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Book of abstracts

Analysis of flavor generation in beer by PTR-ToF-MS

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Summary: *The online studies of beer aroma generation by PTR-ToF-MS help to unravel the role of yeast and hops on the final product quality.*

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Rapidly growing beer market requires innovative products with greater flavor diversity, harnessing yeast biotransformations may provide a pathway to achieve this goal. Unfortunately, these pathways for some compounds are still poorly understood. The “gold standard” gas chromatography techniques are not well suited for the purposes of the online monitoring of aroma evolution in rapidly fermenting systems especially when needing to compare multiple variables simultaneously. Proton transfer reaction time of flight mass spectrometry (PTR-ToF-MS) coupled to a multipurpose head-space automated sampler increases significantly the analysis throughput by automated, rapid, non-invasive and real time measurement of beer samples.

In this work we present two studies. Study 1 focuses on the aroma differences between 2 yeast strains (Scottish ale and California Ale) and 2 hop varieties (Motueka and Nelson Sauvin). Study 2 involved 6 yeast strains (Fermentis WB-06, US-05, S-33, S-189, S-23, and W-34/70), 1 hop variety (Motueka), and 3 temperature regimes (15, 20, and 25°C). The goal of these studies were to improve our understanding of how and when beer flavour is generated and in particular how yeast modulates hop aroma compounds. Both studies used malt extract (120g/L), Waimea bittering hops (0.24 g/L, 20 International bittering units) and aroma hops (5g/L) added for 5 min after 30 min boiling when wort temperature cooled to 90°C

PTR-ToF-MS coupled to a multipurpose head-space automated sampler enabled the evolution of the volatile organic compounds (VOCs) to be followed during fermentation and to obtain the release kinetics of VOCs important in beer flavor. It was found that the magnitude and kinetics of biotransformations are heavily yeast-strain dependent and to adequately describe the formation of these compounds yeast strain variability needs to be considered in experimental designs