2024 Craft Malt Conference Session Proposal Example

Title

Improving beer flavor with barley breeding: a metabolomics approach

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Introduction

Quality control is a vital component of the rapidly-growing beer industry. Identifying superior ingredients that provide distinct flavors (e.g. taste, aroma) is an important area of research. In addition, brewers seek to identify raw ingredients to improve the stability of flavors during storage, which can occur for up to 5 months at variable temperatures. In brewing, barley is converted to malt and is a major ingredient for most beer. However, it is currently unclear if different varieties of barley contribute to different flavors and flavor stability characteristics of the beer, the final product.

Objectives

The goal of this study is to determine if variation in the chemical content of the barley grain results in the differences in flavor and flavor stability in beer. Here, we used a metabolomics approach to characterize the chemical content of six barley grains and the corresponding malt and beer.

Materials and Methods

Barley grain and malt was ground into a fine powder and metabolites were extracted by a biphasic solvent (methyl-tert-butyl-ether [MTBE]/70% methanol/water). The barley grain, malt extracts, and beer were injected into two metabolite profiling platforms: liquid chromatography time of flight mass spectrometry (LC-TOF-MS) for non-volatile molecules and gas chromatography mass spectrometry (GC-MS) for volatile molecules. An ionomic platform was utilized to evaluate elements (inductively coupled plasma mass spectrometry, ICP-MS) [1].

Results and Discussion

The profiles of the six barley grains, malts, and beers were evaluated using principal component analysis and ANOVA. Both statistical analyses revealed significant variation in the chemical content of the barley grain, malt and beer. Further, several metabolites were found to be associated among the sample types, supporting that barley metabolites are associated with the final chemical content of the beer. Future work will include integrating the non-volatile metabolite and ionomic datasets with volatile metabolomic profiles collected using headspace/solid phase microextraction (HS/SPME-GC-MS), as well as sensory data collected on each beer before and have storage for 5 months. Taken together, these data support the role of barley metabolites in beer quality, and indicate barley as a future target to breed plants for improved flavor and flavor stability in beer.

References

1. Chaparro, J.M., et al., *Metabolomics and Ionomics of Potato Tuber Reveals an Influence of Cultivar and Market Class on Human Nutrients and Bioactive Compounds.* Frontiers in Nutrition, 2018. **5**(36).