

Production of Higher Alcohols during Beer Fermentation with Different Yeast Concentration



Brewing Science

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Abstract

The study has been done with six different concentration of yeast. We can say that the yeast concentration has had the direct impact in the time of main fermentation where with rising the concentration was shorten the time i.e. is developed the faster process of fermentation. The attenuation degree has been risen with the rising of yeast concentration and the samples 4,5 and 6 have the higher degree of fermentation than samples 1,2 and 3 where the yeast concentration is smaller. Chemical analyses of final beer show that the highest degree of fermentation is reached at sample 5, where the apparent degree of fermentation is 84.06%. As for higher alcohols they differ in independent way from each other and while at propanol and isobutanol we have the light rising of values with the rise of yeast concentration, at isoamylalcohol occurs the opposite thing and have the small drop of values.

Introduction

The aim of this work is to study the influence of yeast concentration in fermentation, in all its stages and the influence on forming the higher alcohols as important components of beer. The yeast concentration is important for reaching the desired fermentation parameters and the right concentration of higher alcohols as for the quality of beer in general.

Methods And Material

Technical equipment, production proces and technological conditions in wort production department:

- Pilsner malt, Scarlet type is used.
- Wet milling of malt, with water,
- Wort production with two decoctions
- The same fermentation conditions for all samples.

Fermentation started at 12°C with original extract 13%, when reached the temperature 15°C is held for 48 h and then temperature is dropped to 1°C. During this time the extract dropped from 13% to 2%.

There were used six different concentration of yeast during fermentation:

1. Concentration of 15×10^6 cells/ml (sample 1).
2. Concentration of 20×10^6 cells/ml (sample 2).
3. Concentration of 22×10^6 cells/ml (sample 3).
4. Concentration of 25×10^6 cells/ml (sample 4).
5. Concentration of 30×10^6 cells/ml (sample 5).
6. Concentration of 35×10^6 cells/ml (sample 6).

Practical work was done in Birra Peja Brewery, in Peja, in production department and analyses were done in the laboratory of the brewery.

Results and Discussion

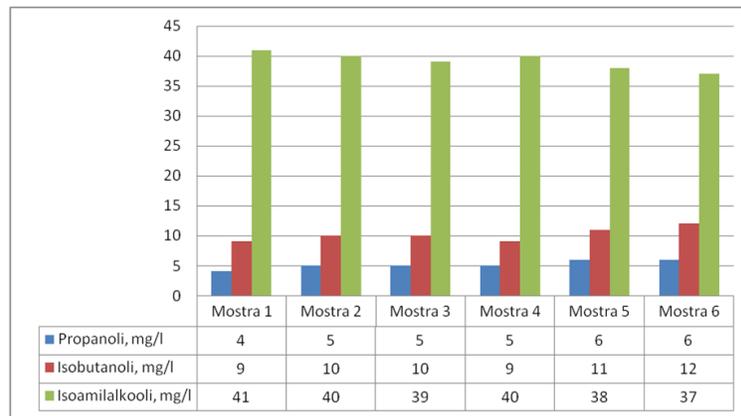


Figure 1. Higher alcohol values in beer with six different concentration of yeast.

From figure 1 one can see that the value of Propanol changed from 4 mg/l at sample 1 to 6mg/l at sample 6. Isobutanol changed from 9mg/l at sample1 to 12mg/l at sample6. In both cases there is a slight rise of values. But, at Isoamyl alcohol the value falls from 41mg/l at sample1 to 37mg/l at sample 6.

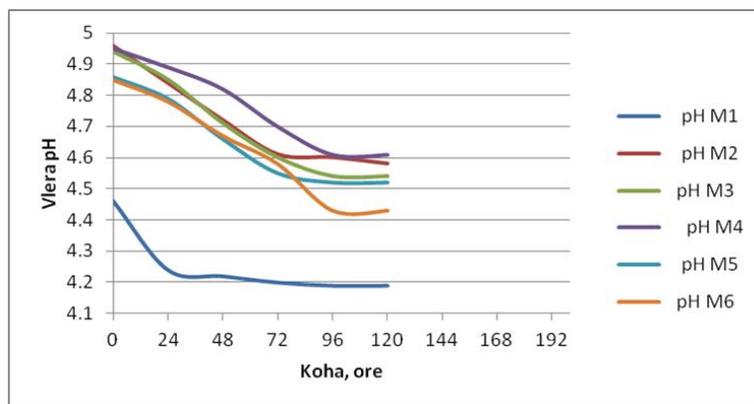


Figure 2. The change of pH value during the fermentation with different yeast concentration.

The lowest value is given at sample 1, and the highest at sample 4.

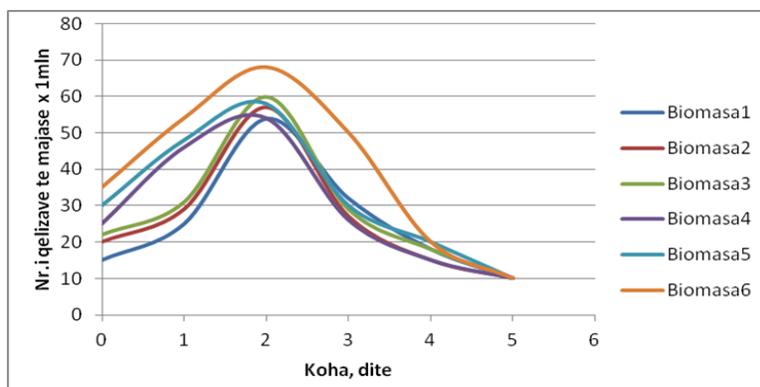


Figure 3. The biomass change with different yeast concentration.

As one can see from the figure 3 the highest biomass of yeast is reached with the sample 6 where the highest pitching rate is and the biomass at other five samples is approximately the same.

Conclusion

We can conclude that the yeast concentration had a direct impact in fermentation time where with the rise if concentration was shorten the time, that means that has been developed faster fermentation process.

Regarding higher alcohols, they differ in independent way from each other and as propanol and isobutanol rises slightly with the rise of yeast concentration, isoamylalcohol happened the oposit and the value falls slightly with the rise of yeast concentration.

Even there is difference in concentration of higher alcohols we should say that all the values are inside the limits of safety of product.

The rise of biomass is developed according to the yeast concentration and the sample 6, with the highest yeast concentration in the beginning has had the biggest rise of the biomass, and has gone to 70×10^6 cells/ml, while at other samples there is a smaller difference and lifts from 50 to 60×10^6 cells/ml.

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