P-110

Developing New Yeasts for IPA Production via Targeted Yeast Breeding and Adaptive Laboratory Evolution

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World Brewing Congress 2024
August 17-20
Minneapolis, Minnesota USA

Introduction

As a category, India Pale Ale (IPA) remains dominant in the craft beer space. The IPA has now differentiated into sub-styles with a range of bitterness, haze, and alcohol content, presenting new challenges for yeast strain selection. A relatively limited number of yeast sub-families are used to produce most IPA-style beers worldwide. Of these, two yeast sub-families dominate, the Chico/Cali family and the London III/Foggy London family. With the sustained popularity of IPA and the increasing competition for IPA market share, there is a need to develop new yeast strain varieties tailored to IPA beer production to improve the end product diversity available to consumers. IPA-relevant yeast phenotypes include aroma production (esters and hop biotransformation), as well as haze (positive or neutral), attenuation, ethanol tolerance, and fermentation kinetics. There is therefore a strong incentive to develop new yeasts tailored for modern IPA production.

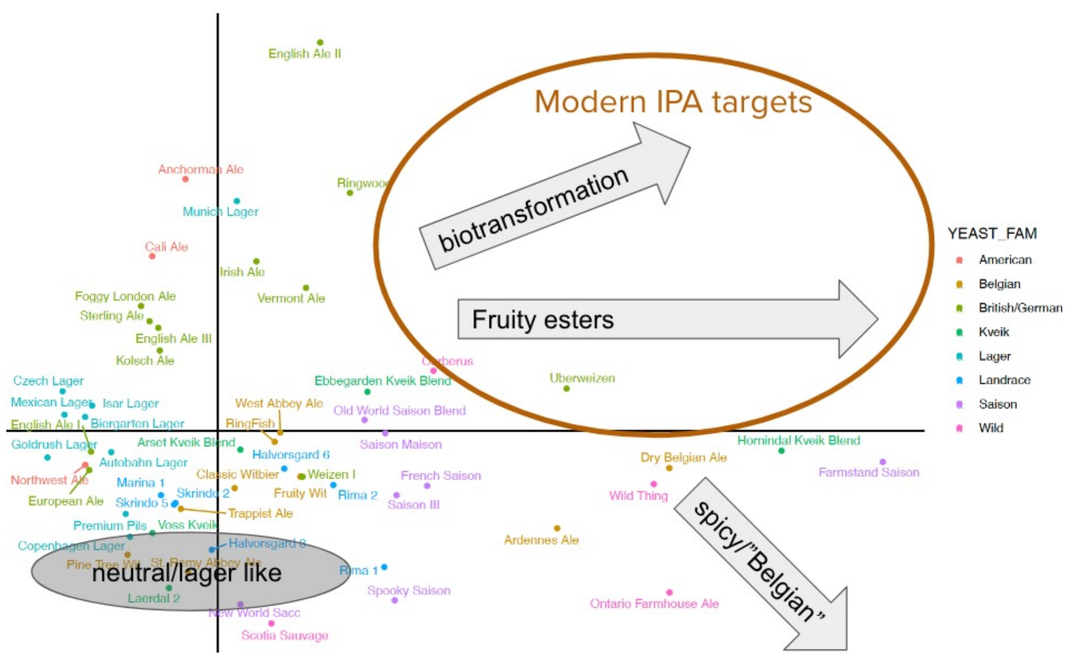


Figure 1. PCA biplot of a dataset of yeast aroma data.

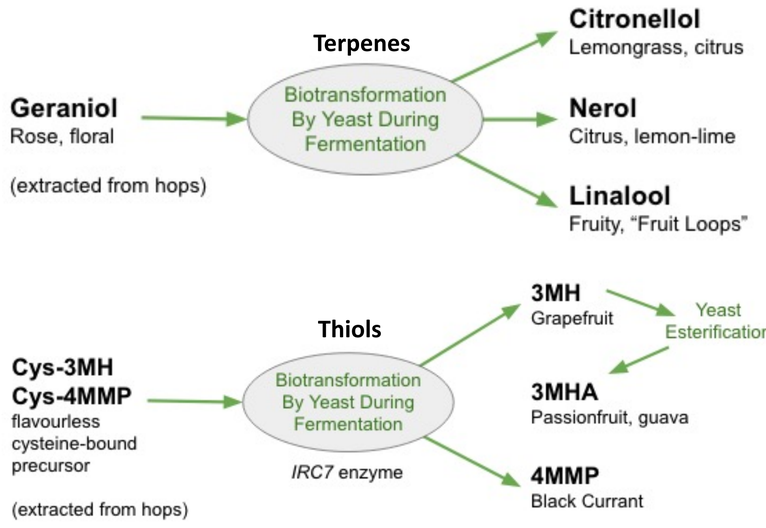


Figure 2. Key hop biotransformation reactions facilitated by yeast in IPA beer.

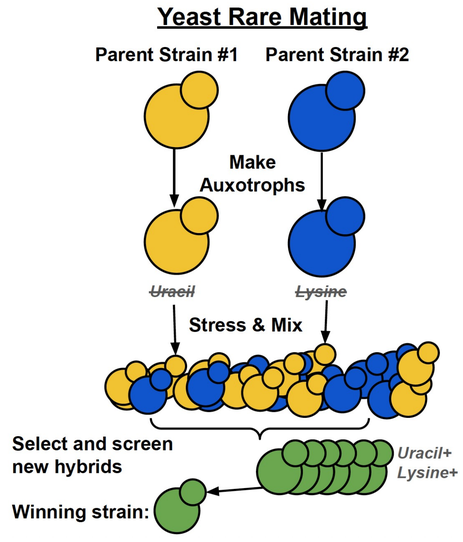


Figure 3. Overview of yeast rare mating (hybridization) procedure.

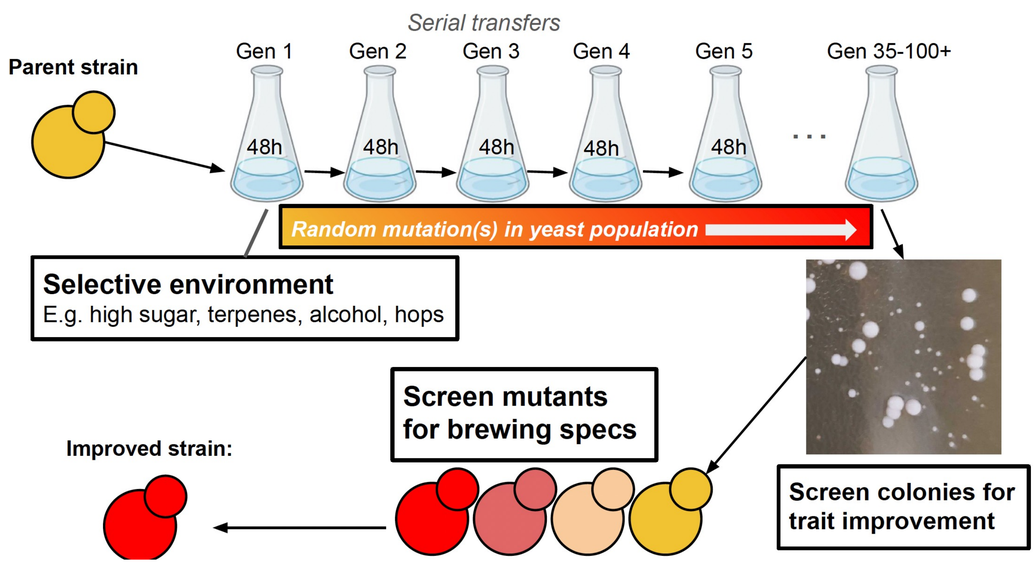


Figure 4. Overview of yeast adaptive laboratory evolution.

Strain Development & Results

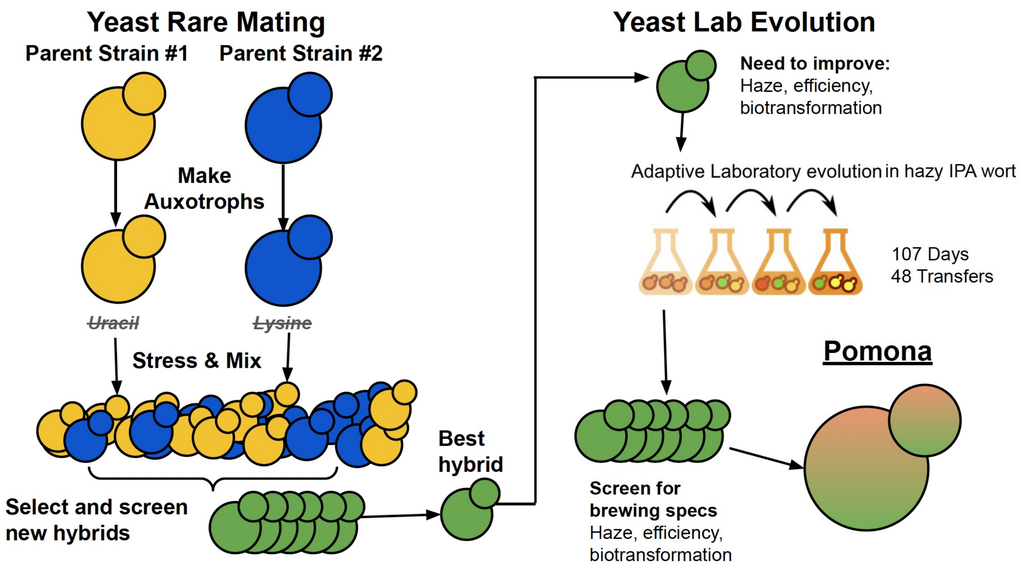


Figure 5. Development of Pomona yeast through hybridization and adaptive laboratory evolution in hazy IPA wort.

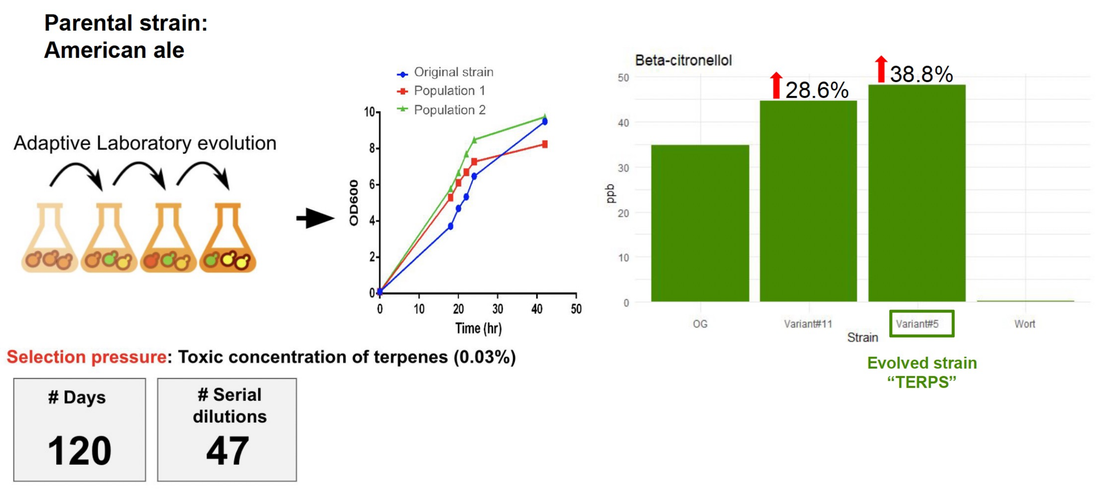
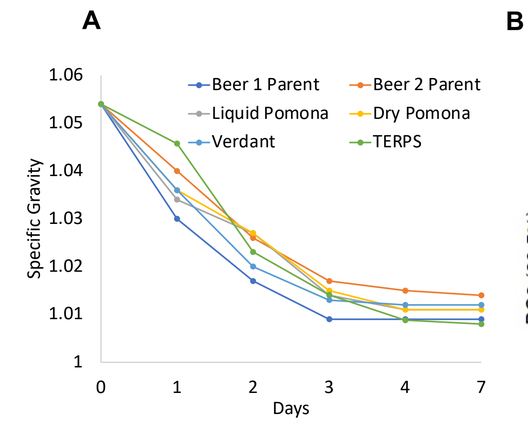


Figure 6. Development of TERPS yeast (improved terpene biotransformation) through adaptive laboratory evolution in wort with the addition of terpenes (0.03% linalool)



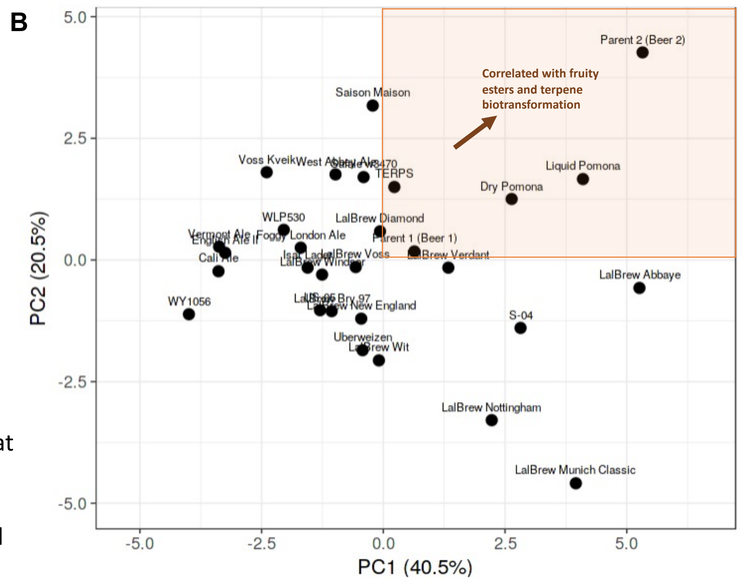


Figure 7. A) Fermentation kinetics in wort at 20ºC. B) PCA biplot of yeast aroma data (HS-GC-MS) from a wort fermentation experiment including a variety of dried and liquid yeast strains (similar to Figure 1)

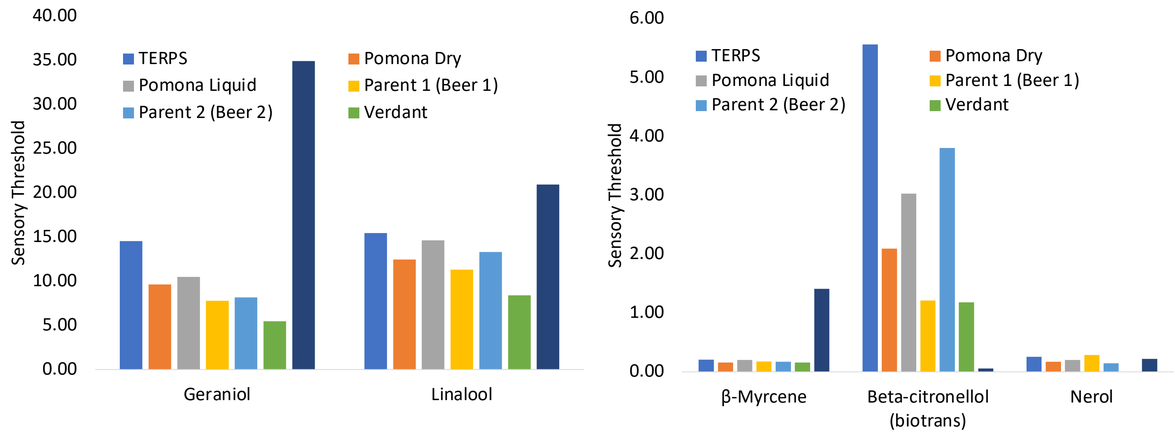


Figure 8. Terpene concentrations of wort and finished beer fermented with various yeast strains and measured using SPME-GC-MS.

Discussion

- Yeast breeding and adaptive laboratory evolution are effective tools that can be used to develop new beer yeast strains to meet changing flavour and functional requirements.
- Novel strains TERPS and Pomona show enhanced terpene biotransformation capability as well as ester production.
- Pomona strain performed similarly in terms of flavor and kinetics when utilized in either dry or liquid yeast format.
- Future work includes characterizing the genomic changes undergone during the adaptive laboratory evolution process.

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