Research BULLETIN

WEST COAST SMOKE EXPOSURE TASK FORCE

CALIFORNIA OREGON WASHINGTON IDAHO

This bulletin is a summary of the current research status related to smoke exposure research that was shared during a November 2024 workshop with wine industry stakeholders and the scientific community. A research roadmap - Following the Smoke Signals: Elucidating the Future of U.S. Smoke Exposure Research - was developed from the workshop by the U.S. Department of Agriculture's Agricultural Research Service (USDA-ARS). The roadmap serves as a resource for industry communications of the West Coast Smoke Exposure Task Force. The task force thanks USDA-ARS researcher Dr. Arran Rumbaugh for helping coordinate the workshop and creating the research roadmap, which is available at wcsetf.org.

BULLETIN NO. 1

Unification of Research and Industry Efforts

TOP INDUSTRY CONCERNS

Wildfires present significant challenges related to smoke exposure to winegrapes that can negatively impact wine quality. Measuring and monitoring the compounds responsible for smoke taint require laboratory analysis and numeric thresholds to indicate impacted grapes or wine are not well established. The compounds associated with the undesirable "ashy" flavor in wine are volatile phenols and thiophenols. Better understanding of their metabolism in grapes is needed before grape growers and wineries can manage their impact. During the workshop, growers and winemakers shared the need for reliable, cost-effective and real-time detection tools to more

quickly assess smoke exposure in the vineyard and during winemaking. The wine industry also needs specific thresholds established for sensory detection, a task that is complicated due to the complex chemistry of smoke-related compounds and variables associated with smoke exposure.

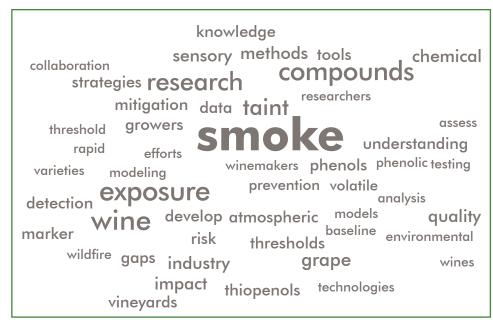
The grape and wine industry has identified key research priorities of improving prevention and mitigation strategies. Barrier sprays to protect grapes from smoke exposure have potential, however, issues of feasibility of timing of application, durability of material and varying effectiveness need more study. Growers also need rapid and accurate methods to assess risk in vineyards. Predictive atmospheric models that consider factors like fire proximity and fuel source burned are being developed.

U.S. RESEARCH PROGRAMS

A coordinated research effort to address priorities of the U.S. wine industry is underway through USDA-ARS and land grant universities of California, Oregon and Washington. The efforts are funded through multiple sources, from various industry, state and federally-funded grant programs to direct appropriations to ARS from Congress.

USDA-ARS PROGRAMS

ARS researchers in Davis, Calif. are focused on the development of an inexpensive and rapid detection tool to monitor levels of smoke-derived compounds in grapes. Also, they are generating a database of smoke marker compounds of different varieties



Word cloud of top industry concerns discussed during the November 2024 workshop.



and locations, studying the mechanism of grape smoke absorption and what happens to the smoke marker compounds after absorption. ARS scientists at the Albany, Calif., research unit are working in the areas of genomics, transcriptomics, biotechnology and gene editing to better understand smoke taint in winegrapes. ARS scientists are also working to develop microbial-based tools for quick detection of the smoke volatile phenols and potential removal from grapes. At the ARS unit in Corvallis, Ore., researchers are investigating ways to predict smoke exposure at the vineyard level through atmospheric forecasting tools for industry stakeholders that could allow management decisions adjusting harvest dates or other mitigation tools.

CALIFORNIA UNIVERSITY PROGRAMS

The University of California, Davis (UCD) is the primary arm for smoke related research in California. Emphasis at UCD has been on both vineyard management and winery interventions. Key studies include development of a vineyard sensor network incorporating satellite imagery to assess smoke risks, and predictive models for air quality to improve decision-making

in both vineyards and wineries. California scientists have also investigated the use of oak and oak products to mitigate smoke impacts on wine, as well as developing advanced treatments for smoke-affected wine that use unique phenol glycosidases and resins. For prevention, studies are focused on barrier sprays and canopy management practices to reduce smoke compound uptake. Additionally, California investigated the role of ash in vineyards and clusters and its potential impact on wine quality and tested small-scale fermentation protocols to predict how smoke exposure will affect commercial wine production. Lastly, California is working on decision-making tools to help growers and wineries make informed harvest and winemaking choices based on smoke exposure risks.

OREGON UNIVERSITY PROGRAMS

Oregon State University is conducting a variety of research to better understand and mitigate the impacts of smoke exposure on vineyards and wine. In coordination with UCD and Washington, efforts are focused on development of a vineyard sensor network to assess real-time smoke density and composition. Researchers

are also working to improve methods to measure smoke compounds in grapes and wine, such as developing analytical tools to measure free and bound compounds. Sensory research is focused on establishment of sensory thresholds for smoke compounds, development of standard sensory evaluation methodologies, and exploration of the interactions between wine compounds that may influence smoke taint perception. Oregon is also working to develop a food grade, nanoparticle barrier to protect grapes from smoke exposure and is investigating fermentation mitigation strategies of enzymatic hydrolysis, reverse osmosis, and yeast as ways to reduce the impact of smoke compounds.

WASHINGTON UNIVERSITY PROGRAMS

Washington State University's (WSU) research efforts are similar to those in Oregon and California, with a focus to develop vineyard sensor networks and air quality models, evaluate field-based sensors, and assess how to integrate data from satellite imagery and other sources. Analytical research is working to refine methods for measuring smoke compounds, and using Liquid chromatography with quadrapole time-of-flight mass spectrometry (LC/ QTOF-MS) technology to compare results from smoke-affected and control wines. Scientists are also exploring oxidative methods and microbial metabolism to mitigate smoke taint. Vineyard prevention techniques of barrier sprays and canopy management practices are underway to reduce smoke uptake. Finally, researchers at WSU are using RNA transcriptomics and chemical profiling to better understand grapevine responses to smoke exposure.

SMOKE TAINT SYMPOSIUM AT 2025 ASEV CONFERENCE

The American Society for Enology and Viticulture (ASEV) sponsored the daylong Smoke Taint Symposium on June 17. The event shared research outcomes supported by the Specialty Crop Research Initiative, project award 2021-5118-35862, from USDA's National Institute of Food and Agriculture. The seminar provided an overview of a systems approach to vineyard monitoring and an update to all aspects of the impact of wildfire smoke exposure to winegrapes by leading researchers, including air quality modeling, viticulture and physiology, and enology and sensory evaluation. SYMPOSIUM RECORDING: Available for purchase at allstartapes.com/asev-76th-national-conference-2025/.

The West Coast Smoke Exposure
Task Force is a coalition of industry
leaders committed to providing
timely communications, resources
and best practices to help winegrape
growers and vintners navigate the
challenges of wildfire smoke. The
task force serves as a central hub for
updates, education and collaboration
to support industry resilience and
informed decision-making.