WEST COAST
SMOKE EXPOSURE
TASK FORCE

# Micro-Fermentation Protocol

## BACKGROUND

Much remains to be understood about how smoke compounds interact with grapes in the vineyard and the potential risks for smoke damaged grapes and effects on wine quality. A lab analysis of smoke exposed grapes can reveal useful information, but often such analysis alone is insufficient to reliably predict the risk of smoke affected wines. Consequently, researchers recommend the use of lab analysis and sensory analysis of wine made from a micro fermentation of smoke exposed grapes.

Fermenting a grape field sample is one of the best tools currently available to predict smoke exposure markers (both free and bound volatile phenols) that may be present in a wine post-fermentation. A winemaker can use the finished micro-fermented lot to evaluate the presence of off-aromas and ashy flavors and submit a wine sample to a lab for volatile phenol and glycoside analysis to understand the potential risk of smoke damage. *This method is most accurate as a predictor of risk when used closer to harvest*. This method is adapted from the AWRI Fact Sheet Small-lot fermentation method.

## SAMPLE COLLECTION

- Evaluating risk with sensory and analytics is more accurate when conducted closer to harvest. Collect samples as close to harvest as feasible and/or >22 brix (within 3 degrees of harvest brix). This may be lower for some varieties that get picked at lower brix. If a sample is taken too early, then a second sample collection will be necessary to further evaluate risk for the crop.

- Pick a minimum of 40-50 clusters, one per vine, across all corners and areas of the vineyard or block. When collecting clusters for a micro-fermentation it is important to preserve the identity and chain of custody of the grapes and resulting wine.

- Destem clusters and place berries in a 5 gal stainless or food grade bucket (or similar container).
    - Record weight of fruit (tare scale before filling bucket with fruit). A minimum of 10 pounds of fruit for fermentation is recommended. At 175 gal per ton (330ml/pound) this should result in 3.3L of must. **Note:** You can always pick a bigger sample and use a larger fermentation vessel as it could be more representative.
    - Stems and MOG can carry smoke compounds; dispose of green material as you would normally going into a fermenter.

- Crush grapes with a manual crusher. Red and white grapes follow the same recommended fermentation methods in order to evaluate highest risk potential, despite typical white winemaking practices.

- Add 50 ppm KMBS (0.165g for 10 pounds, corresponding to 3.3L) to crushed grapes. Mix in thoroughly.

- Take sample of crushed grapes to lab for brix, pH/TA, YAN.

- Adjust must to 3.30-3.50 pH (in some cases this may be a K2CO3 addition) and 250 YAN.

- Add pectinase enzyme to buckets and mix thoroughly (your normal rate of addition). For example:
    - For whites: Add 0.01ml/# (15ml/ton) of Cinn-Free to each bucket.
    - For reds: Add 0.04ml/# (70ml/ton) of Color-Pro to each bucket.

## INOCULATION

- Rehydrate with 1g/gal (2.2#/kgal) of Dynastart rehydration nutrient (dissolved in 10x weight of 110F water). When water cools to 104F add 1g/gal (2.2#/kgal) EC1118, or any suitable yeast you would normally use for the variety.

- Warm grape must to 60-70F. Industrial heaters and fish tank heaters are all useful items.

- After 10 minutes, stir in 50ml of grape must. Wait an additional 10 minutes, then stir in another 50ml of grape must. Continue until yeast mixture is within 10 degrees of juice temp.

- Add yeast slurry to fermentation vessel.

- Punch down bucket to ensure yeast is mixed in well.

## FERMENTATION

- Fermentation temp should be maintained at 60-70F for whites and 70-80F for reds.

- Be sure to use loose lids and store in an area without smoke.

- Stir and punchdown mixture four times per day to break up and submerge cap.

- Check brix/temp and smell/taste daily to ensure fermentation is healthy and at correct temperature.

- When mixture is at 1/3 sugar depletion (approx. a brix of 15), rehydrate 1g/gal (2.2#/kgal) of fermentation nutrient by dissolving in 10x weight of water. Add nutrient mixture to bucket. If H2S forms before 1/3 sugar depletion, add nutrient earlier.

## PRESSING

- Press after five full days (5 x 24 hours increments) of being on skin contact. This is important for consistency.
    - Place strainer over empty stainless or food grade bucket and drain ferment through strainer.
    - Pour all skins into strainer and press grapes, extracting as much liquid as possible.
    - Pour decanted wine into 1-gallon jugs and cover opening with cheese cloth. Confirm ferments are RS Dry (<2g/L sugar), using Clinitest or enzymatic assay before moving forward (additional time may be required to achieve RS Dry conditions).

- Once RS Dry, rack off lees, add SO2 and copper sulfate, mix well, and transfer into 750 ml bottles for storage, reserving some for analysis. Settle before evaluation; storing in your refrigerator can help with clarification.
    - 0.1ppm copper sulfate. Mix well.
    - Whites: 30ppm KMBS solution.
    - Reds: 50ppm KMBS solution.

## SENSORY

Sensory analysis, when coupled with post-fermentation lab analysis for the presence of smoke markers, is the best method for detecting smoke damage in grapes. While sensory analysis may prove more revealing and useful than lab analysis alone, it's important to remember that even with experienced experts, taste and smell remain subjective experiences. So, a significant number of wine analyses may fall within a grey zone of uncertainty. When uncertainty exists regarding the status of smoke exposed grapes or wine from those grapes, small lot fermentations allow for a sensory analysis of the kind of wines that can be made from smoke exposed grapes. Taste each sample at least twice within a short period of time. Maintain a two-minute minimum interval in between lots because there is a strong sensory carryover effect after tasting impacted wines. Test that evaluators are sensitive to smoke taint by screening, using both heavily smoke impacted and non-impacted wines as controls. Many people are not sensitive to smoke taint.

## ANALYSIS

Use an accredited third-party lab, such as ETS. Using an ETS tube – marked for *smoke volatile markers wine* (write in analysis under "other") and submit for analysis.

**Note:** An analysis from an accredited third-party lab will ensure conformity to standard methodology, provide an objective basis for assessing the status of a wine's source grapes and can be used to support a grower's crop insurance loss claim. USDA's Risk Management Agency (RMA) has not established specific threshold levels for the presence of smoke compounds in grapes or wine for purposes of determining smoke damage, except such lab results must support a finding of "elevated levels of guaiacol and 4-methylguaiacol.

- Lab analysis will deliver results for guaiacol ug/L and 4-methylguaiacol ug/L. Most labs consider a value greater than 0.5 ug/kg (ppb) in grape samples or 1.0 ug/L (ppb) in wine or juice as an elevated level for these compounds.

- Another option is *smoke volatile markers extended panel* which will also give you Cresols (sum and individual), Phenol, 4-methylsyringol, and Syringol; this option may not be available during harvest due to time constraints.
    - **Note**: These compounds are naturally present in grapes without smoke exposure, so absent baseline data for a specific grape or wine variety, positive results don't necessarily correlate to taint.

- An additional option is wine *smoke glycosylated markers*, reporting total bound smoke compounds, but this option may not be available during harvest due to time constraints.
    - **Note:** These compounds are naturally present in grapes without smoke exposure, so absent baseline data for a grape or wine variety, positive results don't necessarily correlate to taint.