

Smoke Taint in Hops



Presentation Overview

- What is smoke taint?
- Smoke taint chemical compounds
- Current industry research
- YCH's approach to smoke taint
- Importance of evaluating smoke taint

What is smoke taint?

- The chemical compounds present in wildfire smoke are deposited onto the hop while in the field or during kilning.
- The severity of the smoke taint is dependent on fire proximity, smoke density and exposure time.
- This subject has been an area of extensive research in the wine industry but it is relatively new in the hop industry as wildfires are increasing in frequency and intensity.

Year	Acres Burned in Washington State
2019	169,742
2020	842,370
2021	647,222
2022	173,659
2023	151,316
2024	275,593
2025	251,840

Smoke Taint Chemical Compounds



Guaiacol

- Product of the pyrolysis of lignin
- Phenolic, smokey and sweet aroma



Syringol

- Product of pyrolysis of lignin
- Smokey aroma specifically barbeque



Furfural

- Product of pyrolysis of sugars and carbohydrates
- Sweet, almond or caramel-like aroma



4-methylguaiacol

- Also known as creosol
- Product of pyrolysis of plant biomass
- Sweet and spicy smokey aroma



Cresol

- 3 isomers: meta-, para- and ortho-cresol
- Medicinal, animal and tarry aroma



4-methoxythioguaiacol

- Product of interaction of hydrogen sulfide and phenolic compounds
- Meaty, sulfurous and roasted aroma



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Current Industry Research – New Belgium

- New Belgium Brewing published a GC-MS method for the analysis of smoke-taint related volatile phenols in hops in 2021.
- New Belgium Brewing worked with Colorado State University to use the GC-MS method to characterize smoke taint volatile phenols after simulated smoke exposure which was published in 2024.

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Characterization of Smoke Taint in Hops: Insights from Laboratory Simulation and Chemical Profiling

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ABSTRACT

The Pacific Northwest (PNW) region contains approximately 97.5% of U.S. commercial hop acreage. In recent years, wildfire events have been increasing in both number and severity within the region. Currently, there is an extensive body of research from the wine industry on the impact of smoke taint in grapes, however, research investigating smoke taint in hops is limited. This study aims to characterize smoke taint in hops through laboratory simulated wildfire smoke exposure coupled with chemical profiling by nontargeted gas chromatography-mass spectrometry (GC-MS). Results reveal that the chemical profiles of smoked hops varied across fuel types. Specifically, several known smoke taint markers, including guaiacol and 4-methylguaiacol, as well as previously unreported compounds such as xylopyranose were observed to be elevated in smoked hops compared to controls. This research provides a foundation for future studies to investigate various fuel types and their varying effects on hop quality.

KEYWORDS

GC-MS; hops; nontargeted profiling; smoke exposure; smoke taint



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Current Industry Research - OSU

- OSU has expanded their wine smoke taint research lab to include hop smoke taint.
- Cade Jobe and Thomas Shellhammer of OSU recently published a research article investigating the effects of smoke exposure during kilning.

Kilning with smoke-affected air impacts the chemical and aromatic qualities of Cascade hops

Cade A Jobe ¹, Thomas H Shellhammer ²

Affiliations + expand

PMID: 41895926 DOI: [10.1016/j.foodres.2026.118800](https://doi.org/10.1016/j.foodres.2026.118800)



Current Industry Research – Collaborative

- Collaborative work between New Belgium Brewing, Oregon State University, John I. Haas and Yakima Chief Hops has led to a sensory method for smoke taint in hops and beer.
- This method was recently published by ASBC.



Smoke Taint Evaluation

Whole Cone Hop Sensory

- Each bale lot received has a composite sample made (core samples from every 10th bale are combined into 1 larger sample).
- This composite gets taken to sensory where it is evaluated by validated sensory panelists for aroma.
- At this point, if a lot is flagged by 2 or more panelists or was harvested during a time when the AQI was 150 or more, will trigger further testing.

Flagged Lot Handling

- The flagged lot will automatically be reassessed by panelists for confirmation.
- The lot will also be analyzed after going through a lab scale fermentation for smoke translation and intensity into a beer.
- If 3 or more panelists flag the fermentations for smoke, all sensory data will be given to the lot review team for lot fate determination.



Importance of Evaluation

- Quality
 - Ensure the hops that we are receiving are of the highest quality.
- Comprehension
 - To better understand the mechanism and implications smoke exposure has on hops.
- Troubleshooting
 - With better understanding, we can develop ways to help troubleshoot issues related to smoke taint.

References

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