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# Study identifies 15 red wine markers that predict spoilage yeast risk with 98% accuracy

The findings could help wineries flag wines more susceptible to Brettanomyces bruxellensis before storage and aging damage appears.

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Researchers have identified a set of chemical markers in red wine that may help predict whether a wine is more likely to support the growth of Brettanomyces bruxellensis, a spoilage yeast that can harm wine quality during storage and aging.

The study, listed by ScienceDirect in the journal Food Chemistry, linked the chemical composition of red wine to its vulnerability to the yeast by using untargeted metabolomics, a broad screening method that looks across many compounds at once instead of focusing on a short list of known targets. According to the available study summary, the researchers identified 15 markers and built a predictive model that reached 98% accuracy in distinguishing wines that were more permissive to the microorganism.

The analytical work used LC-UV-MS, a laboratory approach that combines liquid chromatography, ultraviolet detection and mass spectrometry to separate and measure chemical compounds in complex samples. In practice, that allowed the team to compare the broader chemical fingerprints of different red wines and relate those profiles to the yeast’s ability to develop.

The central question behind the research is important for winemakers because Brettanomyces bruxellensis remains one of the most difficult microbial threats in red wine. The yeast is associated with spoilage and can reduce the sensory and commercial quality of a wine once it becomes established. Producers have long known that some wines appear more susceptible than others, but the reasons are not always clear from standard cellar measurements alone.

By pointing to specific chemical signals tied to that susceptibility, the new work suggests that vulnerability may be measurable before a spoilage problem becomes obvious. If those markers are confirmed in wider testing, wineries could use them to sort wines by risk and decide where to focus tighter monitoring and prevention.

That has practical implications for the beverage sector, especially for wineries trying to control spoilage while limiting blanket interventions. A predictive tool based on wine chemistry could help producers identify higher-risk lots earlier and adjust cellar decisions more precisely, whether that means closer microbiological follow-up, stronger protection during barrel aging, or more selective use of additives. For producers

interested in reducing unnecessary treatments, that kind of screening could eventually support a more targeted approach.

The research also fits into a broader scientific effort to understand how yeast behavior is shaped by the chemical environment of fermented products. Scientists have increasingly used metabolomics to study questions that conventional testing can miss, including how raw materials, fermentation conditions and storage affect microbial stability. In wine, that is especially relevant because the product's composition can vary widely by grape variety, region, vintage and production method.

Interest in Brettanomyces bruxellensis and related metabolomic tools was highlighted at the 16th International Symposium on Yeasts, held in Barcelona from Oct. 8 to Oct. 12, 2023. The meeting was hosted by IRTA, the Instituto de Agroquímica y Tecnología de Alimentos of Spain's National Research Council, and the University of Barcelona. Organizers said the symposium brought together researchers working on yeast physiology, genetics, genomics, ecology, biotechnology and pathogenicity.

The program included work on yeast metabolism, systems biology, fermentation science, synthetic biology and applications in food and medicine. Among the areas of special focus was the role of Brettanomyces bruxellensis in wine spoilage and the use of metabolomic methods to study its effect on red wine quality, showing that the issue has drawn attention well beyond routine winery quality control.

The reported 98% accuracy of the model stands out, but its practical value will depend on how well it performs across a wider range of wines and production conditions. Laboratory models often need further validation before they can be used reliably in commercial settings. Even so, the identification of 15 candidate markers gives researchers and wine producers a clearer starting point for developing screening tools that could be used before visible spoilage or sensory damage appears.

For the wine industry, the work points toward a more predictive form of quality management. Instead of responding only after Brettanomyces contamination is detected, producers may eventually be able to assess the underlying chemical conditions that make a wine more or less favorable to the yeast. That would shift part of the response from late-stage correction to earlier prevention, a change that could be

valuable in premium red wines where spoilage can carry high financial costs.