Study of the effect of forced ageing in the evolution of off-flavours in beer

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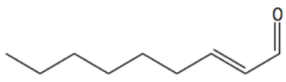
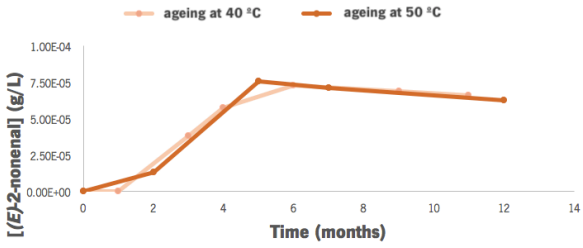
Conservation at low temperatures slows the development of chemical reactions responsible for beer aging **[1,2]**. On the other hand, exposure to high temperatures increases significantly the evolution of all kind of chemical compounds including the ones which have a negative impact on the organoleptic characteristics of beer, the so called off- flavours **[3]**.

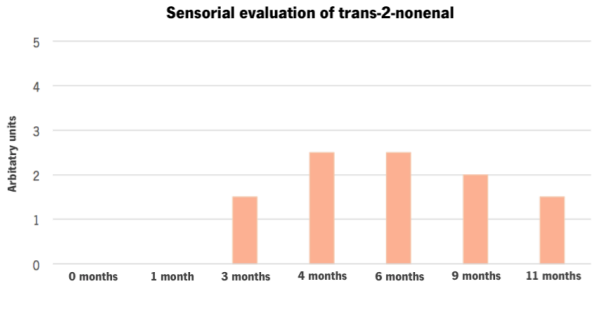
The aim of this work was to study the influence of forced ageing conditions in the chemical and organoleptic properties of a commercial available beer in order to establish the effect of forced ageing in the evolution of off-flavours. The methodology involved the exposition of beer samples to a series of controlled temperatures, from 40 ºC to 60 ºC correlating the evolution of off-flavours with the temperature of the ageing regimens.

The analysis of the final products involved the quantification of several off-flavours such as *(E)*-2-nonenal, acetic acid, furfural and 4-vinilguaiacol using GC-MS and HPLC-UV as analytical techniques. Samples were also subjected to a sensory evaluation by a panel of specialized judges, aiming to evaluate the impact of forced ageing and to correlate these values with those obtained by the chemical analyses. Additionally, it was done a study on the colour variation to understand the trend observed in the colour of the samples.

The obtained results allowed us to conclude that the studied ageing regimens had different impacts on the evolution of the off-flavours that were tracked. Furthermore, both colour variation and sensorial evaluation results indicate that only the samples that were submitted to the 50 ºC ageing regime showed significate variation of the chemical and organoleptic properties. These samples revealed sensorial hints related with the off-flavours that were found at the highest concentrations, which is relatable with the thresholds that were found on literature.

(E)-2-nonenal 





[1] B. Vanderhaegen, H. Neven *et al.*, "The chemistry of beer aging - A critical review". Food Chemistry, 95 (2006), 357–381.

[2] H. Li, F. Liu, "A study on kinetics of beer ageing and development of methods for predicting the time to detection of flavour changes in beer", Journal of The Institute of Brewing, 121 (2015), 38–43.

[3] B. Vanderhaegen, F. Delvaux *et al.*, "Aging characteristics of different beer types", Food Chemistry, 103 (2007), 404–412.