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Study Finds Cork Raises Oxygen Levels in Aging Malbec Bottles

Warmer storage sped early oxygen shifts, but closure type drove clearer differences after 60 days in Mendoza Malbec wines

Wednesday, July 8, 2026



A study presented through IVES OpenScience found that both bottle closure and storage temperature can change oxygen levels in aging Malbec, a result that could help wineries better manage oxidation and wine stability during bottle ageing.

The research focused on Malbec wines from Mendoza, Argentina, and examined how cork stoppers and screw caps performed when bottles were stored for six months at 15°C and 25°C. The work was carried out by Lourdes Giuffrida, Mariela Assof, Romina Castellanos and Lucía Abdala, with affiliations including Argentina's National Institute of Agricultural Technology, known as INTA, and CONICET. The paper was published on July 7 as an extended abstract in the IVES Conference Series linked to GiESCO 2017.

According to the abstract, the wines were made at Fincas Patagónicas winery using standard protocols and had first been aged for 12 months in both new barrels and barrels that had been used for one year. After bottling, researchers tracked dissolved oxygen in the wine and oxygen in the headspace of the bottle over a six-month period. They used luminescence technology, specifically a Fibox 3-Trace system, to measure both variables at different intervals. The data were then analyzed with mixed linear models at a 95% significance level using Infostat/P 2017 software.

The researchers said the first month was marked by a drop in both dissolved oxygen and headspace oxygen that depended on storage temperature. The main changes during that early stage were seen in bottles kept at 25°C, suggesting that warmer storage accelerated oxygen-related shifts soon after bottling.

After about 60 days, the differences between treatments were tied more clearly to the type of closure than to temperature alone. Wines sealed with cork, at both 15°C and 25°C, showed higher levels of dissolved oxygen and headspace oxygen than wines sealed with screw caps. That pattern continued through the end of the six-month trial.

The findings add to a long-running issue in wine production: how much oxygen enters or remains in a bottle during ageing, and how that affects quality over time. Oxygen can play a useful role in some stages of winemaking, but too much exposure during storage can push a wine toward premature oxidation, dull fruit character and reduce freshness. Too little oxygen exchange can also shape development in ways producers may or may not want, depending on style.

For wineries, importers, retailers and collectors, the study points to two practical variables that can be controlled more easily than many others: closure choice and storage conditions. In commercial terms, that matters because bottle ageing does not

stop when wine leaves the cellar. Temperature during warehousing, shipping and home storage may alter oxygen behavior early on, while closure selection may influence how that evolution continues over time. That could affect consistency across markets and shelf life for wines intended to age.

The work also has broader relevance for the beverage sector because it quantifies how packaging decisions and storage environments can shape product stability. In wine especially, where closure debates often center on tradition, cost and consumer perception, measured differences in oxygen levels offer producers another basis for deciding how to package wines meant for short-term release or longer cellaring.

The abstract did not report sensory results such as aroma, flavor or consumer preference, so it does not establish from this trial alone whether one closure produced a better-tasting wine after six months. It does show, however, that cork and screw cap did not behave the same way under the tested conditions, and that warmer storage changed oxygen dynamics most strongly during the first month.

That distinction is important for producers in regions with warm distribution chains or limited temperature control. A bottle stored at 25°C may face faster early changes than one kept at 15°C, even before longer-term closure effects become more evident. For Malbec producers in Mendoza and elsewhere, those results may support more targeted decisions about bottling format, logistics and recommended storage conditions.

The study was released as an extended abstract rather than a full paper in the material provided by IVES OpenScience. Even so, it offers new data on a practical issue for wineries handling age-worthy reds: how closure permeability and storage temperature interact with dissolved oxygen and headspace oxygen during the first six months after bottling.