

ENARTIS NEWS

SMOKE TAINT IN GRAPES AND WINE

Over the past 15 years, bushfires have become increasingly more common in the dry summer months for wine growing regions all over the world. Australia, is being ravaged by the worst fires seen in decades, with swathes of the country devastated since the fire season began in late 2019.

Smoke exposed vineyards can result in smoke tainted wines with undesirable sensory aromatic and mouthfeel characteristics, which detract from overall wine quality. Research has shown the compounds primarily responsible for the development of smoke tainted wines are free volatile phenols (Parker et al. 2012), which are products generated during the combustion of plants such as trees and grasses. Research has also shown that these volatile phenols can undergo biotransformation once they enter grapevines to give glycoside, or 'bound' forms of the phenols (Hayasaka et al. 2010). The non-volatile glycosides can be considered precursors to the volatile phenols, which are responsible for the aromas and flavors of smoke taint in wines. Grape analysis to understand the potential severity of the smoke taint and make suitable picking decisions is now available and recommended. Wine analysis of smoke taint is also available and can give you a better understanding of impact of wine making products in the process to reduce smoke taint.

WHICH COMPOUNDS ARE RESPONSIBLE FOR SMOKE TAINT?

When absorbed by the plant, smoke taint related volatile phenols become bound to sugars by enzymatic activity within the berry. These glycosylated forms of phenols are not detectable aromatically, as the glycosylation process reduces volatility of these compounds. The bound/glycosylated form of smoke compounds present in much higher concentration in grapes and young wine. During fermentation and aging the glycosides hydrolyze naturally contributing to a decrease in the bound form and increase in volatile form. The bound compounds will be detected on the palate on the finish along with retro-nasal effect. Enzymes present in the saliva are able to break the glycosylated bond and release the compounds retro-nasally.

While brushfires of different types can produce smoke compounds in grapes of considerable variability, the two compounds found most commonly across all types of brushfires are Guaiacol and 4-Methyguaiacol. Other volatile phenols which also act as influent factors include: o-cresol, m-cresol, p-cresol, syringol and 4-methyl syringol.

For the above reasons, Laboratories now offers a robust method for the quantification of Total Smoke Taint Markers (volatile and glycosylated smoke markers of all different kind of volatile phenols) in grapes, juice and wine. For more details on smoke taint analysis and procedure, please contact Vintessential Laboratories.

HOW MUCH SMOKE EXPOSURE TO GRAPES WILL CAUSE A WINE TO BE SMOKE TAINTED?

Studies have shown that in just as little as 30 minutes of exposure to heavy smoke (30% obscuration/m), at a sensitive stage of vine growth, is enough to cause a smoke effect in wine (Kennison et al. 2008).

HOW CAN I ASSESS THE LEVEL OF SMOKE TAINT IN MY GRAPES?

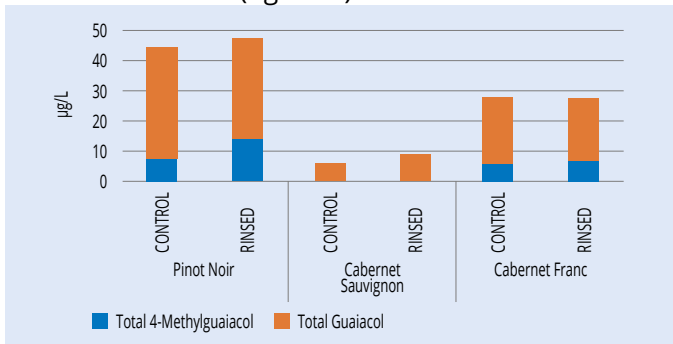
In grapes, we recommend measuring the Total Smoke Taint Markers as the "free" (volatile) fraction is almost non-existent with grapes and not representative of the smoke taint risk. Testing grapes two weeks prior to harvest is recommended.

HOW DO I ASSESS THE LEVEL OF SMOKE TAINT IN MY WINE?

To assess the risk of smoke taint in wine, we recommend testing for Free and Total Smoke Taint Markers as this gives a more complete picture for the status of free and bound fractions within the wine. For red wines, samples can be tested just after pressing a red must and at any point during the ageing process. Regular sensory monitoring is recommended for the duration of cellar aging until bottling as more bound smoke taints can be released during this period of time.

SHOULD I RINSE MY GRAPES TO REDUCE SMOKE TAIN?

Washing grapes at reception does NOT reduce the smoke taint risk (figure 1).



RECOMMENDATIONS FOR HANDLING SMOKE AFFECTED GRAPES

Smoke taint compounds are present in grape skins and leaves, therefore their levels increase with maceration time. We recommend avoiding machine harvesting, removing leaf material, reducing skin contact, and separating press fractions.

- **Press fractions in white/rosé juice:** Press fractions for a white or rosé have higher concentrations of smoke taint markers than free run juice. Separating these fractions and testing them separately after fermentation will help minimize risk of smoke taint.
- **Skin contact in red grapes:** Recent research has shown a majority of smoke related compounds are extracted within the first few days of grape soaking and fermentation. With this in mind, we recommend limiting maceration and soaking prior to fermentation.

RECOMMENDATIONS FOR REMEDIATING SMOKE AFFECTED WINES

1. Fining agents have been shown to be effective for remediation of some volatile fractions of smoke taint in wine. For this reason, measuring the total and free levels of smoke taint markers in wine can provide information for the amount of smoke taint which still exists in a bound form in the smoke affected wine.

Enartis additionally offers several fining agents which can be utilized to remove volatile smoke taint:

- **FENOL FREE** - activated carbon with specificity for phenol removal with low color removal capacity
- **EnartisStab MICRO M** - pre-activated chitosan blend is able to remove vinyl phenols as well as smoke taint markers such as Guaiacol.
- **Enoblack Perlage** - pelletised activated carbon with phenol removal capability for the ease of application in winery cellars.

It is highly recommended to conduct fining trials, followed by sensory evaluation, to understand the best option for each specific smoke affected wine. Analysis may also be conducted to verify changes in smoke taint markers.

2. Selection of yeast strain can have a significant sensory impact on smoke taint. Trials have shown that with the use of yeast strains which are able to produce intense fruity aromas, the smoky notes can be notably masked. EnartisFerm Q5, EnartisFerm Red Fruit and EnartisFerm ES454 have all shown promising results.

3. The bitter and ashy aftertaste associated with smoke taint compounds can be mitigated in smoke affected wines with the use of polysaccharides such as **SURLÌ VELVET** and/or **CITROGUM** or **CITROGUM PLUS**.

4. Sugar level can have an impact on the organoleptic characteristics of the wine. Research has shown that the level of volatile phenol compounds released by salivary enzymes were significantly reduced when residual sugar was present in the wine. For winemakers, when assessing the impact of smoke on finishing wine it is best to perform sensory assessment after the completion of alcoholic fermentation and when the wine is dry. In addition, adding sugar or adjusting residual sweetness level of finished wine can be a potential remedial strategy to implement, in order to reduce the sensory impact.

5. Reverse osmosis is a physical treatment which can reduce volatile free smoke taint compounds. This process, like fining, does not remove bound forms of smoke compounds within a wine.

See our full Winemaking Guidelines for [Red Wines](#) and [White Wines](#) on our website for recommendations on how to manage smoke tainted grapes.

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