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Aluminum cans preserved carbonated blueberry wine best in packaging stability trial

Researchers found cans retained more anthocyanins, sulfur dioxide and volatile compounds than glass or PET during ambient storage

Friday, June 19, 2026

Researchers presented new findings on red winemaking, cofermentation, aroma enhancement and packaging stability during an enology session at the American Society for Enology and Viticulture’s national conference on June 18, offering data that could help wineries adjust production choices with possible effects on wine style, aroma and shelf stability.

The session, held from 1:30 p.m. to 2:50 p.m. in Grand Ballroom 100C, included four research reports from Iowa State University, the University of Arkansas, Brock University in Canada and the University of Florida.

A study led by Aude A. Watrelot of Iowa State University examined how adding grape stems affects red wine quality in Marquette and Frontenac wines. Interest in stem use has grown because stems are rich in fiber and phenolic compounds, but their effect on finished wine has remained less documented, especially for interspecific grape cultivars.

In the 2023 trial, Marquette and Frontenac grapes were crushed and destemmed, then stems were collected and added back in fresh form, oven-dried form or oven-dried and ground form. A control without stems was also included. In 2024, the team repeated those treatments and also used stems from the Itasca cultivar in Marquette musts. The

wines were made with a standard red winemaking protocol, then evaluated for color and phenolic composition during production. After seven months of aging, the researchers assessed aroma by gas chromatography-mass spectrometry and carried out sensory descriptive analysis.

According to the study, Frontenac wines made with dry ground stems had the highest anthocyanin and flavanol concentrations, while whole-cluster wines had the highest tannin levels. In 2023 Marquette wines, fresh and dry ground stems significantly increased iron-reactive phenolics and flavanol concentrations compared with the control. The researchers also identified methyl salicylate, associated with wintergreen or root beer notes, as a marker of fresh stem addition in both Frontenac and Marquette wines, with odor activity values ranging from 2 to 3.5. Overall, the team said stem additions changed both volatile and non-volatile extraction and produced wines perceived as hotter and drier.

Amanda Fleming of the University of Arkansas presented work on cofermenting Noble muscadine grapes with Merlot to assess aroma outcomes. Muscadine grapes can present challenges with color and phenolic stability in wine, but they also bring distinctive aromas and flavors. The researchers tested five duplicate treatments: 100% Noble, 75% Noble plus 25% Merlot, 50% Noble plus 50% Merlot, 25% Noble plus 75% Merlot, and 100% Merlot.

Volatile compounds were analyzed at bottling using solid-phase microextraction gas chromatography-mass spectrometry. Five sensory panelists also identified aromas in the 100% Merlot, 100% Noble and 50%-50% wines using gas chromatography-olfactory-flame ionization detection. In the 2024 wines, the team identified 77 volatile compounds, including 32 esters, 21 higher alcohols, four terpenes, three ketones, two glycols, two sulfides and one lactone.

Total volatiles ranged from 73,328 ug/L in the 100% Noble wine to 89,358 ug/L in the 100% Merlot wine. As Noble content increased, the aroma profile shifted toward aldehydes, terpenes, higher alcohols and esters linked to waxy, soapy, green, floral, fruity and citrus notes. Wines containing more Merlot were characterized by esters, higher alcohols, ketones and acids associated with fruity, apple, honeyed, nutty,

fermented and wine-like aromas.

The sensory analysis found that the 100% Noble wine showed strawberry and apple juice aromas driven by esters. The 100% Merlot wine showed red berry, leafy, herbal and fatty aromas from a mix of acids, esters and higher alcohols. The 50% Noble-50% Merlot wine showed alcohol or solvent, melted butter, butterscotch, citrus and wine-like aromas tied to terpenes, esters, aldehydes, higher alcohols and ketones. The researchers said cofermentation may offer quality benefits earlier in production than postfermentation or prebottling blending while potentially improving consumer appeal for muscadine wines.

At Brock University, Reid Ball presented trials aimed at improving the aroma of Vidal table wine through alternative enological regimens. Vidal blanc is widely grown in Ontario for Icewine production, but local producers have shown interest in techniques that could enhance volatile thiols in table wine made from the grape.

The team tested seven fermentation treatments involving different yeast strains, micronutrient use and temperature programs. The control used Saccharomyces cerevisiae EC1118 at 14°C without Stimula Sauvignon blanc. Other treatments used S. cerevisiae Sauvy with or without Stimula Sauvignon blanc at 14°C or 20°C, as well as a regime that reached 26°C for one day.

Sixteen aromatic compounds were quantified by gas chromatography-mass spectrometry. Only hexanol was significantly higher in the control than in the treatment wines. Ethyl acetate, 2-methylpropanol, ethyl isobutryate, isoamyl acetate and 2-phenylethyl alcohol were significantly higher across treatments than in the control. While differences among other compounds varied by treatment, wines exposed to the 26°C temperature regime generally showed significantly greater concentrations of measured compounds than wines from other regimens.

Sensory bench trials indicated that wines from the 26°C regime had the most favorable aroma profile. Preliminary liquid chromatography-tandem mass spectrometry work also indicated the presence of 3-mercaptohexanol in the samples. Quantification of that compound along with 3-mercaptohexyl acetate and 4-mercapto-4-methyl-2-pentanone is still underway. The researchers said they are now testing additional commercial

yeast strains and a locally isolated non-Saccharomyces cerevisiae strain using the same temperature regime with Stimula Sauvignon blanc.

The final presentation focused on packaging rather than fermentation. Nicholas Wendrick of the University of Florida reported on chemical changes in carbonated blueberry wine stored at ambient temperature in aluminum cans, polyethylene terephthalate bottles and glass bottles. As alternative packaging gains traction across alcoholic beverages, the study addressed how package choice may affect quality over time.

The researchers packaged market-ready carbonated blueberry wine in each format and stored it at 25°C for 240 days. They measured pH, titratable acidity, soluble solids, density and alcohol content and found no significant package-dependent differences during storage when those metrics were considered alone.

Differences emerged in color retention and aroma-related chemistry. Color intensity and hue varied significantly by package type, with cans performing better than glass or PET. After 240 days, anthocyanin concentration was 49 mg/L in cans compared with 44 mg/L in glass and 32 mg/L in PET. Free sulfur dioxide retention also differed at Day 240: cans held 40 mg/L versus 25 mg/L in glass and 14 mg/L in PET.

Total volatile organic compounds also differed significantly by package type, with cans maintaining the highest concentrations compared with glass or PET. The researchers concluded that aluminum cans showed the smallest chemical deviations during ambient aging and described cans as a viable alternative packaging material for carbonated blueberry wine.

Taken together, the studies pointed to practical decisions that producers can test at cellar level: whether to include stems in red fermentations, whether to coferment grape varieties instead of blending later, how fermentation temperature and yeast inputs shape aromatic expression in Vidal table wine, and how packaging material can influence chemical stability after release. For beverage producers, those findings could inform recipe design and process choices aimed at improving final quality rather than relying only on tradition or trial and error.

Funding for the stem study came from the U.S. Department of Agriculture’s Agricultural Marketing Service through Specialty Crop Block Grant Program awards 23SCBPIA1187 and SCBP24000621. The cofermentation study was supported by the Southern Region Small Fruit Consortium. The Vidal research was funded by Ontario Grape and Wine Research Inc. and the Canadian Grapevine Certification Network. The blueberry wine packaging study received support from the Florida Department of Agriculture and Consumer Services.