Making Wine From Smoke-affected Grapes

Are you going to ferment on skins or go directly to press?

- White varietals
 Directly to press
- Red varietals
 - How much smoke is too much for fermenting on skins?
 - Berry analysis guaiacol values
 - Machine-harvested fruit is more problematic but not impossible to salvage

Making Wine From Smoke-affected Grapes

WO: 1717078		Sample	es Received: 9/24/2020 Report Date: 9/29/20	020 Report No: IAL-17880			
Lab Sample ID	Client Sample ID	Analysis Date	Total 4-methylguaiacol (ppb)	Total Guaiacol (ppb)			
1717078-51488	20PBBCVPNJV	9/29/2020	30.2	62.0			
Test Method: Total 4-methylguaiacol = Total 4-methylguaiacol by GC-MS/MS (Total), Total Guaiacol = Total Guaiacol by GC-MS/MS (Total)							

WO: 1717096		Sample	es Received: 9/24/2020 Report Date: 10/8/20	020 Report No: IAL-18391	
Lab Sample ID	Client Sample ID	Analysis Date	Free 4-methylguaiacol (ppb)	Free Guaiacol (ppb)	
1717096-51539	BCV-14	10/8/2020	2.33	13.4	
1717096-51540	WHV040507	10/8/2020	6.85	39.8	
1717096-51541	HDV0406	10/8/2020	6.64	32.5	

Test Method: Free 4-methylguaiacol = Free 4-methylguaiacol by GC-MS/MS; Method Reference: Metabolites, 10(7): 294. (2020); Reporting Limit = 0.50 ppb, Free Guaiacol = Free Guaiacol by GC-MS/MS; Method Reference: Metabolites, 10(7): 294. (2020); Reporting Limit = 0.50 ppb

WO: 1717080		Sample	es Received: 9/24/2020 Report Date: 10/7/2	020 Report No: IAL-18347
Lab Sample ID	Client Sample ID	Analysis Date	Total 4-methylguaiacol (ppb)	Total Guaiacol (ppb)
1717080-51500	GRAPES: YMVCHB14	10/7/2020	4.18	21.5
1717080-51501	GRAPES: YMVPNB17	10/7/2020	3.46	16.8

Test Method: Total 4-methylguaiacol = Total 4-methylguaiacol by GC-MS/MS and Acid Hydrolysis; Method Reference: Metabolites, 10(7): 294. (2020); Reporting Limit = 0.50 ppb, Total Guaiacol = Total Guaiacol by GC-MS/MS and Acid Hydrolysis; Method Reference: Metabolites, 10(7): 294. (2020); Reporting Limit = 0.50 ppb

WO: 1716930		Sample	es Received: 9/22/2020 Report Date: 9/29/2	020 Report No: IAL-17907		
Lab Sample ID	Client Sample ID	Analysis Date	Free 4-methylguaiacol (ppb)	Free Guaiacol (ppb)		
1716930-51013	Pinot Noir Grapes: ROEB7	9/29/2020	0.70	3.21		
Test Method: Free 4-methylguaiacol = Free 4-methylguaiacol by GC-MS/MS; Method Reference: Metabolites, 10(7): 294. (2020); Reporting Limit = 0.50 ppb, Free Guaiacol = Free Guaiacol by GC-MS/MS; Method Reference: Metabolites, 10(7): 294. (2020); Reporting Limit = 0.50 ppb						



White & Rose Protocols

What worked:

- Gentle pressing (no higher than 1400mb) and traditional settling method, rack off of gross lees
- Pre-fermentation fining with carbon and bentonite with daily stirring for 3 days followed by settling for 3 days
 - Anecdotal/sensory analysis: pre-fining juice smelled like a campfire; post-fining juice smelled good
 - Best estimate sensory threshold seemed accurate for both whites and Pinot Noir
 - Proceed with fermentation as usual after racking off the carbon lees

Table 4. Best-Estimate Threshold (BET) for Odor and Standard Error (SE) of the Mean Values Determined for Four Volatile Phenol Compounds in Red Wine, as well as the Flavor Threshold for Guaiacol^a

compound	BET ($\mu g/L$)	SE
m-cresol ($n = 23$)	20	0.6
guaiacol $(n = 23)$	23	0.8
guaiacol (flavor, $n = 22$)	27	0.6
p-cresol ($n = 22$)	64	0.5
o-cresol ($n = 22$)	62	0.8

^aThe number of assessors is also provided.

Table 4: Parker, M. et al. Contribution of Several Volatile Phenols and Their Glycoconjugates to Smoke-Related Sensory Properties of Red Wine *J. Agric. Food Chem.* 2012, 60, 2629–2637

White & Rose Protocols

Fermentation – extra measures to "hedge your bets":

- Ferment on chitosan and inactivated yeast product/mannoproteins/polysaccharides and untoasted oak tannin
- Use a vigorous yeast strain with a short lag phase that is a high ester producer
- Rack off of primary lees as soon as fermentation is complete (even if planning to go through MLF)
- If proceeding with MLF, add MLB and MLB nutrient to postracking new wine

White & Rose Protocols

Preparing for bottling:

- Get extended and glycosylated smoke markers panel!
- If glycosylated markers are high (where the sum of the bound and corresponding free compounds would equal a number higher than the BET for that compound), execute enzymatic hydrolysis (if desired), re-check glycosylated markers, then proceed with fining
- If free VPs are still at or near BET, treat with Claril SMK (bench trial first) and re-check after treatment
 - > do this before protein/tartrate stabilization
- Consider bottling at $\geq 3g/L RS$

Different approaches taken harvest of 2020

Low temp, minimal maceration, enzyme & sacrificial tannins for extraction
 Ferm temp range of 72/78F
 Maximum 1 cap management per day

High temp, minimal maceration, enzyme & sacrificial tannins for extraction
 ➢ Ferm temp range of 78/94F
 ➢ Maximum 1 cap management per day

"Usual" protocol, "usual" adds (sometimes none)
➢ Ferm temp range of 72/82F
➢ 1-3 cap managements per day

- High temp, heavy maceration
 - Ferm temp range of 78/94F
 - ➤ 1-3 cap managements per day

Sensory Analysis Best Results: High temp, heavy maceration. The more heavily extracted, fruit-forward wines before smoke mitigation treatments yielded the most balanced and enjoyable wines after treatment.

Red wine aging and preparation for bottling – Best Results

- Rack off of primary lees as soon as alcoholic fermentation is complete
- Hurry through MLF in tank using temp control and MLB inoculation
- Post-MLF, pre-elevage carbon fining
 - Can proceed with enzymatic hydrolysis before aging (this is not what was done but will be future approach)
 - ➢Get post-hydrolysis extended/glycosylated panel
 - Fine with carbon and bentonite (for settling and to deactivate the enzyme).
- Age on sweet oak, M/ML/M+ toast, American wood or engineered oak products for sweetening.

Enzymatic hydrolysis in tank

- Glycosidase enzyme at 10-15g/hL
- Result was immediately apparent via sensory analysis after 48 hour bench trial
- Hold wine temp at approx. 64F for 4-6 weeks w/regular agitation
- Result was anywhere from 15%-60% reduction in glycosylated markers (and corresponding increase in free volatile phenols) on all samples analyzed
- Add deodorizing carbon (bench trial recommended here, as well) to treat free VPs and 1#/Kgal bentonite to de-activate enzyme result of this was complete mitigation per sensory analysis

Example of pre-hydrolysis, pre-carbon VP Analysis

Analyte		Resu	lt	Analysis Date	Method Reference
106080737	20UNCONDPN				
guaiacol GC	MS/MS	17.3	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
4-methylguai	acol GC MS/MS	7.8	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
o-cresol GC I	MS/MS	8.1	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
m-cresol GC	MS/MS	6.9	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
p-cresol GC I	MS/MS	6.0	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
cresols (sum))	21.0	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
phenol GC M	ÍS/MS	31.5	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
syringol GC N	MS/MS	20.5	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
4-methylsyrin	ngol GC MS/MS	14.9	µg/L	6/10/21	A2LA Accredited Test - SOP# S018
Smoke Glycos	svlated Markers LCMS/MS (QQQ)				A2LA Accredited Test - SOP# H032
guaiacol rut	inoside	18.4	µg/L	6/14/21	
4-methylgua	aiacol rutinoside	11.7	µg/L	6/14/21	
cresol rutino	oside	35.5	µa/L	6/14/21	
phenol rutin	oside	24.9	µg/L	6/14/21	
syringol aen	ntiobioside	2.2	µg/L	6/14/21	
4-methylsyr	ingol gentiobioside	<1.0	µg/L	6/14/21	

Analysis of same sample post-hydrolysis, post-carbon, 1 year after bottling

Analyte	Resu	lt	Analysis Dat	e Method Reference
212080045 20 UNC PN				
guaiacol GC MS/MS	8.4	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
4-methylguaiacol GC MS/MS	3.2	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
o-cresol GC MS/MS	2.1	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
m-cresol GC MS/MS	3.0	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
p-cresol GC MS/MS	2.3	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
cresols (sum)	7.4	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
phenol GC MS/MS	22.8	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
syringol GC MS/MS	12.3	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
4-methylsyringol GC MS/MS	10.8	µg/L	12/13/22	A2LA Accredited Test - SOP# S018
Smoke Glycosylated Markers LCMS/MS (QQQ)				A2LA Accredited Test - SOP# H032
guaiacol rutinoside	3.6	µg/L	12/12/22	
4-methylguaiacol rutinoside	3.5	µg/L	12/12/22	
cresol rutinoside	10.6	µg/L	12/12/22	
phenol rutinoside	8.1	µg/L	12/12/22	
syringol gentiobioside	<1.0	µg/L	12/12/22	
4-methylsyringol gentiobioside	<1.0	µg/L	12/12/22	

Conclusions drawn from 2020 vintage experience:

- It is possible to make an enjoyable, early-release wine from smoke-affected fruit at a slightly higher final production cost.
 - The wine featured in the previous analyses was an 8000 cases total production and has shown well in the market over the past year and is now mostly sold/consumed.
- With red wines, a heavy extraction approach yields the best post-treatment result.
- Spending the extra money on pre- and post-treatment extended and glycosylated volatile phenols panel before deciding to bottle is worth it.
- The commonly publicized "Best Estimate Sensory Thresholds" for VPs seem to be accurate according to most tasters.
- Bottling at 3g/L RS (reds and whites both) had a positive effect on sensory perception of smoke markers.
- I would repeat my decision to produce only the sub-\$25 SRP Pinot Noirs due to insufficient data on long-term bottle aging effects of smoke markers.