INTRODUCTION

Dry-hopping is a technique which is increasingly being applied in the production of specialty beers in order to impart additional and plant-origin hoppy aroma notes. However, its impact on the flavour stability of beers is currently not well understood, especially regarding the specific contribution of the hop variety used. In this study, the flavour stability of a series of six single-hop beers derived from three distinctly different commercial hop varieties (A, B, C) was investigated.

- During ageing, a decline in total bitterness was observed for all the beers. 
- As expected, cis-iso-α-acids were more stable than trans-iso-α-acids in all beers.

ISO-α-ACIDS

The decline in total bitterness was different depending on LH versus DH, but also depending on the applied hop variety:
A: LH > DH
B: LH = DH
C: LH < DH

STALING ALDEHYDES

Alddehydes were observed to increase with ageing time.
After 6 months, Strecker aldehydes and furfural levels were much higher for the DH beers, with the exception of hop variety C.
Beer C-LH showed a significantly higher increase than beer C-DH.

The lipid oxidation aldehydes on the other hand, did not exhibit this trend, although C-LH did show a modest increase.

HOP OIL-DERIVED CONSTITUENTS

β-myrcene concentrations in the dry-hopped beers were significantly higher than in the late-hopped beers and tended to decrease with ageing, whereas they remained fairly constant in the late-hopped beers. Similar behaviour could be observed for α-humulene and β-caryophyllene, while β-farnesene remained fairly constant during ageing regardless of the hopping regime. The sum of humulene epoxides I, II and III was found to be slightly higher in the dry-hopped beers, and did not change significantly during ageing. The amount of linalool in all beers appeared to increase with ageing, which has been attributed to the liberation of glycosidically bound linalool, according to the literature. After liberation from hop glycosides, linalool may contribute to the hoppy aroma of beer.

SENSORY EVALUATION

DO and HSO were found to be lower in the LH beers for varieties A and B. For variety C, DO was comparable between the LH and DH beers, but HSO showed the lowest values for the dry-hopped beer. This may explain the difference in bitterness stability observed for hop variety C.

OXYGEN

Fresh beers - TPO (total package oxygen), HSO (headspace oxygen) and DO (dissolved oxygen)

DO-LH was similar to DO-DH, while HSO-LH was significantly higher than HSO-DH.