

WEST COAST SMOKE EXPOSURE TASK FORCE

Smoke Impacts: Frequently Asked Questions

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. When concerns exist after a smoke exposure event, 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 contradictory. Effectiveness of barrier sprays is variable and perhaps related to differences in application timing and extent of coverage. Most barrier sprays materials should probably be washed off before harvest.

Would washing my grapes in the vineyard help?

Washing grapes does not wash off smoke compounds (volatile phenols) as those are found in the skin. However, depending on the amount of ash, washing ash off the fruit could be helpful. The potential to increase mildew and rot and the time and expense involved are a consideration. Several smoke-related volatiles have been found in ash in lab analysis, but research has not studied release of volatile compounds in vineyards. It is possible that fresh ash could release these compounds into the fermenting must but research involving washing ash off the grapes is inconclusive. Some studies show rinsing ash off to be beneficial while another trial made it worse.

Any effort to wash grapes in the vineyard should be careful not to drive ash into grape bunches and washing should be focused, as much as possible, directly at the grape bunches and not surrounding leaves. Think about removing the leaves in the bunch zone before spraying. Washing away ash from varieties with tight clusters may be more difficult. Test the water spray pressure needed to ensure only washing of the outside of the cluster.

What should I know about pest control applications?

Common thought now is any pest control application containing adjuvants with 'sticker' or 'spreader' properties to enhance the effectiveness of the spray, during a smoke event, may promote greater smoke uptake by berries of damaging smoke compounds.

Can ash on grape berries be removed by simply washing the grapes?

Yes, not 100%, but a significant amount. Washing grapes at the UC Davis vineyard was tried using a pesticide application apparatus to spray water. A video of how this was done is [here](#).

I know there was some ash in the vineyard, but none is now visible on my grapes. Should I still wash them?

First, try a simple test. You can collect and place a few bunches in a container of water and evaluate the water for signs of any visible ash released from the bunches. If no ash is apparent, then perhaps the ash was removed (by the wind or another event) from the bunches, eliminating the need and benefit of washing in the vineyard or elsewhere.

Can ash on grapes contribute to smoke taint in wines?

Unfortunately, the role of ash in smoke exposure risk has not been studied. Up to now there is only anecdotal evidence that ash may have an influence. Some winemakers believe removing ash from their grapes was the difference between making a smoke impacted wine or not. Previously researchers were less concerned about the ash as it is carbon. However, preliminary investigations indicate fresh ash may be a source of volatile phenols (smoke exposure marker compounds). Ash collected from a vineyard at University of California Davis was stored in a sealed container and the headspace above the ash was analyzed for the presence of volatile phenols. A significant amount of volatile phenols were found. Volatile phenols have a half-life (break down over time) while ash (carbon) is very stable. Thus, the fresher the smoke, the more potential risk it poses. However, this has not yet been proven and is currently under investigation.

If leaves contribute to smoke uptake should I pull them off?

While leaves, similar to grapes, do absorb smoke exposure marker compounds (e.g., volatile phenols (VPs)), current research indicates limited movement of VPs from the leaves to the grapes. Leaves are important to maintain vine health so common thought is leaf removal may do more harm than good.

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 contribute to smoke damage.

What is the best way to determine the risk of smoke damage?

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 superfocusing, 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 topography and distance from the fire is very difficult. Many factors determine whether vineyards may be impacted and currently no proven models are available to reliably predict the risk of smoke damage to grapes, based on distance from fires, atmospheric conditions and length of smoke exposure event. This is a key topic for future research. Temperature of the fire, wind strength and direction, as well as topography play a role. Any smoke exposure in a vineyard may present a potential risk for smoke damage. However, the highest risk is fresh smoke. Meaning, the risk of damage from smoke 24 hours or less in age is more potent than older smoke.

Is there a time when my grapes are not susceptible to smoke exposure?

New research indicates that grapes are susceptible at any stage of ripening. The degree of smoke impact may vary among different varieties, but this is not currently correlated with any grape physiological parameters.

What should I ask my winery?

Have a dialogue about what the tolerance level is for smoke impact. You should be fully aware what the winery requires prior to harvest and the methods they will use to determine whether smoke damage has occurred. 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.

WINERY

Do you know anything about the solubility of the volatile phenols? If they are more soluble and extracted in the juice phase or in the alcohol phase?

Volatile phenols are very soluble and behave similar to anthocyanins. Yes, alcohol helps extract volatile phenols more quickly, but they are pretty soluble in water already. Processes or tools used to remove color from red skins, will also extract the volatile phenols.

Will smoke compounds (volatile phenols) continue to accumulate in berries over time? Instances where smoke has worked its way through the vine, and seen levels decrease in the fruit after enough time has passed?

Volatile phenols (VPs) present in the air can be absorbed by grapes, leaves and potentially the rachis as well. The absorption of VPs will stop when the air does not contain high enough concentrations of VPs for absorption. The VPs in the grapes will start being glycosylated (bound) within hours of absorption and this process can go on for an extended period of time. So, a decline in free VPs in grapes over time may occur, but will correlate with an increase in bound VPs. Both forms contribute to smoke impact, so it does not help you. When we see small increases in VP

after there has been no more smoke impact, we think this may be due to vineyard variability. Berries from the same vine can contain vastly different quantities of VP.

Will whole cluster fermentations increase the risk of making smoke impacted wines?

There is the possibility that the rachis may also be a source of volatile phenols. For that reason, if you suspect smoke impact, it may be better to destem. However, this has not been specifically studied and is currently under investigation.

We are about to start small lot fermentations of clusters post smoke exposure; do we still need to turn in grape samples to the lab as well?

We recommend doing analysis on a sample from grapes used for fermentation as well as an analysis of the finished wine. A lab analysis of a grape sample is needed to support a grower's crop insurance claim, but USDA's Risk Management Agency has said if the grape analysis shows a low number, but a sensory analysis of the wine produced by small scale fermentation reveals damage, then this information can support a loss claim. It's important to maintain and prove chain of custody. A lab analysis of commingled lots of wine, from different grape sources, is not valid for purposes of a crop insurance claim. Crop insurance carriers need a number for each block and variety and the ferments need to represent those grapes only. Also, results from a baseline grape sample before smoke exposure, can provide insight into whether lab results of grapes post exposure constitute "elevated" levels of smoke compounds. However, there are no clear, established thresholds by variety and wine style and researchers are trying to address these complex questions.

Regarding anyone who is thinking about using oak in their micro-ferments: As far as trials go, remember the moment a wine comes into contact with oak, free volatile phenols numbers will be affected by the oak contribution of volatile phenols, which are unpredictable.

Are white wines generally less at risk than red wines?

The smoke compounds that affect wine quality reside in the skins and because of the way white wines are made, there may be less risk. However, since the matrix of flavor compounds in a white wine are less complex than red wine, the presence of smoke compounds in white wine may be more noticeable at lower levels than in red wine.

How do I minimize my risk during white wine fermentation/processing?

Anything done to reduce skin contact can help. Hand-picking, gentle pressing, no extraction enzymes. The press juice will have more smoke compounds than the free-run juice.

How do I minimize my risk during red wine fermentation/processing?

An unpublished study examined Pinot noir wines made in several different styles and whole cluster fermentation produced the worst outcome, as far as smoke impact goes. UC Davis researcher, Anita Oberholster, Ph.D. is conducting tests this year to more fully explore these issues, but at the moment destemming is recommended. Theoretically it makes sense that the rachis may absorb some volatile phenols, however, if it is hard and brown, will it release any? Currently, there is no definitive answer. Dr. Oberholster would recommend erring on the side of caution and destemming fruit.

What does it mean when people say the smoke “keeps coming back”?

This idea of smoke taste in wine reappearing refers to a phenomenon where winemaking tools or amelioration treatments were used and were thought to have successfully masked or removed the perception of smoke impact, but the perception of smoke impact returns over time. There are several potential reasons why this occurs. As a wine ages, its fruity characteristics and wine body (phenolic content) can decrease, which contributes to the perception of smoke impact standing out more. Additionally, during aging, the slow hydrolysis of bound VPs may be released as free VPs which can change the expression of smoke impact.

When wine is treated by an amelioration technique such as fining, mostly free VPs are being removed. Any sensory observation of reduced smoke impact can re-emerge, although not always. Researchers speculate this is due to an equilibrium between free and bound VPs being re-established within the specific wine matrix, releasing more free VPs and thus bringing the smoky character back. However, we know that both free and bound volatile phenols contribute to smoke impact, but the ratio of the different components within a specific wine matrix may play a role in smoke impact expression.

How do I involve my grape grower?

From an early stage, a winery should communicate the tolerance level for smoke and standards for the presence of smoke compounds. Early, timely and transparent communications are key. The winery should be specific about how grapes and wine may be assessed for smoke damage, and where feasible the grower should be involved in the sensory evaluation of wine. A winery's decision regarding the quality status of grapes and whether to accept grapes should be made with a clear understanding of the options and obligations provided for in the relevant grape contract.

CROP INSURANCE

What analysis does my crop insurance adjuster need for me to make a claim?

Guaiacol and 4-methylguaiacol markers from a certified third-party lab.

Note: As of September 8, 2020, USDA Risk Management Agency updated their 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 field location, 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. 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.”

A rejection letter or amendment to reduce pricing between winery and grower is required as documentation--listing damage from smoke as the cause for the rejection/reduction in price.

How do my results come back?

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 as an elevated level for these compounds.

What if my internal lab tests down to 0.1ppb?

Per the rules of the crop insurance policy, there is no set numerical value for elevated levels of smoke. If a lab result comes back with a level, below 0.5ppb, and this results in a rejection, work with your insurance company to verify the lab results are acceptable.

Do I need to collect a grape sample from my vineyard prior to harvest to support my crop insurance claim? If a winery rejects my grapes based on a small lot fermentation, is that acceptable? What if I freeze some clusters and analyze them later?

Grape samples tested for the presence of smoke compounds should be collected prior to harvest. Each variety and unit should be separately sampled and tested. The key in this step is to maintain the identity of where the tested fruit came from. Use photos with location identifiers to clearly document location of where the grapes were pulled.

An analysis from a small-lot fermentation can support a grower's loss claim. A winery should provide a grower with laboratory test results, indicating elevated levels of smoke compounds, from wine produced in a small lot fermentation or if the winery's determination is based on a sensory analysis of the wine, then the winery should confirm in writing that the rejection is based on that sensory analysis.

It's a good idea to collect and store samples for later testing. Some insurance carriers are okay using test results from frozen or refrigerated samples; work closely with your specific claims adjuster and follow any guidelines they may have.

With the labs so backed-up, what if I don't get my results in time to make a claim? Is there leniency for lab delays?

Growers should file a notice of a loss claim with their agent when the presence of smoke is observed in the vineyard. Growers are required to provide notice of a loss within 72 hours of when damage or loss is observed. It's good practice to open a loss claim immediately after smoke is observed in the area, regardless of the test results.

The USDA Risk Management Agency recognizes the considerable delays for industry operators to obtain lab results and they have attempted to make the lab testing process more attainable. In case-by-case scenarios, a lab test may not be needed. Again, work with your specific claims adjuster to determine if there is a work-around in this case.

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.

If grapes are harvested and the winery conditionally accepts with the intention of waiting for the tests, it's important that any test of grape samples (by varietal and unit) was collected prior to harvest. Any sample of wine made from your grapes must have been collected prior to the commingling of that wine with other lots of wine. The USDA Risk Management Agency requires a sample (of grapes or wine) used for a loss claim be identifiable and not collected after

commingling. Samples collected after commingling cannot support a loss claim because those samples are not unique to the identity of grapes. It's fine for a winery to commingle lots of wine, provided a sample was collected for testing prior to the commingling.

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:

- February 1 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. The policy states growers need to notify their agent within 72 hours of determining there could be an issue. There are no penalties for filing crop insurance claims, regardless of the outcome. The premium does not increase due to claims filed, and there is no monetary deductible for crop insurance.

Do I need to have crop insurance to be eligible for future disaster relief payments?

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 a level of at least 60% coverage.

What sort of chain of custody-of-samples collected do I need to have?

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 the claim's adjuster any carrier specific requirements for tracking.

FROM THE USDA

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:

The most pressing matter for the insured is to contact their agent within 72 hours.

RISK ASSESSMENT

How do I determine if my grapes are smoke impacted?

It is important to obtain guaiacol and 4-methylguaiacol numbers from a third-party lab. However, research indicates other smoke compounds that may be present in grapes also contribute to perceptions of smoke affected wine. So, the best predictor of smoke exposure risk is an analysis that tests for the presence of 13 volatile phenols, 7 free and 6 bound forms. Although lab analysis of grapes with the extended panel of free and bound VPs of smoke exposed grapes can reveal useful information, such analysis alone may not always reliably predict the risk of smoke affected wines. A significant number of wine analyses may fall within a grey zone of uncertainty (low to medium risk). When uncertainty exists regarding the status of smoke exposed grapes or wine from those grapes, [small-scale fermentations](#) allow for sensory analysis of the kind of wines that can be made from smoke exposed grapes.

See the video published by UC Davis on small scale fermentations: [How to do small-scale fermentations for the evaluation of grape smoke exposure risk](#).

Are there any tools that the winemaker can use to reduce the risk of making smoke impacted wines?

With white wine the impact of smoke may be less due to more limited skin contact during winemaking, however it depends on the smoke exposure. If grapes/small scale fermentations reveal smoke impact, then winemaking should utilize very little skin contact, press fractions should be kept separate, and fining with activated charcoal of the juice can be used. [Please reference this technical review](#). This process will strip the juice, but that may be compensated for, in varying degrees, through yeast selections, mannoproteins, oak selection, etc.

For similar reasons, making a rosé wine is an option for reds, although this is not always an economically viable option. Otherwise, make the best red wine possible and 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. This may be preferable to some smoke removal treatments which lack specificity and will remove some desired compounds along with problematic volatile phenols. Some residual sugar and good acid can help hide smoke impact as well, although this is based solely on anecdotal evidence. 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, aggressive treatments may be effective, but there is a compromise on the overall impact to wine quality. Flash Detenté seems to play mostly a masking role.

What do Air Quality Index (AQI) levels tell us about the risk of smoke damage?

The greatest risk of smoke damage in grapes occurs when fresh, dense smoke less than 24 hours old is present in a vineyard. Observing the direction of wind flows, relative to the source fire, may help determine how old the smoke may be, however due to the nature of smoke it can be hard to track its flow. Atmospheric scientists are working to develop better prediction methods. AQI levels

at 2.5 micron are oriented toward protecting human health from the risks of ozone and ambient levels of particulate matter found in smoke. These AQI values have not been correlated, through research, with the presence of compounds that give rise to smoke damage in grapes. So, AQI levels are not a reliable predictor of smoke exposure risks in grapes.

Currently looking at an AQI level from www.airnow.gov can give you an idea of density of the particles. Particles don't correlate to volatile phenol levels in the air, the compounds that impact grapes.

Are there any published threshold levels for lab analysis?

Research has not identified threshold levels as it is dependent on many factors including grape variety and the wine matrix (everything else present in the wine). This is another area that is the focus of a future research study.

How do I perform a micro fermentation?

- [This document details small-scale fermentation protocol.](#)
- [This video contains a step-by-step demonstration of 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., However, you may 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. Many people (approx. 25% of the population) are not sensitive to smoke taint.

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 import or customs issues based on your vineyard location:

- ETS: <https://www.etslabs.com/analyses/%23JSMOKEB>
- 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/
- EIH laboratories & Consulting Group: <https://www.iehinc.com/>

- Napa Valley Vintners compiled a list: <http://help.etslabs.com/en/articles/4415808-list-of-additional-smoke-impact-analysis-providers>
- California Department of Food and Agriculture: <https://blogs.cdfa.ca.gov/CDFAIInspectionServicesBlog/index.php/2020/10/28/cdfa-laboratory-has-tested-140-winegrape-samples-for-smoke-impact-is-open-for-testing-more/>

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: These compounds are naturally 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: These compounds are naturally 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.

FAQ's provided with the assistance of:



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