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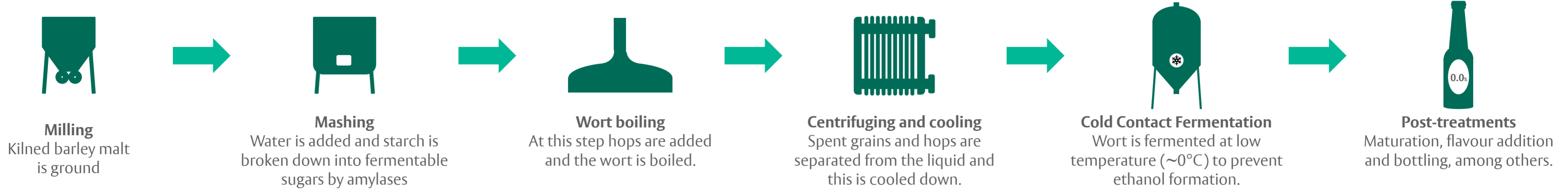
Characterisation of the key aroma compounds in alcohol free beer base by aroma extract dilution analysis

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Alcohol Free Beer Cold Contact Process



Introduction

Alcohol-free beers brewed by cold contact process usually exhibit a flavour reminiscent of wort and lack fruitiness [1]. Although the addition of flavourings after fermentation is a common practice, the typical “worty” aroma cannot easily be masked. The aim of this research is to identify the compounds contributing to the characteristic aroma of these beers by means of the Sensomics approach.

Materials and methods

Base beer sample

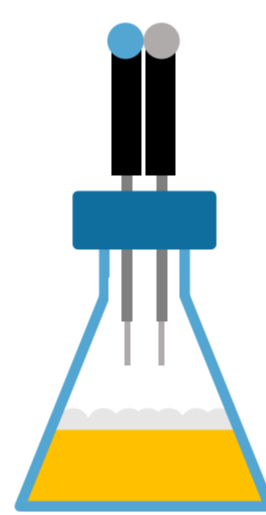
- Brewed by Cold Contact Process
- Alcohol free product (<0.05%)
- NO external flavours added to “Base” beer
- Pasteurised and bottled



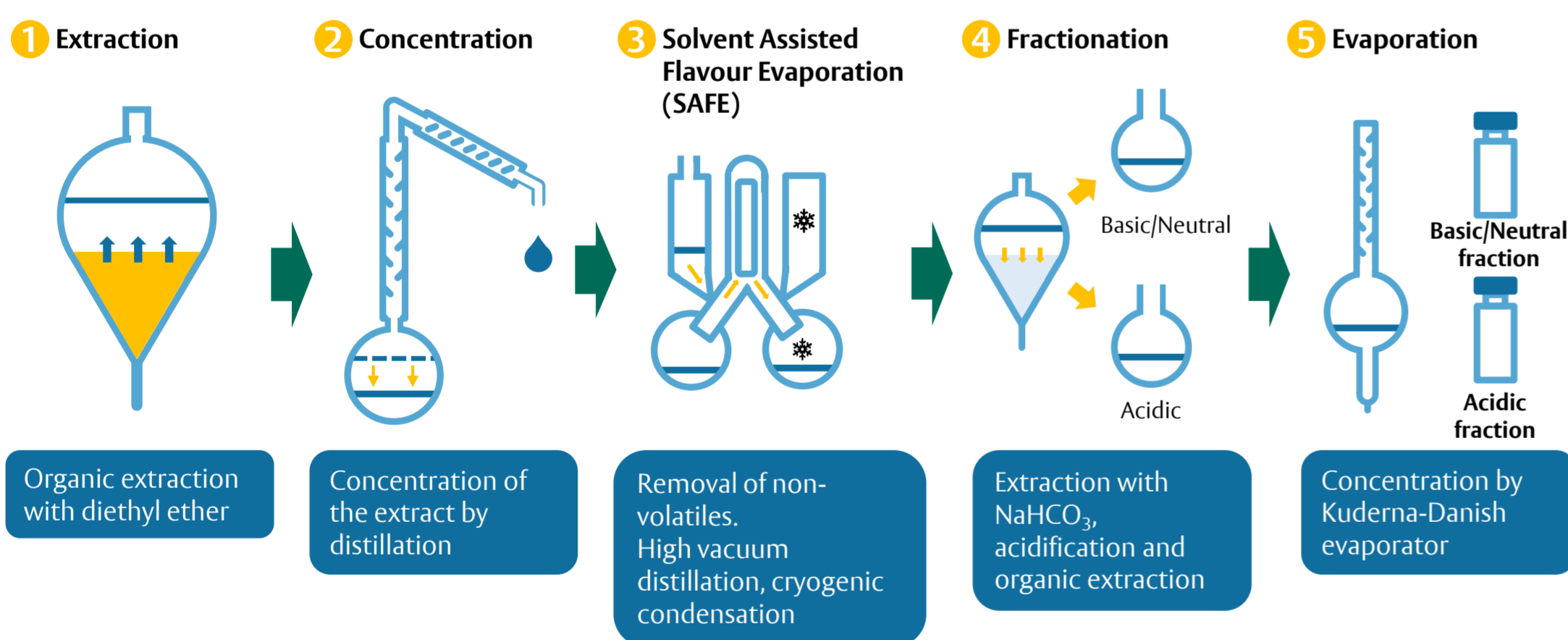
Two fibres-HS-SPME

Volatile compounds were adsorbed/absorbed onto the SPME fibre. Simultaneous extraction of two fibres:

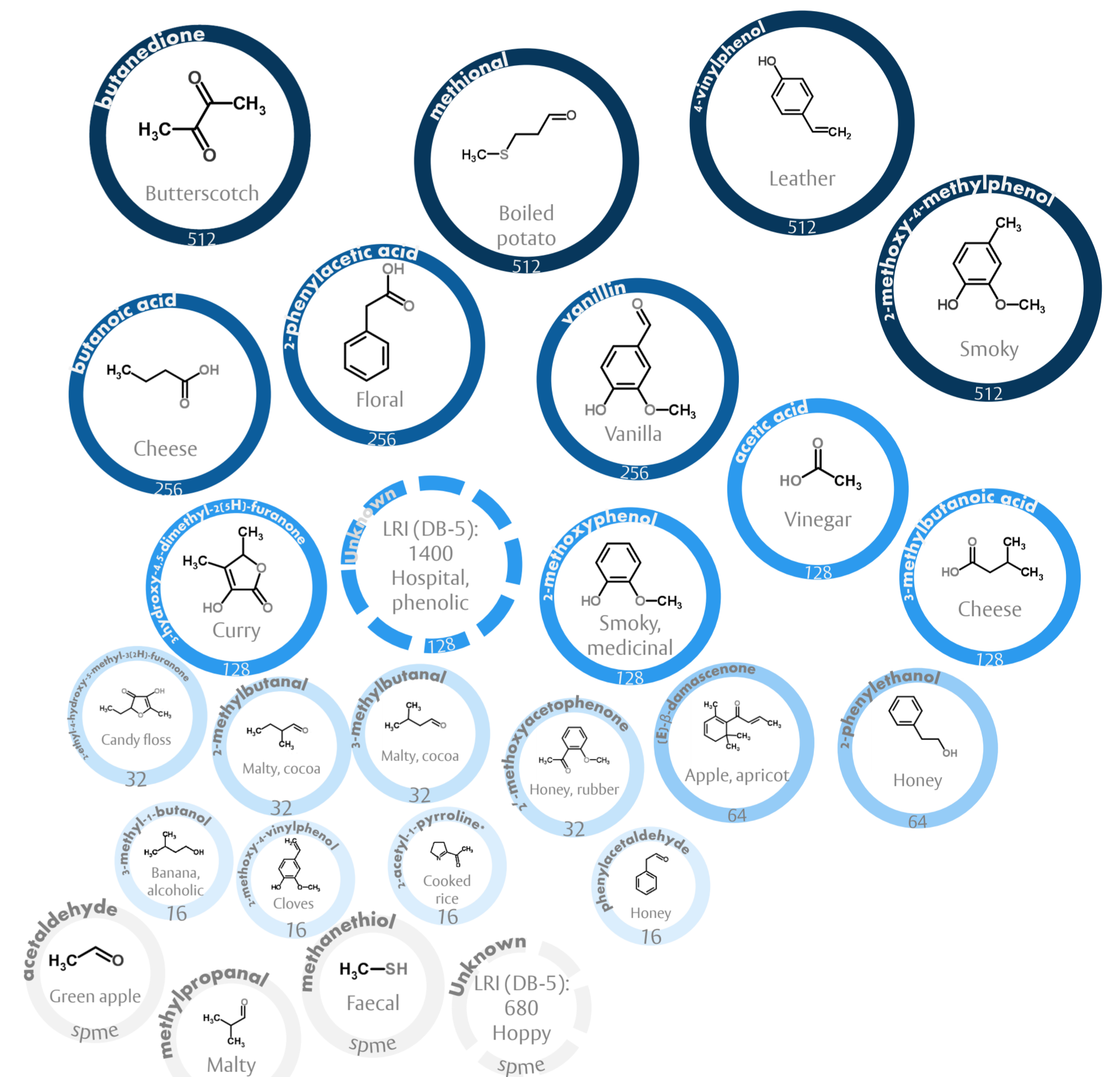
- DVB/Carboxen®/PDMS: wide range of compounds
- Carboxen®/PDMS: highly volatile compounds



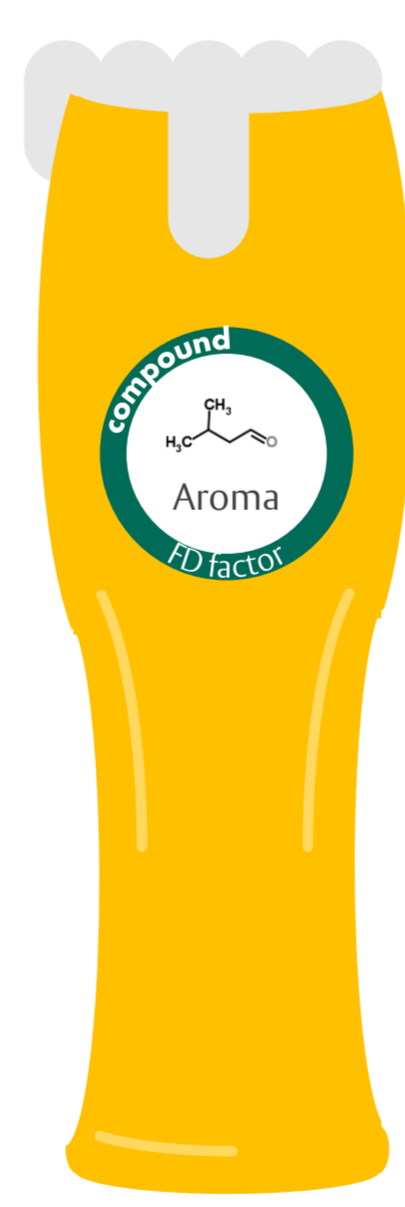
Isolation of volatile compound fractions by SAFE^[2]



Results and discussion



- 22 odour-active compounds had $FD \geq 16$; with methional, butanedione, 4-vinylphenol, and 2-methoxy-4-methylphenol amongst the highest.
- 4 additional compounds were found in SPME-GC-O experiments.
- No fruity ester, typically found in lager and other beers [2], was among these compounds, explaining the lack of fruitiness.
- Strecker aldehydes (methylpropanal, 2-methylbutanal, 3-methylbutanal, phenylacetaldehyde, methional) have been reported as contributors to the malty, worty aroma of alcohol free beers [1].
- Identification of 2-acetyl-1-pyrroline is not conclusive.
- Furthermore, 2 compounds remain unidentified.

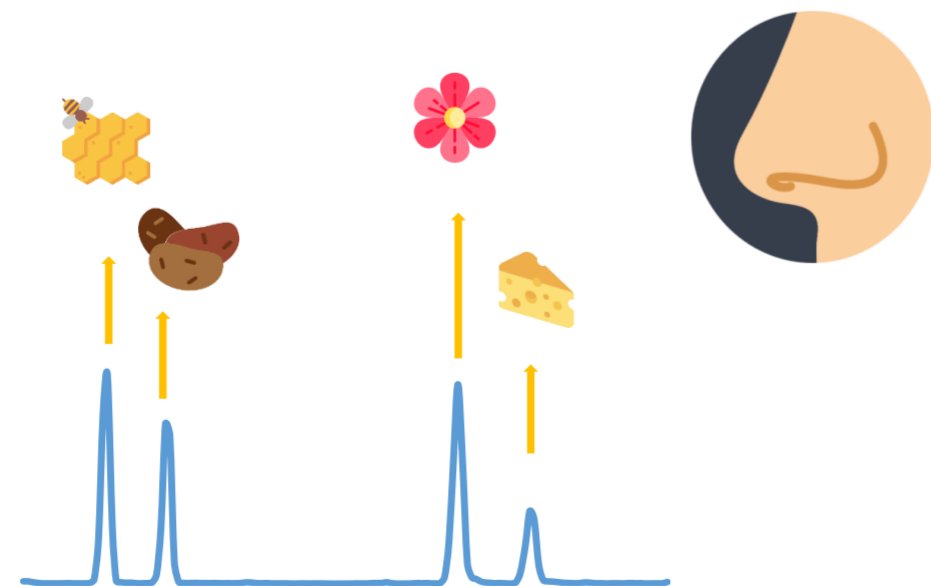


Identification of odour-active compounds

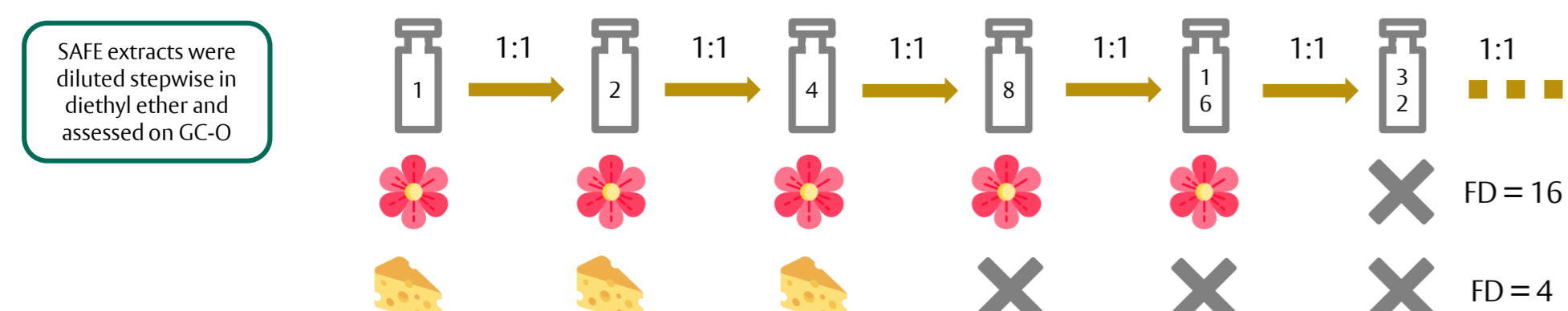
GC-MS and GC-Olfactometry were performed on SAFE and SPME extracts.

Criteria for identification:

- LRI on polar (FFAP) and non-polar (DB-5) columns
- Odour description
- Bibliography
- Agreement with analyses of authentic compounds



Aroma extract dilution analysis (AEDA)



FD factor for a specific odour region is defined as the highest dilution at which the odour can still be perceived at the sniffing port of the GC-O.

Conclusions

- The lack of fruity flavour was associated with the absence of odour-active fruity esters.
- Methional was a potential contributor to the “worty” aroma of the alcohol free base beer studied.
- Quantification of these compounds is of great importance to understand their role in the aroma of the product.

References

- Perpète, P. & Collin, S. J. *Agric. Food Chem.*, **1999**, 47 2374-2378.
- Langos, D., Granvogl, M., & Schieberle, P. J. *Agric. Food Chem.*, **2013**, 61, 11303-11311.

Acknowledgements

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- Icons retrieved from www.flaticon.com, authored by Freepik (snowflake, peach, flower, honeycomb), Smashicons (nose) and Madebyoliver (cheese, potatoes).

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