Reference

240

An industrial brewer's yeast strain in very high gravity wort fermentations

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Abstract

In the beer production, the fermentation of worts whose gravity is higher than 18 ºP has been presented as an efficient way to improve the capacity of brewery facility without changes in the brewhouse.
In this work, a brewer yeast strain was submitted to high gravity fermentations to evaluate the influence and the limits of the environmental parameters on the fermentation performance and final product profile. The variables included in this study were the primary fermentation temperature, wort concentration (extract) and yeast pitching rate. Static fermentations were carried out anaerobically in 2 L tall tubes (EBC recommendation for small scale brewing fermentations) with 15, 18 and 22 ºP wort, at constant temperature of 12, 15 and 18 ºC. The yeast was grown aerobically at 27 ºC in 15 ºP wort (saturated with air) and collect by filtration to inoculate by mass at different pitching rates of 12, 18 and 22 million cells/ml. Fermentations were monitored daily measuring the ethanol, extract, pH, temperature, biomass in suspension and viability. At the end of the primary fermentation, the green beer was analysed concerning diacetil, esters and high alcohols by gas chromatography. Fermentation data were statistically treated in order to obtain an optimum approach for the studied parameters. For statistical proposes, the fermentation performance was measured by ethanol produced, apparent extract and the fermentation time.
Although the temperature has a positive effect on the indicators of the fermentation performance, the wort concentration has not a positive effect for all indicators. When the wort has higher concentration at the beginning of the fermentation, as expected, the fermentation takes longer to be finished with more ethanol produced.
Considering that the produced ethanol, the fermentation time and the residual extract have the same level of interest for the brewing process, the statistical analysis showed that the optimal point for the wort concentration, fermentation temperature and pitching rate is 20 ºP, 18 ºC and $20x10^6$ cell/ml, respectively. The optimal conditions were repeated and the beer profile regarding the aroma profile was determined.