

Effects of Mashing Temperatures on Sugar Composition in a Low Alcohol Beer Production

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Introduction

- This project aims to create a low alcohol beer by using a yeast strain with low alcohol production and adjusting the mash temperatures to reduce the production of fermentable sugars.
- Our investigation question was how does changing the mash temperature alter the sugar spectrum of the resulting wort and how does this impact alcohol production.
- Mash temperatures above 70°C should deactivate β -amylase and should result in a reduced concentration of maltose and therefore make a less fermentable product.
- We used the yeast Fermentis SafBrew LA-01 (60g/hL), chosen for its maltose negative traits and ability to limit alcohol production.

Methods

Teams of two students used Small Brewing Systems (SBS) and trialed various mash temperatures and a sample from each system was sent for High Performance Liquid Chromatography (HPLC) sugar spectrum analysis at the Applied Genomic Centre (AGC).

1. A control mash was done at 68°C
2. One system mashed for 15 minutes at 72°C
3. One system mashed for 15 minutes at 73.4°C
4. Two systems mashed for 15 minutes at 75.5°C
5. Two systems mashed for 15 minutes at 80°C

Fermentation samples were taken at 0, 1, 24 and 48 hours after yeast addition.

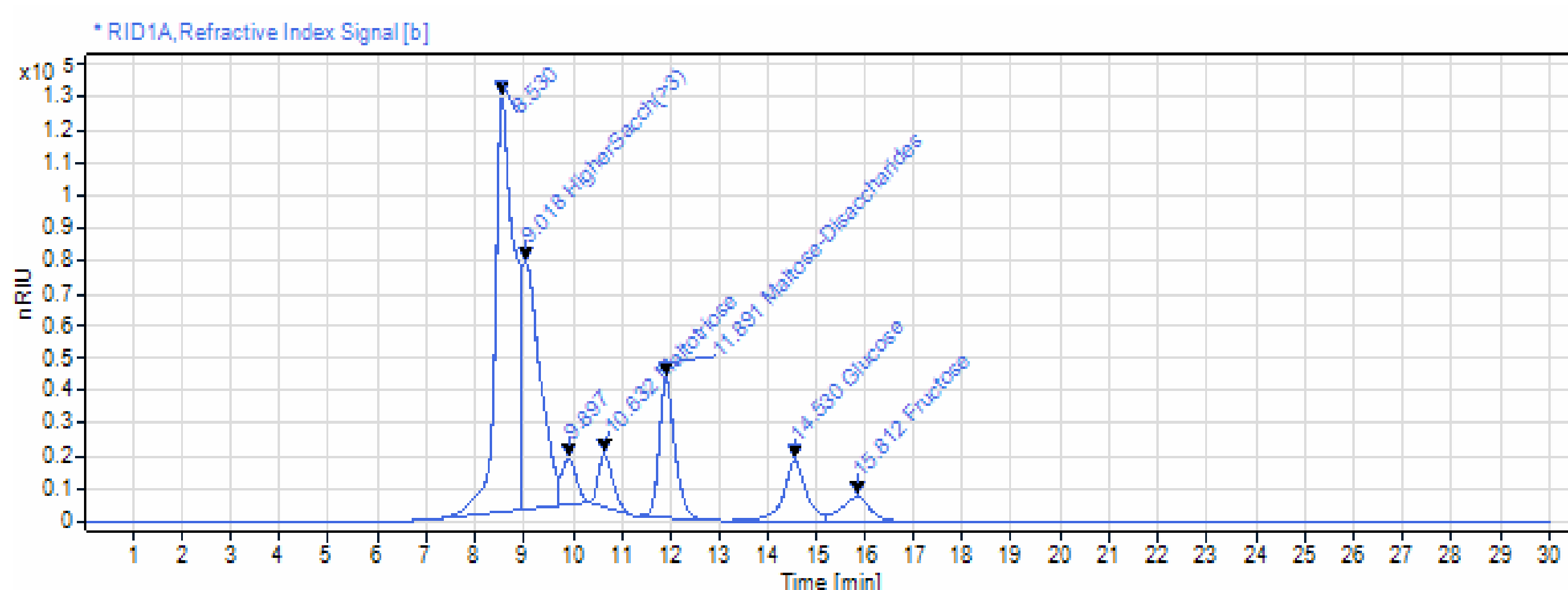


Figure 1.0 HPLC sugar spectrum of the sample at a mash temperature 80.4°C



Figure 1.1 Mash temperature recording



Figure 1.3 Small brewing system (SBS) set up for lautering

Results

Figure 2.0 Sugar and Alcohol Levels vs. Fermentation Time

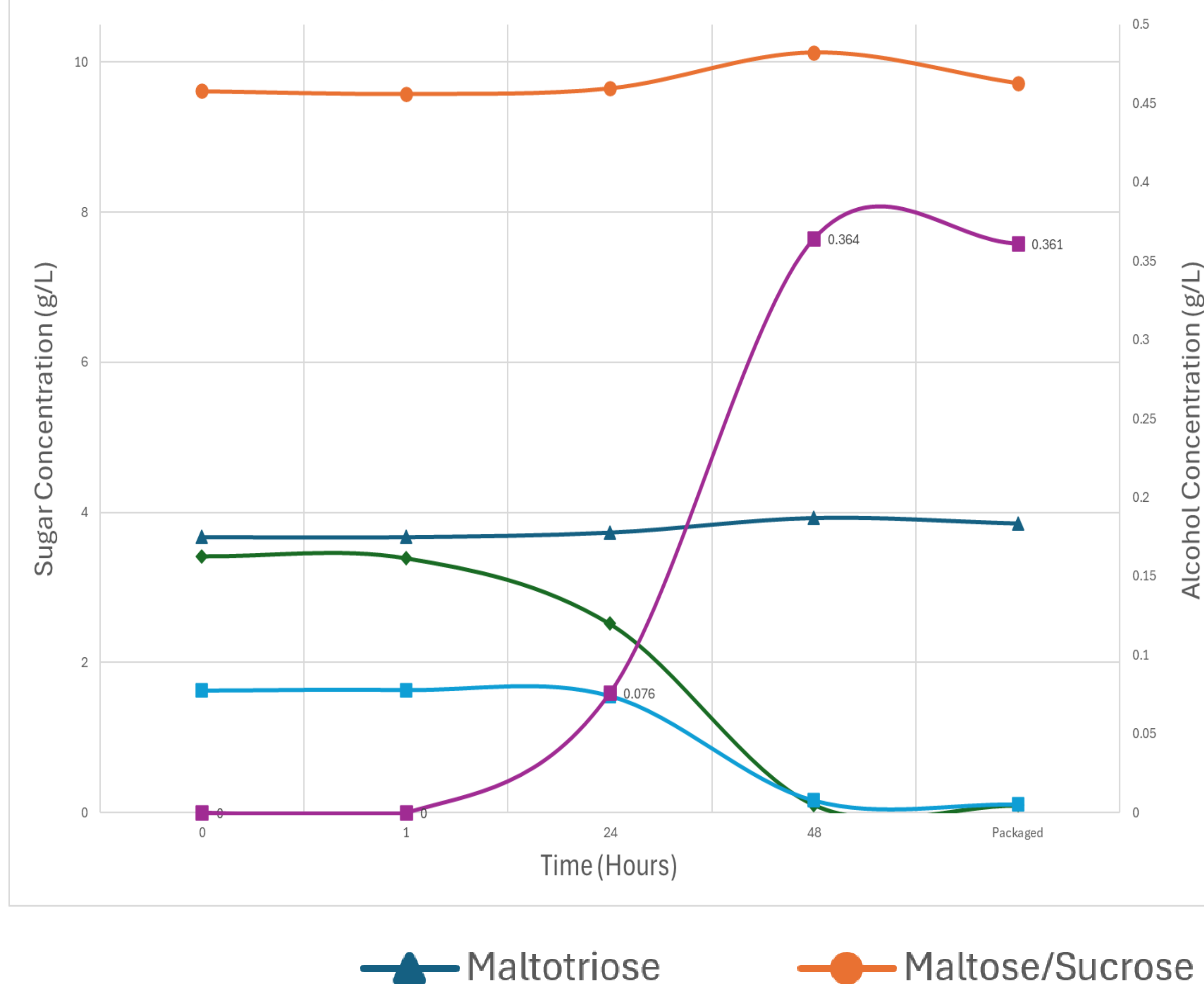
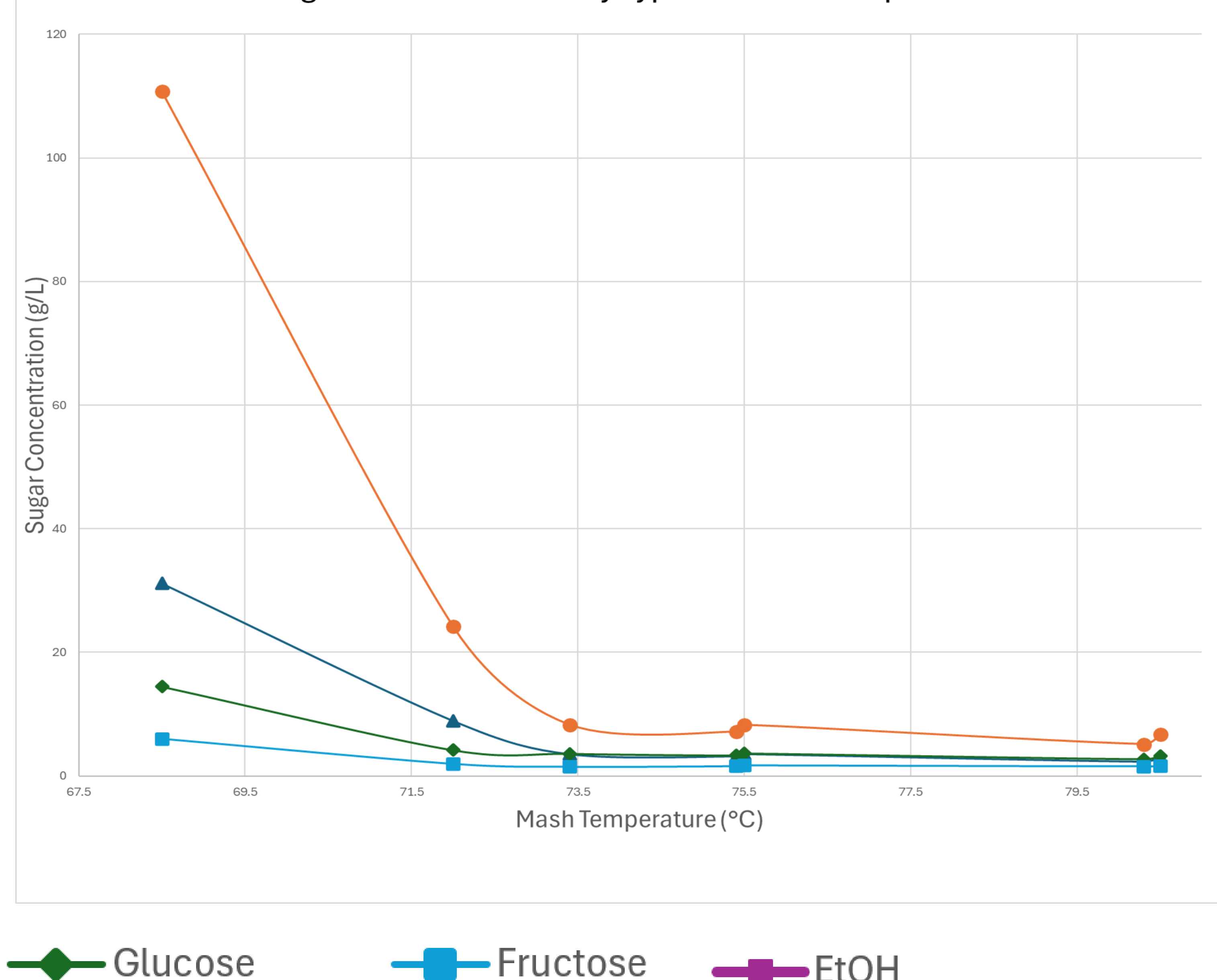


Figure 2.1 Sugar Concentrations by Type vs. Mash Temperature



Conclusions

- The data in figure 2.1 confirms that higher mash temperatures lead to lower concentrations of fermentable sugars.
- The data in figure 2.0 confirms that the yeast strain used is maltose/maltotriose-negative and that this yeast consumes glucose and fructose to produce ethanol.
- Mashing temperatures at or above 73.5°C significantly reduced the concentration fermentable sugars (glucose, fructose, maltose and maltotriose).

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