Analysis of Protein Production in Different Types of Brewing Yeast

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Abstract

In this project, we analyzed the amount of protein production in different types of brewing yeast. We used wine, cider, and beer yeast packets placed into water to compare and contrast the amount of protein that was produced in each type. Our hypothesis was that beer yeast would produce the most protein compared to wine and cider. The hypothesis was correct, as beer produced almost triple the amount of protein that wine produced, and almost double the amount that cider produced.

Introduction

Protein production and consumption may not be the first thing you think of when you think of the benefits of alcohol consumption. In an online article, we found that "proteins aggregate in response to various stresses including changes in solvent conditions", so why wouldn't the same concept apply to alcohol (Singh, 2010)?

Most people sit down and have a glass of wine, cider, or beer and don't think of what they are actually putting into their body. There are proteins found in a majority of consumable substances, and the ossible functions can be assigned to a protein based on the known functions of its interacting partners (Schwikowski, 2000). Since beer is the highest calorie drink out of the three, we set that as the basis of our hypothesis: beer has the most sugar and carbohydrates, so it must produce the most protein as well. We were right! The main proteins produced in barley are hordeins and glutelins, which when extracted by the brewing companies, may contain up to 25% of protein in dry weight (Miera, 2023). Although beer, wine, and cider produce sugars and proteins, it is not enough to outweigh the negative effects that alcohol does have on your body.

Methods

Materials & Location

In this projects, we used 3 packets of wine, cider, and beer brewing yeast, a microcentrifuge tube (with glass beads), a vortex, tubes with 980 µL of 1x PBS solution each, Bradford reagent, cuvettes, a spectrophotometer, 2 micro pipettes (one set to 20 µL, and one to 980 µL), a beaker and a graduated cylinder. We did all procedures and collected all data in the lab.

Procedure

Add and mix 1 packet of yeast to 50 mL of water. Take 1 mL of the yeast mixed in water and add to a yellow microcentrifuge tube, with glass beads for vortexing. Vortex for 1 minute.

Add 20 µL of vortexed yeast into the PBS tube. Add 980 µL of Bradford reagent to a cuvette. Combine 20 µL of yeast from PBS tube with the Bradford reagent in the cuvette. Invert the cuvette a few times to mix the contents. Calibrate spectrophotometer with just Bradford reagent. Measure the absorbance of the yeast using the calibrated spectrophotometer at 595 nm wavelength. Use standard curve to determine protein concentration.

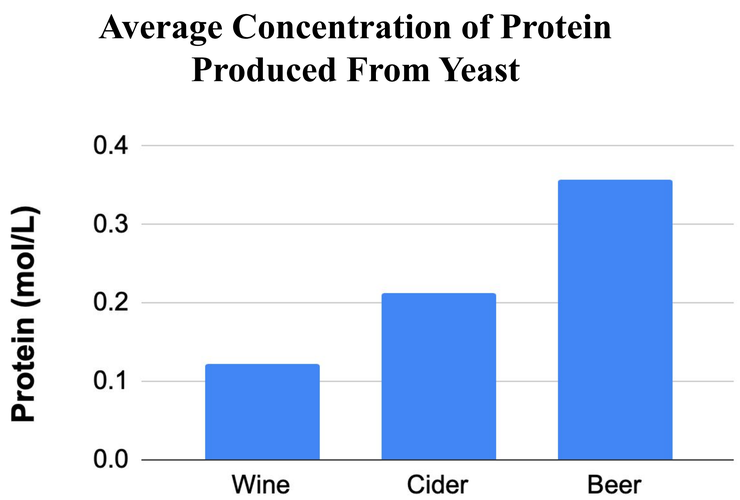

Figure 1. This bar graph shows the differing amounts of protein produced from wine, cider, and beer yeasts. The protein production is measured in moles per liter.

Figure 2. This picture shows how the Bradford Assay solution turns blue over time as the protein is added

Discussion

We hypothesized that beer yeast would produce the greatest protein concentration of the three yeasts we tested, mostly due to its higher sugar and carbohydrate concentrations. We found that beer yeast produced significantly more protein than both cider and wine. Beer yeast produced an average of 0.357 mol/L of protein while cider produced 0.213 mol/L and wine at 0.122 mol/L.

Overall, our research shows that beer yeast could potentially be a viable source of protein when consumed as just the inactive yeast, which is similar to the findings from (Miera, 2023) which found barley can contain up to 25% of protein in dry weight. Our study was slightly limited due to only having one type of each brewing yeast. To get a more broad look and better understanding of how each type of yeast differs in protein production, more than one type of each yeast would ideally be used.

The implications of the results from our study could be applied to athletes who are looking to increase the amount of essential nutrients they get, as they could incorporate brewer's yeast into their diet. Based on the results of our study, if the athlete were to be focusing on consuming more protein, beer yeast would be the most optimal.

For future research, we suggest a set time is used when letting the Bradford Assay solution sit in a cuvette, to reduce confounding variables, and maintain as accurate of results as possible.

Acknowledgements

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