

Technical Brief

Adoption of International Units of Measurement in United States Wine Analysis

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The United States wine industry is competing in an increasingly global environment where attention to reduction of technical barriers to trade is an important consideration. One common existing technical barrier is the lack of a common language for expression of wine analytical results. The Wine Institute Technical Committee has adopted the consensus units described in this brief and recommends their adoption by the U.S. industry.

Key words: Wine analysis, international units, units of measurement, harmonization

Laboratories performing various wine and grape must and juice analyses report results in several different units of concentration. Frequently there are inconsistencies in reporting units, even within a given laboratory. It is common to find the concentration of analytes recorded in percent, g/L, g/100 mL, mg/100 mL, ppm, and mg/L on the same analytical report. This can easily cause confusion among organizations when attempting to reconcile results and can particularly become an issue in international trade.

In recent years, there has been significant progress toward acceptance of international standards, as evidenced by adoption of SI units for expression of many scientific terms and adoption of metric units for package sizes. The Wine Institute Technical Committee decided to investigate common wine analysis reporting procedures in the United States to determine how these compared to those used by the international wine community. The committee designed a survey to determine the units of concentration used by a number of U.S. wine industry laboratories for reporting of analytical results.

Eight laboratories were surveyed, representing the largest wine producers in the United States and an independent wine analysis laboratory. The Technical Committee determined that the resulting data would be representative of current U.S. wine analyses reporting practices. The results were then compiled and compared to the units used by the OIV (Office International de la Vigne et du Vin) in their Official Methods of Analysis [1]. Several differences in expression of results were observed,

but after extensive discussion the Technical Committee reached a consensus as to the units it considered most appropriate. Results of the survey, current OIV units, and units agreed to by consensus are presented in Table 1.

Two issues prevent complete accord with current OIV units of expression, as can be noted in Table 1. The first is the choice of acid in which titratable acidity is expressed. The OIV standard, and that of the European Union, is the use of sulfuric acid as the reference acid, while the committee consensus and U.S. standard is tartaric acid. The Technical Committee agreed that the U.S. reference acid should be retained for two reasons. Not only is the use of tartaric acid as the reference compound a consistent and long-standing one in the United States, but also it seems the more logical choice, since tartaric is the primary acid found in grapes.

The second issue is choice of temperature at which percentage of alcohol by volume is expressed. The international standard temperature adopted everywhere except the United States is 20 degrees Celsius (20°C). The United States still relies upon the temperature of 60 degrees Fahrenheit (60°F, or 15.56 degrees Celsius). It is the hope of the Technical Committee that the U.S. Bureau of Alcohol, Tobacco and Firearms, in the interest of international harmonization of units, will take steps to address this discrepancy.

Members of the Technical Committee and the surveyed laboratories agreed to adopt the consensus units as presented in Table 1 for purposes of international trade and to move toward adoption of the consensus units for routine internal analyses. The Technical Committee additionally recommends that the consensus units be adopted by the U.S. industry in the interests of international harmonization.

Literature Cited

1. Office International de la Vigne et du Vin. Recueil des Methodes Internationales D'Analyse des Vins et des Mouts. OIV, Paris (2000).

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Table 1 Units of measurement used in surveyed laboratories and by the OIV, and units agreed to by consensus of the Wine Institute Technical Committee.

	Current units: laboratories								OIV	Proposed	
	IL ^a	A	B	C	D	E	F	G			
Total SO ₂	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Free SO ₂	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Ethanol	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 60°F	% v/v at 20°C	% v/v at 20°C
Total dry extract	g/L	g/L	g/L	g/L	g/L	g/L	g/L	g/L	g/L	g/L	g/L
Reducing sugar	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/10 mL	g/100 mL	g/L	g/L	g/L
Volume	mL	mL	mL	mL	mL	mL	mL	mL			mL
Sorbic acid	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Titrateable acidity	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/100 mL as tartaric	g/L as sulfuric	g/L as tartaric
Volatile acidity	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/100 mL as acetic	g/L	g/L as acetic
Citric acid	g/L	mg/L	mg/L	g/L		g/L	g/L	mg/L	g/L	g/L	g/L
Glucose + fructose	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/100 mL	g/L	g/L	g/L
Malic acid	g/L	mg/L	mg/L	mg/L		mg/100mL	mg/L	mg/L	g/L	g/L	g/L
Tartaric acid	g/L	mg/L	mg/L	g/100 mL		g/100 mL	mg/L	g/L	g/L	g/L	g/L
Lactic acid	g/L	mg/L	mg/L	mg/L		g/L	mg/L	mg/L	g/L	g/L	g/L
Ammonia	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Potassium	mg/L	mg/L	mg/L	mg/L			mg/L	mg/L	mg/L	mg/L	mg/L
Calcium	mg/L	mg/L	mg/L	mg/L			mg/L		mg/L	mg/L	mg/L
Benzoic acid	mg/L	mg/L	mg/L	mg/L			mg/L		mg/L	mg/L	mg/L
4-Ethylphenol	ng/mL	ng/g					µg/L				ug/L
Copper	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L
Iron	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L
Fluoride	mg/L	mg/L	mg/L	mg/L			mg/L	mg/L	mg/L	mg/L	mg/L
Magnesium	mg/L	mg/L	mg/L	mg/L			mg/L		mg/L	mg/L	mg/L
Lead	mg/L	µg/L	µg/L				µg/L		µg/L	µg/L	ug/L
Arsenic	mg/L	µg/L	mg/L				µg/L		mg/L	mg/L	mg/L
Zinc	mg/L	µg/L	mg/L				mg/L		mg/L	mg/L	mg/L
Acetaldehyde	mg/L	mg/L	mg/L				mg/L		mg/L	mg/L	mg/L
Ethyl acetate	mg/L	mg/L	mg/L				mg/L		mg/L	mg/L	mg/L
Pesticides	mg/L	mg/L					µg/L		mg/L	mg/L	
Ethyl carbamate	ng/g	ng/g or µg/Kg	µg/Kg				µg/L		µg/L	µg/L	µg/L
Total phenolics	mg/L	mg/L	mg/L	mg/L			mg/L	mg/L	mg/L	mg/L	
Methanol	mg/L	mg/L	mg/L				mg/L		mg/L	mg/L	mg/L
Carbon dioxide	mg/100 mL	mg/100 mL	mg/100 mL	mg/100 mL	mg/100 mL	mg/L	mg/100 mL	mg/L	g/L	g/L	g/L

^aIL: Independent wine analysis laboratory.