analysis of Sugars



Sample	Response (Absorbance)	Results	Reference (g/L)
Water	0.01	0.04	0
Sweet wine 1	0.41	11.13	11.16
Sweet wine 2	0.65	17.78	17.85
Sweet wine 3	1. 10	29.80	29.75



Sample	Response (Absorbance)	Results	Reference (g/L)
Water	0.01	-0.02	0
Dry wine 1	0.17	0.60	0.59
Dry wine 2	0.34	1.23	1.22
Dry wine 3	0.50	1.84	1.83
Dry wine 4	0.67	2.45	2.44
Dry wine 5	0.79	2.92	2.93

The D-Glucose test, for example, is an enzymatic test method that uses hexokinase (HK) with ATP (Adenosine 5-triphosphate) and glucose-6-phosphate dehydrogenase (G6P-DH) with NAD^+ (Nicotinamide adenosine dinucleotide) and follows this reaction:
D-Glucose + ATP ---HK---> Glucose-6-phosphate + ADP Glucose-6-phosphate $^+$ NAD^+ ---G6P-DH---> Gluconate-6-P $^+$ NADH $^+$ H^+
Solution kits include all necessary reagents, and can complete up to 1000 tests. A sugar combination standard is available separately. Glucose levels in homogenous juice and wine samples can be determined using the automated discrete analyzer which has the ability to analyze 100 samples for both glucose and fructose in 90 min with first results completed in < 15 min. Ready to use system reagents:

- Reduce hands-on time
- Require less reagent usage
- Produce less waste
- Cost less than 20 cents per test

Standards ensure that results are accurate and repeatable. The analysis methods for use with discrete analyzers are well known enzymatic and colorimetric tests that have been validated according to international reference methods.

Ordering Information

System Reagents Kits	Test range g/L	Precision CV%	Followed Reference Standard
D-Fructose	0.7 – 200	1.0 – 1.4	AOAC 985.09, OIV-MA-AS311-02
D-Glucose	0.1 – 160	1.6 – 1.7	IFU 55, ISO 13965, EN 1140, AOAC 985.09
D-Glucose + D-Fructose	0.04 - 200	1.0 – 1.4	IFU 55, EN 1140, AOAC 985.09, OIV-MA-AS311-02
D-Glucose + D-Fructose + Sucrose	0.24 – 200	1.6 – 2.7	IFU 55, EN 1140, AOAC 985.09, OIV-MA-AS311-02
Sucrose (Total Glucose)	0.1 – 100	1.2 – 1.6	IFU 56, EN 12146

System Reagents Kits	Part Number
D-Fructose The method is based on hexokinase, phosoglucose isomerase and glucose-6-phosphate dehydrogenase. Sugar Combination Standard, available in 3 x 3 mL, 0.5 g/L. BR71488-EN 0115S	984302, 300 tests 984380
D-Glucose The method is based on hexokinase, phosoglucose isomerase and glucose-6-phosphate dehydrogenase. Sugar Combination Standard, available in 3 x 3 mL, 0.5 g/L.	984304, 300 tests 984764, 1000 tests 984380
D-Glucose + D-Fructose The method is based on hexokinase, phosoglucose isomerase and glucose-6-phosphate dehydrogenase. Sugar Combination Standard, available in 3 x 3 mL, 0.5 g/L.	984314, 300 tests 984313, 1000 tests 984380
D-Glucose + D-Fructose + Sucrose The method is based on beta-fructosidase (invertase), hexokinase, phosphoglucose isomerase and glucose-6-phosphate dehydrogenase. Sugar Combination Standard, available in 3 x 3 mL, 0.5 g/L.	984317, 300 tests 984301, 1000 tests 984380
Sucrose (Total Glucose) The method is based on beta-fructosidase (invertase), hexokinase, and glucose-6-phosphate dehydrogenase. Sugar Combination Standard, available in 3 x 3 mL, 0.5 g/L.	984312, 300 tests 984380

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

[1] Wansbrough, H.; Sherlock, R.; Barnes, M.; Reeves, M. Chemical Processes in Winemaking, HYPERLINK "http://www.nciz.org/nz/ChemProcesses/food/6B.pdf"www.nciz.org/nz/ChemProcesses/food/6B.pdf [Online] (accessed December 11, 2014).

[2] Dharmadhikari, M. Composition of Grapes, HYPERLINK "http://www.extension.iastate.edu/wine/compositionofgrapes.pdf" www.extension.iastate.edu/wine/compositionofgrapes.pdf [Online] (accessed December 11, 2014).

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