

Managing Wine Quality : Strategies and Tools

A. César Silva Ferreira
aferrera@deb.uep.pt, Círculo Superior de Biotecnologia, Universidade Católica Portuguesa, Portugal
 fvr@stg.ugb.ac.za, University of Stellenbosch, South Africa

Quality

- Comply with the requirements
 - Organoleptic properties and Sensory : composition, stability
 - Product Performance : flavor technology, fitness for use
 - Regulatory compliance : authenticity, labeling, chemical identity, purity
 - Food ethical compliance : kosher, halal, organic
- Absence of faults
 - Free from off-flavors
 - Absence of contaminants

Kammer, C. et al. 2008. 12th International Flavor Research Symposium, 1-4 July 2008, Interlaken, Switzerland

Wine Composition: the Big Picture

Water	Ethanol	Glycerol	Tartaric Acid	Malic Acid	Succinic Acid
800 - 900	70 - 100	3 - 10	3 - 5	0 - 10	0.5 - 1.5
Lactic Acid	Nitrogen Substances	Potassium	Reducing Sugar	Phenolic compounds	
1 - 5	2 - 4	0.2 - 7	0.5 - 5	0.1 - 5	

g / L

Why do "metrics" matters ??

- Authenticity
- Quality

Raw Data

Quality Authenticity

Strategies

Complexity

Wine = $\int_{\text{pruning}}^{\text{harvest}} \int_{\text{juice}}^{\text{fermented must}} \int_{\text{finished wine}}^{\text{consumption}} \text{vine} \times \text{yeast} \times \text{aging}$

"Shelf-Life"

Sensory Quality

Acceptable Sensory properties ...

How much O₂ will maximize "Sensory Quality" ??

"Managing the Paradox Family"

Sauvignon Blanc

Potent Odorants

Odorant	Sensory Threshold (ppb/L)
4-mercapto-4-methyl-pentan-2-one	0.0001
3-mercaptobutan-2-ol	0.001
3-mercaptobutan-1-ol	0.002
H ₂ S	0.05
CH ₃ -S-CH ₃	1.0
CH ₃ -SH	2.0
CH ₃ -CH ₂ -SH	1.0
CH ₃ -S-CH ₂ -CH ₃	15.0
CH ₃ -CH ₂ -S-CH ₂ -CH ₃	4.0

Yeast metabolism, Thiols, Disulfides

T. Tominaga, M.L. Morat, D. Dubourdieu, J. Agric. Food Chem. 46 (1998) 7034. Springer-Verlag, Heidelberg & Paris. Analytical Journal of Grape and Wine Research, 2005

Metabolite Profiling: Multi-scale

NMR mg/L

MS µg/L

Others ECD... ng/L

"Workflow"

- Extract Sensory Information
- Key-Molecules Identification
- Mechanisms of Formation
- Kinetic Measurements

Compliance to Sensory Specifications

Sensitivity Quantitative Qualitative Consumer Tests

- Thresholds
 - DIN Methods
 - Degree of Difference
 - Time Intensity
 - Odor Activity Value (OAV concept)
 - DoT (Dosage over-Threshold)
 - Comparative Taste Dilution Analysis (cTDA)
 - Quantitative LC-Taste®
- Scaling
 - Sensory Categories
 - Ratio-Figures
- GC/O
- LC-Taste®
- Descriptive Analysis
- Preference Mapping
- Affective
- Acceptance
- Preference
- Hedonic

Kammer, C. et al. 2008. 12th International Flavor Research Symposium, 1-4 July 2008, Interlaken, Switzerland

"Workflow"

- Extract Sensory Information
- Key-Molecules Identification

"Correlate Sensory & Chemical Data"

Sensory Analysis

Instrumental Analysis

Hybrid techniques





