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Italian researchers use artificial intelligence to map how Taurasi wine ages

The study of four DOCG vintages points to future tools for quality control and authenticity verification in winemaking

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Researchers at the Institute of Food Sciences of Italy’s National Research Council in Avellino said on Friday, October 30, that they have used laboratory analysis and artificial intelligence to study how Taurasi wine changes as it ages, in work that could

eventually support new tools for quality control and authenticity checks in winemaking.

The study examined four Taurasi DOCG vintages, from 2015, 2018, 2021 and 2022. According to the institute, the researchers compared the wines by measuring their main chemical components, including polyphenols, anthocyanins and aromatic compounds, then applied machine-learning algorithms to detect patterns across the samples.

The research team said that approach allowed it to identify similarities and differences among the four vintages and to build what it described as a chemical map of the wine’s evolution over time. The study lists Daniela Evangelista as first author and was carried out by a research group at the Avellino institute.

The findings were published in the scientific journal Metabolites as part of the Agritech project, which is funded through Italy’s National Recovery and Resilience Plan, known as the PNRR. The institute said the work focuses on Taurasi DOCG, one of the best known red wines from the Irpinia area of Campania, and uses it as a case study for broader questions about how wines develop during aging.

The research reflects a growing effort in food and beverage science to combine classical chemical testing with data analysis systems that can process complex sets of measurements. In wine, aging can change structure, color, aroma and other characteristics in ways that are difficult to capture with a single indicator. By comparing multiple compounds at once, machine-learning models can help researchers see relationships that are harder to detect through conventional review alone.

The institute presented the study as an early step toward wider applications of artificial intelligence in the analysis of wine quality, characterization and authenticity. That does not mean the method is ready for routine use across the industry. The announcement described it as a first step, which suggests the work remains exploratory and would need broader validation on more wines, more vintages and additional production contexts before it could be turned into a standard tool.

Even so, the study points to a potential direction for the beverage sector. If similar methods prove reliable at larger scale, they could give wineries, laboratories and regulators another way to monitor how products evolve over time and to strengthen analytical checks tied to origin and authenticity. That is especially relevant in premium wine categories, where aging history, style and provenance can carry significant commercial value.

Taurasi holds DOCG status, Italy’s highest protected designation for wine origin and production standards. That makes it a suitable subject for research into chemical markers and classification methods, because questions of identity and consistency are central to how such wines are evaluated in the market. A system that can connect measurable compounds with stages of aging could also help producers better understand vintage variation and cellar development.

The Avellino institute did not present artificial intelligence as a replacement for traditional enological analysis. Instead, the work combines standard lab measurements with statistical learning tools. In practical terms, that means the models depend on the quality of the chemical data collected from the wines, rather than operating as a stand-alone shortcut.

The research also adds to a wider trend in agricultural and food science, where AI is increasingly being tested on tasks such as product classification, traceability and fraud detection. Wine is a natural area for that work because it contains a large number of interacting compounds and because the sector already relies heavily on analytical chemistry. Studies like the one from Avellino suggest that machine learning may be most useful when it is used to organize and interpret that complexity, rather than to replace established scientific methods.

For the researchers, the value of the project lies in showing that the aging of a wine such as Taurasi can be tracked through an integrated reading of chemistry and data analysis. For producers and the wider drinks market, the longer-term importance may depend on whether the method can move beyond a limited research setting and demonstrate consistent results across more bottles, appellations and years.