WEST COAST SMOKE EXPOSURE TASK FORCE

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WA 46°N WINE

Smoke Exposure
Frequently Asked Questions – as of July 27, 2021

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 the effects on wine quality. Communication between wineries and growers is key to finding a mutually beneficial solution.

This document brings together current research knowledge and practical experience and will be updated as new information becomes available.

VINEYARD – GRAPE GROWERS

As a grape grower is there anything I can apply to protect my grapes from smoke damage?
Results from barrier spray trials have been inconclusive and contradictive, perhaps related to differences in application timing and extent of coverage. Most barrier sprays materials should probably be washed off before harvest (which might contribute to the variable outcomes).

Would washing my grapes help?
Washing grapes does not wash off smoke compounds (volatile phenols) as these are quickly transported into skin cells in the berry. Washing the ash off the fruit may also not be worth the effort. Fresh ash can release volatile phenols into the atmosphere, and could potentially release these compounds into the fermenting must as well. Several smoke related volatiles have been found in fresh ash, but concentrations drop quickly with time. Ash which has been aged for 24 hours was found to contain only one third as much guaiacol as freshly generated ash. Addition of aged ash (7 days of aging) to fermentations did not result in an increase of smoke related volatile phenols.

There is some evidence that the use of sprays with a sticker or spreader could increase smoke uptake if applied during or shortly before a smoke event.

If leaves contribute to smoke uptake should I pull them off?
While leaves do absorb smoke exposure marker compounds (volatile phenols, VPs) similar to grapes, current research indicates limited translocation of VPs from the leaves to the grapes. Leaves are important to maintain vine health so common thought is that leaf removal may do more harm than good.

As leaves do adsorb smoke related volatile phenols, it would be good practice to remove as many leaves as possible from the fermenter to minimize the extent to which these compounds could be extracted from the leaves during fermentation. Recent research has indicated that leaves can contribute guaiacol and other markers when present in the fermentation.

Will smoke exposure marker compounds (volatile phenols) disappear or decrease during ripening?
Volatile phenols (VPs) will not disappear during ripening. However, the ratio of free to bound VPs

may decrease during ripening as free VPs are glycosylated by enzymes present in the grapes. While there may be a decrease in free guaiacol, for example, there would be a corresponding increase in guaiacol glycosides. Both free and bound forms do contribute to smoke impact.

What is the best way to determine smoke exposure risk?
Quantitative lab tests coupled with sensory analysis of wine produced from smoke exposed grapes is the best way to determine the risk posed by smoke exposed grapes to wine quality. Small-lot fermentations of a representative sample of grapes collected from a vineyard block can be used for sensory analysis, but this method sometimes enhances the effects of smoke compounds that may be present on wine quality. All tasters used for sensory analysis should be tested, by having a smoke-impacted wine as a control, to ensure they are sensitive to smoke taint (20-25% of people are not). During a tasting session, tasters should wait 2 minutes between wines to minimize the carry-over effect from smoke damaged samples. A non-smoke impacted control should be used to ensure tasters are not biased and to guard against carry-over between samples.

How does distance from a fire affect the risk of smoke damage?
Predicting grape smoke exposure risk based on distance from the fire or length of time the smoke has travelled is not possible at this time. Many factors play a role in whether vineyard will be impacted, complicating the modeling of risk. Temperature of the fire, wind strength and direction, as well as topography play a role. Any smoke experienced in your vineyard is a potential risk. However, the highest risk is fresh smoke. At this stage fresh smoke is defined as ≤24 hours. Modelling of risk is a topic of ongoing research.

Is there a time when my grapes are not susceptible to smoke exposure?
New research indicates that grapes are susceptible at any stage of berry development. Pre-veraison exposures as early as fruit set can result in affected wines.

What should I ask my winery?
Have a conversation about what their tolerance level is for smoke impact. You should be fully aware what the winery requires, up front, before testing. Also ask them how they will test and have them provide details on sampling methods, testing methods, and interpretation of results. Ask to be included in the sensory evaluation process if they choose to do small-lot fermentations.

For growers with crop insurance: if your winery wants to conditionally accept the production and conduct further analysis, verify that the winery will be holding and tracking your production separate from any other vineyards. The co-mingling of your production with another grower's production will result in the withdrawal of the claim.

WINERY

Do you know anything about the solubility of the volatile phenols? Are they more readily extracted in the juice phase or in the alcohol phase?
The free volatile phenols are soluble in both water and in alcohol solutions. The glycosides of the volatile phenols are water soluble and would be extracted quickly, similar to how anthocyanins are extracted.

Will whole cluster fermentations increase the risk of making smoke impacted wines?
The rachis may be a source of volatile phenols. If there has been a smoke exposure, it would be prudent to destem. However, the potential impact of the presence of rachi in a fermentation has not yet been specifically investigated.

I like to use oak in my fermentations. Will I still be able to evaluate smoke impact at the lab?
Once a wine comes in contact with oak, the free volatile phenols concentration will be impacted by the extraction of volatile phenols from the oak. The extraction of phenols from oak will reduce the

ability to make decisions based on the analytical results. However, if your production protocols call for oak addition during fermentation, following similar protocols in a micro-fermentation would provide an opportunity to evaluate the impact of your protocol on the sensory perception of the affected wines.

Are white wines generally less at risk than red wines?
Because smoke related compounds are primarily found in the berry skins, there will be less risk for a given exposure for white wines which are not fermented with the skins. However, be aware that since the matrix of a white wine is less complex than that of a red wine, smoke aromas may be more noticeable at lower levels than in red wines. Additionally, if the white fruit is machine harvested, there will be some degree of extraction during transport from the field to the winery.

How do I minimize my risk during white wine fermentation/processing?
Anything you can do to reduce skin contact may help. Hand-picking, gentle pressing, avoiding maceration enzymes. The press juice will have more smoke compounds than the free-run juice. For machine harvested fruit, reducing travel time to the winery and minimizing waiting time at the winery prior to processing would help to reduce the extraction of VPs from the fruit.

How do I minimize my risk during red wine fermentation/processing?
An unpublished study in which Pinot noir wines were made in several different styles found that the whole cluster wine had the greatest smoke impact. It is expected that the rachis would absorb some volatile phenols, however, it is not known to what extent these compounds would be extracted from lignified, brown rachi. In the absence of a definitive answer, destemming prior to fermentation would be a safer practice.

What does it mean when people say the smoke "keeps coming back"?
This often refers to wines for which either winemaking tools or amelioration treatments have masked or otherwise reduced the perception of smoke impact. In some cases, the smoke impact returns over time. There are several potential reasons for these phenomena, including the loss of fruity character and wine body as wines age. Both of these factors can contribute to the smoke impact standing out more.

Additionally, the slow hydrolysis of bound VPs to free VPs can change the expression of smoke impact. When wine is treated by an amelioration technique such as fining, it is mostly free VPs that are removed. A reduction in smoke impact is observed from the removal of the free compounds, but that reduction can be short lived as glycosides are hydrolyzed to release free VPs

How do I involve my grape grower?
From an early stage, let them know your tolerance level for smoke. Be specific about how you will assess the grapes and maybe have the grower involved in the sensory evaluation.

CONTRACTS

What language in my contract is pertinent to smoke impact?
Any language related to expected wine quality.

What about force majeure?
It refers to an event that is outside the reasonable control of a party and which prevents that party from performing its obligations under a contract. This would mostly pertain in the event of road closures or fire obstructions preventing picking.

CROP INSURANCE

(Please note that while RMA has reviewed this information, it is not an officially-sanctioned document from RMA and should be viewed as informational only.)

What analysis does my crop insurance adjuster need for me to make a claim on smoke impact?
Crop insurance only covers actual physical damage to the insured crop and does not cover the inability to market the grapes unless the reason is due to the physical damage. Therefore, lab tests are required to substantiate the loss/damage is from smoke that was due to a "wildfire" as the result of an insured cause-of-loss (COL) and not due to market related conditions.

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 the chemicals markers identified to be related smoke impact.

***Note**: As of September 8, 2020 the USDA Risk Management Agency broadened lab testing requirements, allowing lab testing to be conducted, "by an independent lab, accredited lab, or other capable source (e.g., winery lab with resources to perform such test)." Results should list the location of field, the lab results, the lab name, and any accreditations indicating the lab is qualified to perform smoke exposure testing. Contact your individual insurance adjuster to understand if your lab can be qualified.*

Analysis from a certified 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. However as stated above a third-party lab is not required if the winery has a lab with resources to perform the required testing. This and other options can be authorized by insurance providers on a case-by-case basis and need to be communicated with your individual insurance adjuster.

A rejection letter or amendment to reduce pricing between the winery and grower or other documentation acceptable to the insurance provider will be required. This needs to list damage from smoke as the cause for the rejection/reduction in price.

How do my results come back?
This will vary by lab, but there are no specific requirements by USDA RMA. Labs will report concentrations of guaiacol, 4-methyl guaiacol and any other volatile phenols that lab may include in its analysis. Typically, concentrations will be reported as µg/kg for grape samples and µg/L for wine or juice samples. Additionally, labs will have limits of quantification (LOQ) for each compound. In samples where compounds are either not found or are found at levels below the LOQ, the label will report the concentrations as less than the LOQ, e.g., "<0.5 µg/L" for a compound with an LOQ of 0.5 µg/L. The LOQ value will vary by compound and by lab, depending on how the analysis is conducted.

I understand I need to take a sample of the vineyard prior to harvest to make my claim. Is a small lot fermentation acceptable? What if I freeze some clusters and analyze them later?
Frozen or refrigerated samples have been allowed by some insurance providers, work with your specific claims adjuster closely to follow any set guidelines they may have.

Similarly, work with your claims adjuster to determine whether micro-fermentation results would be acceptable.

If the labs get backed up again and I can't get my results in time to make a claim, is there leniency for lab delays?
Growers must report losses within 72 hours if there is an event that causes a loss, or could cause a loss, regardless of the test results. Insureds need to work with your specific claims adjuster regarding what is required.

Though most wineries will want the lab results prior to accepting the grapes, for crop insurance purposes, the results do not need to be back prior to harvest, they just need to be taken prior to the harvest or before they are commingled.

If grapes are harvested and the winery conditionally accepts with the intention of waiting for the tests, be certain they maintain your production separate and do not let it get co-mingled with any other growers/vineyards. The claims adjuster cannot continue the claim once the identity of the grapes has been lost.

What are the cut-off dates for California, Oregon and Washington to buy crop insurance and to follow up with a claim?
For new insureds, coverage begins on or after:

- January 31 in California; or
- November 21 in all other states.

For carryover insureds coverage begins on the day immediately following the end the of the insurance period for the previous crop year.

For all insureds, coverage ends with the earliest occurrence of one of the following:

- Total destruction of the crop;
- Harvest of the insured crop;
- Final adjustment of loss;
- Abandonment of the crop;
- November 10 in California, Idaho, Oregon, and Washington.

Claims should be filed as soon as you suspect there could be damage. In the event of damage or loss it is the duty of the insured producer to notify their agent within 72 hours of their initial *discovery of damage.* Producers must also notify their agent within 3 days of the date harvest should have started if the crop will not be harvested. There are no penalties for filing crop insurance claims, regardless of the outcome. The premium does not increase due to filing a claim.

Do I need to have crop insurance to be eligible for future disaster relief funding?
Typically, growers are not required to have crop insurance to qualify for disaster relief. However, the most recent USDA programs (Wildfire and Hurricane Indemnity Program Plus – WHIP+) have elements that are specific to crop insurance.

Growers who have crop insurance can also file for a loss claim under WHIP+. Thus, the combined payout from WHIP+ and crop insurance is higher than it is for those growers without crop insurance who collected assistance under WHIP+. As a condition of payment eligibility under WHIP+, growers must obtain crop insurance, on the crop paid under WHIP+, for the first two available consecutive crop years. Crop insurance coverage level must be at least 60% coverage.

What chain of custody do I need to have for the samples collected?
Pictures when sampling the vineyard are great. Lot codes or contract ID codes to track the sample to the lab or micro ferment are also helpful. Discuss with your claims adjuster the specific requirements of your insurance provider needed for tracking.

FROM THE USDA-Risk Management Agency
The USDA has compiled FAQs on their website that can be viewed here:
https://www.rma.usda.gov/en/News-Room/Frequently-Asked-Questions/Wildfires

How to file a crop insurance claim:
https://www.rma.usda.gov/-/media/RMA/Publications/Risk-Management-Publications/how_to_file_a_claim.ashx?la=en

When damage occurs to the insured grape crop, the most pressing matter for the insured is to contact their agent within 72 hours.

RISK ASSESSMENT

Are there any tools that the winemaker can use to reduce the risk of making smoke impacted wines?
The impact of smoke on white wines can be less due to limited skin contact, however it depends on the smoke exposure. If your grapes/small scale fermentations are smoke impacted, minimize skin contact, keep press fractions separate, and fine with activated charcoal of the juice. Please reference this technical review. The use of carbon will strip the juice, but through yeast selections, mannoproteins, oak selection etc. you may be able to partially compensate. For similar reasons, making a rosé wine is an option for reds although this is not always an economically viable option.

For red wines, the best practice is to make the wine using normal practices, then focus on amelioration options. For low impacted red grapes, using fruity yeast and oak additives that uplift fruit may be helpful as well as methods to increase body through extensive extraction of color and other phenolics, especially as smoke removal treatments lack specificity and will remove some of these compounds with the volatile phenols. Treatments such as activated charcoal fining, reverse-osmosis and spinning cone remove a significant amount of free volatile phenols but only a small amount of the bound. For a low (to medium) impacted wine, treatment may be effective although there is a compromise with overall quality impact.

Do the AQI levels correlate to smoke impact?
The AQI system is based on particulate matter less than 2.5 micron in size, because of the impact of these fine particles on human health. The mean size of the particles associated with smoke is smaller than 2.5 microns, so the AQI scale is an imperfect measure of smoke levels, although it is a good measure of overall air quality and density particles in the air. The AQI scale does not always correlate well with smoke intensity.

The greatest risk is from fresh, dense smoke that is less than 24 hours old. Atmospheric scientists are working on models for predicting smoke movement over time. AQI levels from air.gov or other state sponsored websites can provide information about density of smoke in affected areas. However, without information about the composition of the smoke, particularly as it ages, smoke density only provides part of the information required for risk assessment

Are there any published threshold levels for lab analysis?
There are published sensory thresholds for some of the individual smoke related volatile phenols, however, these thresholds will be subject to change based on matrix effects in individual wines, as well as additive or synergistic effects when multiple volatile phenols are present.

How do I perform a micro fermentation?
- This document details the small-scale fermentation protocol.
- This video contains a step-by-step demonstration of the small-scale fermentation protocol.

How do I evaluate my micro fermentation?
The recommended protocol is a useful tool for determining the kind of wine that can be made from smoke exposed grapes. However, in the case of white wines, the small-scale fermentation protocol entails prolonged skin contact which is a worst-case scenario. When a sensory evaluation is performed, evaluators should be aware that the protocol is a worst-case scenario and is intended to eliminate as many false negatives as possible.

You may also choose to do a ferment more similar to how you would make your wine for another assessment (i.e., no white skin contact and no enzymes on red, if that is how you normally ferment). The small-scale fermentation protocol is merely a tool and should not be taken as definitive proof of potential wine quality. It is also recommended any sensory analysis utilize a panel of tasters that understand what smoke compounds taste like to establish known viewpoints on levels.

Taste each sample at least twice within a short period of time. Maintain a two-minute minimum interval in between samples because there is a strong sensory carry over effect after tasting impacted wines. Test that your evaluators are sensitive to smoke taint by screening, using both heavily smoke impacted and completely non-impacted wines as controls.

What labs can I use for risk assessment and what analysis do I get?
A few recommended labs are listed below; if they are located out of the country, reach out to determine if there are any import or customs issues based on your vineyard location:

- ETS: https://www.etslabs.com/analyses/%23JSMOKEB
- IEH laboratories & Consulting Group: https://www.iehinc.com/
- K Prime, Inc, Santa Rosa, CA 707-527-7574
- Canada Supra Research and Development: http://suprarnd.ca/services/analytical-services/smoke-taint/
- Australian Wine Research Institute: https://www.awri.com.au/industry_support/winemaking_resources/smoke-taint/
- The Napa Valley Vintners has compiled a list: http://help.etslabs.com/en/articles/4415808-list-of-additional-smoke-impact-analysis-providers

What other analysis can I look at beyond guaiacol and 4-methylguaiacol for indicators of smoke exposure impact?
Another option is a *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*: Some of these compounds are present in grapes without smoke exposure, so without 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: *Some of these compounds may also be present in grapes without smoke exposure, so without baseline data for a grape or wine variety, positive results don't necessarily correlate to taint.*

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