

Non-GMO strategies for yeast improvement: integrating classical and modern approaches to enhance brewing performance

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● Yeasts play a crucial role in beer production, influencing not only fermentation performance but also aroma complexity and product stability. In response to increasing consumer demand for natural and GMO-free products, there is a growing interest in developing novel brewing strains through non-GMO strategies.

In this context, two parallel approaches were undertaken to generate new yeast strains using non-GMO techniques, emphasizing not only the individual effectiveness of each method but also the synergistic benefits of combining them to achieve desired phenotypes.

The first strategy involved the creation of an interspecific hybrid between a cryotolerant *Saccharomyces bayanus* x *Saccharomyces eu-bayanus* strain (NBRC1948) and a wild *S. cerevisiae* strain (Y15) isolated from unconventional ecological niches such as sourdough. Although Y15 exhibited promising traits, it carried a phenolic off-flavor (POF+) phenotype. Random mutagenesis was successfully applied to reduce this undesirable trait, leading to the selection of an improved POF–hybrid with potential industrial applicability.

The second strategy also relied on interspecific hybridization, combining the same cryotolerant NBRC1948 strain with a *S. cerevisiae* brewing strain (JB735), previously selected for its high aromatic compound production. To further enhance volatile aroma production, the resulting hybrid underwent adaptive evolution under selective pressure.

This work highlights the value of non-GMO strain improvement strategies – both traditional (hybridization, random mutagenesis) and modern (adaptive evolution – and underscores the advantages of integrating multiple approaches to maximize the likelihood of success in developing high-performance brewing yeasts.

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