A Journey into the Hazy Beer Proteome: How Does Dry Hopping Alter the Proteomic Landscape of Beer?

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INTRODUCTION

The beer industry has been evolving with new trends and an urge to provide new experiences for beer drinkers. One major movement in the craft beer scene is the craze for the East Coast style IPA. These beers are characterized by their orange juice-like or "hazy" appearance (Figure 1). The East Coast style IPA has exploded as a major contender in the worldwide craft beer scene. This style is associated with conventional IPAs. The choice of yeast strain and hop variety are critical components. The beer industry has been exploring brewing practices to increase the "hazy" characteristics in beer. Various methods have been targeting yeast strains that produce beers with extra hazy qualities for commercial purposes. They are also scientifically curious about what happens to the proteome of these new hazier beers. To date, very little is known from a proteomics and metabolomics standpoint as to what makes up the composition of Hazy IPAs. One major movement in the craft beer scene is the craze for the East Coast style IPA. These beers are characterized by their orange juice-like or "hazy" appearance (Figure 1). The East Coast style IPA has exploded as a major contender in the worldwide craft beer scene. This style is associated with conventional IPAs. The choice of yeast strain and hop variety are critical components. The beer industry has been exploring brewing practices to increase the "hazy" characteristics in beer. Various methods have been targeting yeast strains that produce beers with extra hazy qualities for commercial purposes. They are also scientifically curious about what happens to the proteome of these new hazier beers. To date, very little is known from a proteomics and metabolomics standpoint as to what makes up the composition of Hazy IPAs.

METHODS

Sample Preparation: Two hundred milliliters from each of the three fermentation processes were prepared for proteomic analysis. Each fermentor was divided into four samples of equal volume to test the effect of protein changes. The samples were spun at 10,000 RPM to precipitate the yeast. The protein samples were collected, nylon filtered, and added directly to a lysis buffer. Total protein concentrations were measured using the Pierce™ BCA Assay Kit. Protein samples were digested with trypsin and desalted using a Thermo Scientific™ EasyPep™ Mini MS Sample Prep Kit. The final yield of peptide post digestion was measured by a BCA Assay Kit. The samples were then added to a MS sample vial and stored at -80°C until analysis.

RESULTS

Data analysis was performed using Protein Discoverer 2.5 software. The proteomes of Additional experiments were performed to test the effect of yeast strain and dry hopping on the proteomic composition of Hazy IPAs. We have evaluated the effects of a commercial yeast strain in combination with the timing of dry hopping. We have demonstrated the effects of yeast strain and dry hopping on the proteomic composition of Hazy IPAs. We have also evaluated the effects of yeast strain and dry hopping on the proteomic composition of Hazy IPAs.

RESULTS (continued)

We have incorporated some novel aspects of this study that will be discussed in a separate publication. Additional experiments were performed to test the effect of yeast strain and dry hopping on the proteomic composition of Hazy IPAs. We have evaluated the effects of a commercial yeast strain in combination with the timing of dry hopping. We have demonstrated the effects of yeast strain and dry hopping on the proteomic composition of Hazy IPAs.

CONCLUSIONS

We would like to thank Amir Hakimi and Daniel Lopez-Ferrer from Thermo Fisher Scientific’s Proteomics Vertical Marketing team for the access to sample prep equipment, consumables and Eric Tague for his assistance in building the fermentation equipment. We would like to thank Lance Shaner at Omega Yeast and Laura Barnes for their assistance in building the fermentation equipment.

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TRADEMARKS/LICENSING

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