Real-time Analysis of Barley Roasting Using Soft Ionization Mass Spectrometry

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Abstract:

Roasting of barley grains is useful in brewery industry, for the production of different kind of malts from amber to dark. Malt from barley grains is also roasted to obtain caramel or chocolate malts. In the present work, flavours generated during this heating step were first identified by SPME GC-MS. Then, real-time analysis of selected key odorants was performed using a thermal analyzer (DSC7, Perkin-Elmer) and APCI-MS as Soft Ionization Mass Spectrometer. A special interface was built to allow direct analysis of gas phase coming from the thermal analyzer. A thermokinetics analysis was performed using AKTS software. It predicts reaction progress of the key odorants that bring the special flavour character of special dark beers.

The graph below shows the chromatogram of roasted barley grains analyzed by GC/MS SPME. Roasting was carried out up to 400°C in a platinum cell.

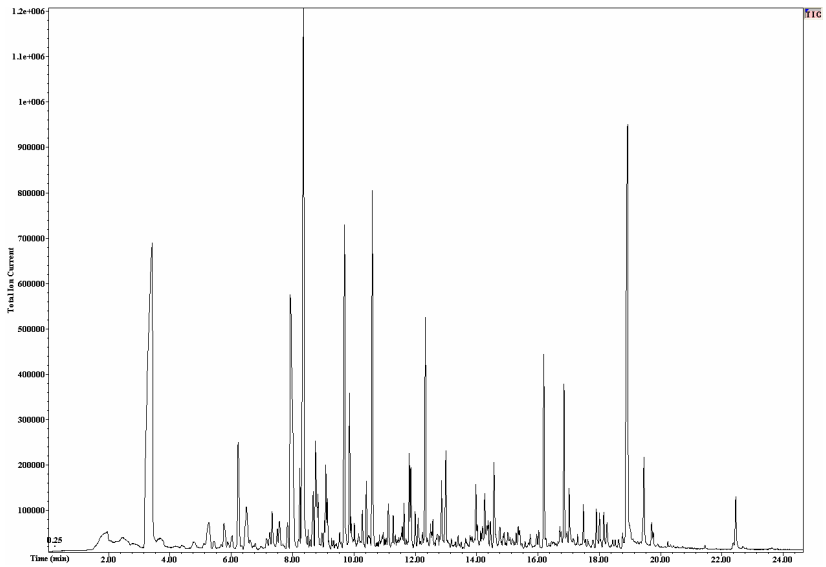

Figure 1 GC Chromatogram of roasted barley grains

Approximately hundred molecules were identified like pyrazine, aldehyde, ketone, fatty acids and others.

Extracted molecular ion from APCI-MS data is shown below. The experiment was perform using DSC7 (PerkinElmer) as thermal analyzer and a Esquire3000 (Bruker) as mass spectrometer.

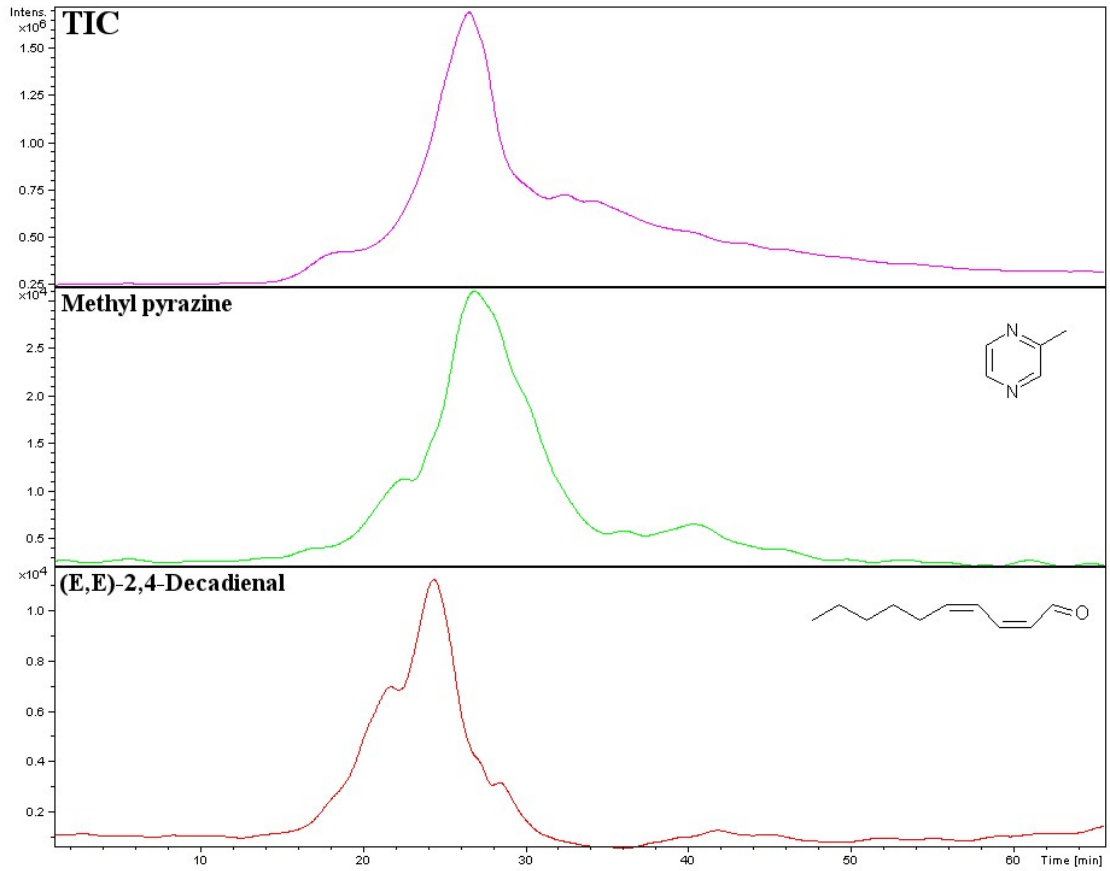

Figure 2 Extracted ions of the TIC of the roasted barley grains

References:

1. Taylor, A.J. and D.D. Roberts, eds. *Flavor perception*. 2004, Blackwell publishing Ltd: Oxford.
2. Taylor, A.J., et al., *Atmospheric pressure chemical ionisation mass spectrometry for in vivo analysis of volatile flavour release.* Food Chemistry, 2000. **71**(3): p. 327-338.
3. Benoit, F.M., et al., *Breath Analysis by Atmospheric-Pressure Ionization Mass-Spectrometry.* Analytical Chemistry, 1983. **55**(4): p. 805-807.