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Monitorization of wort and beer proteolysis by size exclusion and reverse phase liquid chromatography

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The majority of beer protein lies in the 10–40 kDa size range. Mostly, the origin of this protein is malted barley [1]. Beer proteins and polypeptides contribute to mouthfeel, flavour, texture, body, colour, and nutritional value [1]. Protein Z, LTP1, and other proteins and polypeptides present in beer have been associated to foam formation and/or stabilization [1-3]. Protein Z has also been related to beer haze [2].

The goal of this work was to study the evolution of proteolysis during wort fermentation/stabilization and the effect of yeast biomass reuse in the protein and polypeptide degradation. For this purpose wort and beer samples from two different tanks (1000 hl and 3000 hl) were analysed. Three cycles of beer production were followed in each tank, one produced with new yeast and the other two produced with consecutive reused yeast biomass. Protein hydrolyses was evaluated by size-exclusion liquid chromatography (SE-HPLC) and by reversed-phase high performance liquid chromatography (RP-HPLC) both coupled to UV detection. SE-HPLC analyses separated five different fractions, one with 40 kDa (Peak 1), three other fractions corresponding to proteins and polypeptides with molecular weight between 17 and 1 kDa (Peaks 2, 3 and 4), and the fifth fraction corresponding to amino acids (Peak 5). Hydrolysis presented as percentage of protein degradation, was evaluated by the difference of peak area at time zero and peak area at each point. Around 40% protein and polypeptide degradation was observed after 3 days fermentation (except for protein fraction with 40 kDa that at the beginning suffered low degradation but was 75% hydrolysed in the final product). Protein and polypeptide degradation increased to 65-70% at the end of fermentation. Worts and beers produced with reused yeast presented lower content of proteins and polypeptides. Results from RP-HPLC separation were analysed as three fractions, namely, peptides, polypeptides and proteins, similar degradation pattern was observed. No significant differences were observed in qualitative and quantitative profiles of protein/polypeptides/peptides of beers obtained with reused yeast biomass.

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