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Researchers identify how Clavispora lusitaniae survives high sugar stress

The findings suggest the yeast could help sustain fermentation in grape must and other sugar-rich industrial substrates.

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Researchers have identified how the yeast Clavispora lusitaniae withstands the stress caused by high sugar levels, a finding that could widen the options for fermenting grape must and other sugar-rich substrates.

The study, published in the International Journal of Food Microbiology and indexed on PubMed, examined the yeast through physiological, transcriptomic and metabolomic analyses. The work focused on a common problem in fermentation: when sugar concentrations are high, yeasts face osmotic stress that can slow growth, disrupt cell function and weaken fermentation performance.

According to the study, C. lusitaniae was able to maintain cellular activity even under high sugar conditions. The researchers found that the yeast activated genes linked to osmoprotectants and broader stress-response pathways, suggesting that it can adjust its internal systems to cope with sugar-driven pressure from its environment.

The metabolomic analysis pointed to the buildup of compatible solutes, small molecules that help cells retain balance when external sugar levels rise. The researchers also observed broader metabolic adjustments that appeared to support osmotic stability. Together, those results offer a molecular explanation for why this yeast can continue functioning in conditions that are difficult for many microorganisms.

The study also evaluated fermentation performance and found that C. lusitaniae showed promising capacity in high sugar environments. The authors said that result supports its potential use in industrial fermentation processes involving sugary raw materials, including grape must.

That matters for the beverage sector because producers have been looking at non-Saccharomyces yeasts as a way to manage difficult fermentations while also shaping aroma and flavor. In wines made from very ripe grapes, where sugar levels can be especially high, a yeast with stronger tolerance to osmotic stress could potentially help sustain fermentation and expand blending or co-inoculation strategies with conventional strains. The same logic may apply to other fermented drinks made from concentrated fruit juices or other sweet bases.

The research does not suggest an immediate shift in commercial practice, but it adds mechanistic evidence to a growing body of work on alternative yeasts. By linking gene activity and metabolite changes to fermentation behavior, the study gives scientists and beverage producers a clearer picture of how C. lusitaniae might perform when sugar becomes a limiting factor for standard fermentation management.

Clavispora lusitaniae is not among the most widely used yeasts in mainstream beverage production, where Saccharomyces cerevisiae remains dominant. Even so, interest in non-traditional species has grown as wineries and other producers seek tools to respond to warmer growing seasons, riper fruit and more variable raw material composition. Under those conditions, musts can enter the cellar with elevated sugar loads, increasing the risk of sluggish or stuck fermentations.

By showing that C. lusitaniae can preserve cellular functions, activate protective pathways and adjust its metabolism under sugar stress, the study provides a scientific basis for further testing in applied fermentation settings. For grape fermentation in particular, the findings may encourage more work on whether this yeast can contribute not only resilience under pressure but also desirable sensory outcomes when used alone or alongside established fermenting strains.