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WSU Scientists Discover How to Fine-Tune Wine Aromas Through Alcohol Manipulation

Researchers explore how winemakers can balance flavor and alcohol content

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A recent study from Washington State University (WSU) has shown that adjusting alcohol concentration before and after fermentation has comparable effects on wine. According to researchers from the Department of Viticulture and Enology, these

findings give winemakers greater control over the style of their wines, even as grape ripening patterns shift due to global warming.

Published in the journal Food Chemistry, the study analyzed over two years how alcohol adjustments influence the sensory and aromatic profile of Sauvignon Blanc wines at different ripeness levels. The results indicated that both pre-fermentation dilution and post-fermentation alcohol removal produce similar effects on the final wine.

Jim Harbertson, co-author of the study and associate professor at WSU, explained that these techniques could help winemakers counteract the effects of rising temperatures. If climate conditions accelerate grape ripening, producers can either reduce sugar concentration before fermentation or remove alcohol afterward without compromising the intended wine style.

Grape ripeness directly affects sugar content, which in turn determines alcohol levels in the wine. Traditionally, winemakers select the harvest date based on desired flavor and aroma profiles. However, Danielle Fox, co-author of the study and PhD in Food Science at WSU, emphasized that winemaking decisions extend beyond the vineyard. Various cellar techniques allow for alcohol adjustments while enhancing aromatic expression.

To modify alcohol concentration before fermentation, winemakers use methods such as water dilution or chaptalization, which involves adding sugar to the must. After fermentation, alcohol can be reduced through de-alcoholization processes. The study confirmed that alcohol content directly influences aromatic compounds: higher alcohol levels intensify aroma perception.

The research also considered the industry's growing interest in lower-alcohol wines, driven by health organizations' warnings about alcohol consumption risks. However, reducing alcohol can alter sensory perception, increasing acidity and changing overall balance. Harbertson noted that alcohol plays a key role in a wine's structure, and its reduction can highlight less desirable characteristics.

Unlike previous studies focusing on varieties such as Chardonnay or Riesling, this research specifically examined Sauvignon Blanc, known for its tropical, fruity, and herbaceous aromas. The study found that the aromatic compounds of this variety shift

significantly with ripening. Fox explained that harvesting at the optimal moment to capture these compounds, followed by alcohol adjustments, can enhance the wine's aromatic expression.

To assess the effects of grape ripeness and alcohol concentration, researchers harvested grapes at three different stages and had a panel of experts describe the resulting wines' sensory characteristics. The evaluators identified differences in aroma and flavor primarily based on alcohol content rather than ripeness level.

Harbertson concluded that alcohol is a key factor in aromatic perception and that the study provides winemakers with new strategies to adjust sensory profiles beyond harvest timing. Fox added that the research expands knowledge of available cellar techniques, allowing for more precise decision-making in wine production.