Bergische Universität Wuppertal

G. Dierkes[a], A. Bongartz[b]

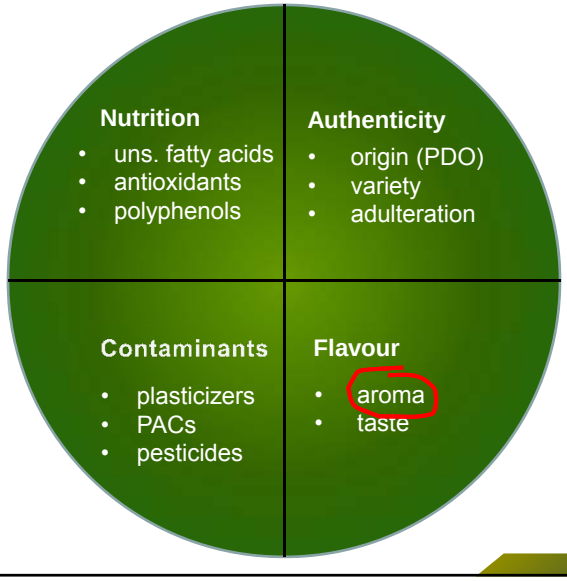
a Bergische Universität Wuppertal; b Zürcher Hochschule für Angewandte Wissenschaften

Zürcher Hochschule für Angewandte Wissenschaften zh aw

Evaluation of olive oil quality by flavour analysis

How do you measure quality?

What is quality?



Olive oil aroma

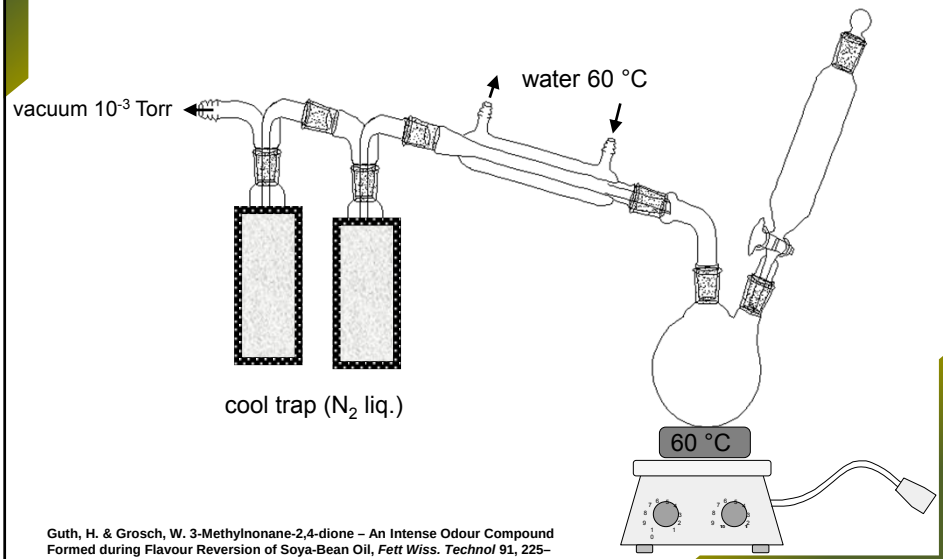
Off-flavours

- fusty-muddy
- musty
- rancid
- winey-vinegary
- metallic

Olive oil aroma

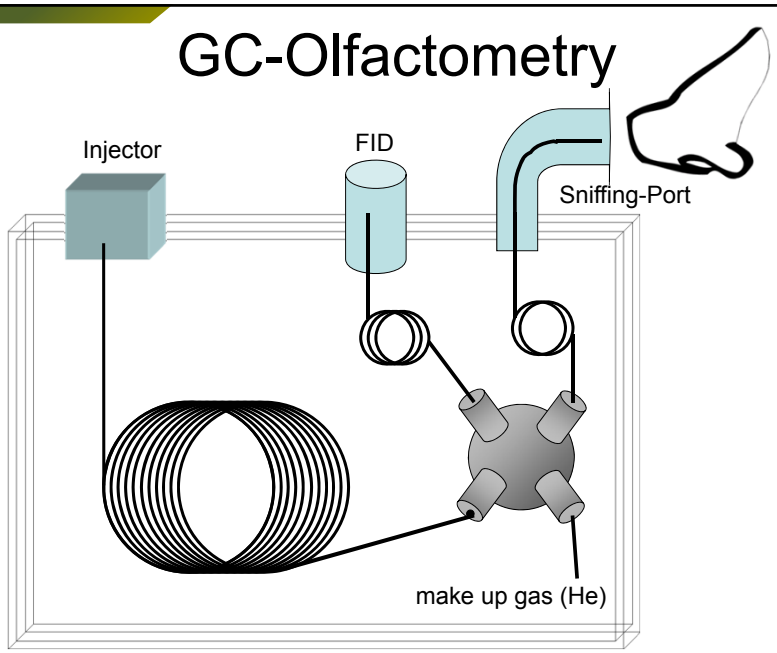
- greenly fruity
- ripely fruity

Vacuum destillation

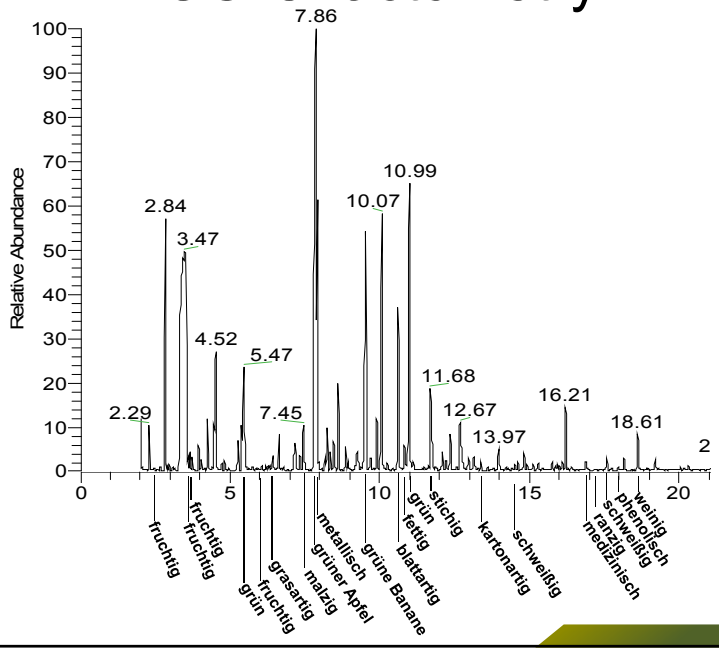


Guth, H. & Grosch, W. 3-Methylnonane-2,4-dione – An Intense Odour Compound Formed during Flavour Reversion of Soya-Bean Oil, *Fett Wiss. Technol* 91, 225–230 (1989).

GC-Olfactometry



GC-Olfactometry



Indicator compounds

Esters:
- Ethyl-isobutanoate
- Ethyl-2-methylbutanoate
- Ethyl-3-methylbutanoate
- 3-Methylbutylacetate
- Z-3-Hexenylacetate
- Methylsalicylate

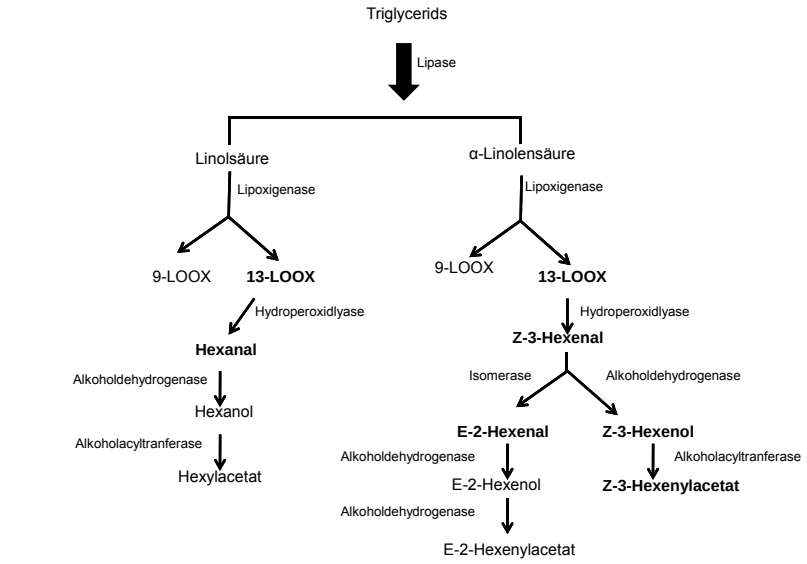
Aldehyds:
- Hexanal
- Z-3-Hexenal
- E-2-Hexenal
- Nonanal
- E-2-Nonenal
- E,E-2,4-Decadienal

Alcohols:
- 3-Methylbutanol
- Z-3-Hexenol
- E-2-Hexenol
- Guaiacol
- 2-Phenylethanol

Carbonic acids:
- Acetic acid
- Butyric acid
- Hexanoic acid

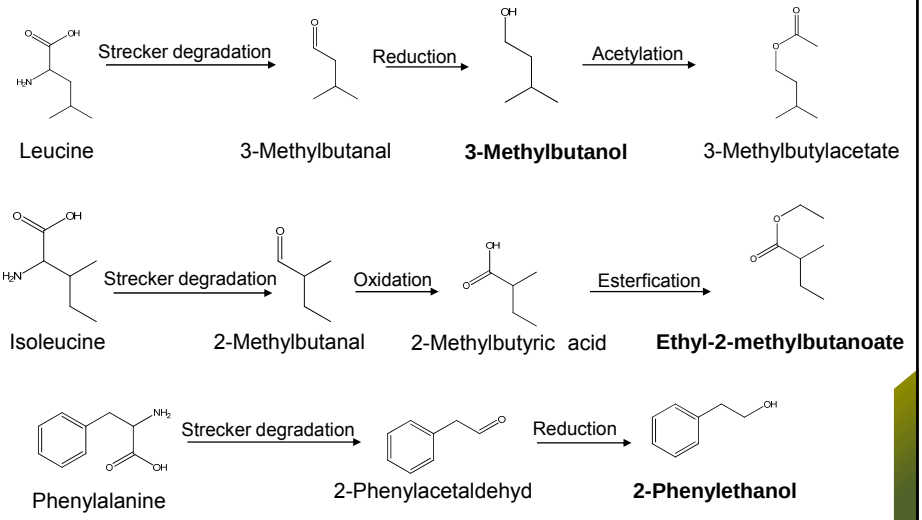
Hydrocarbons:
6,10-Dimethyl-1-undecen

Formation of aroma compounds



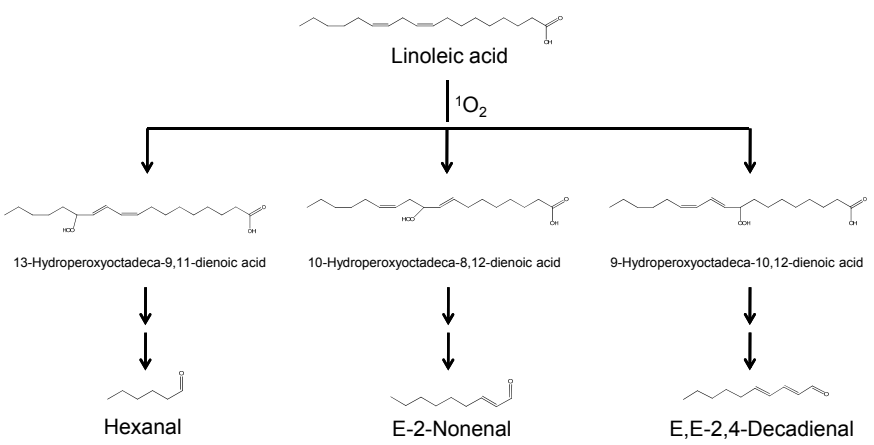
Kalua, C. M. *et al.* Olive oil volatile compounds, flavour development and quality: A critical review, *Food Chemistry* 2007, 273–286.

Microbial spoilage



Garcia-Gonzalez, D. L. Morales, M. T. & Aparicio, R. in *Handbook of fruit and vegetable flavors,* edited by Y. H. Hui (Wiley, Hoboken, 2010).

Photooxygenation



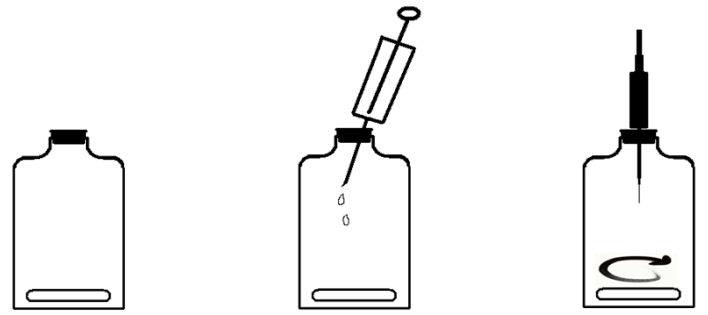
Belitz, H.-D. Grosch, W. & Schieberle, P. *Lehrbuch der Lebensmittelchemie. Mit 634 Tabellen.* 6th ed. (Springer, Berlin ;, Heidelberg, 2008).

Quantification

Specifications for the quantification method

- small sample size
- great spectrum of analytes
- fast
- easy
- reproducible results

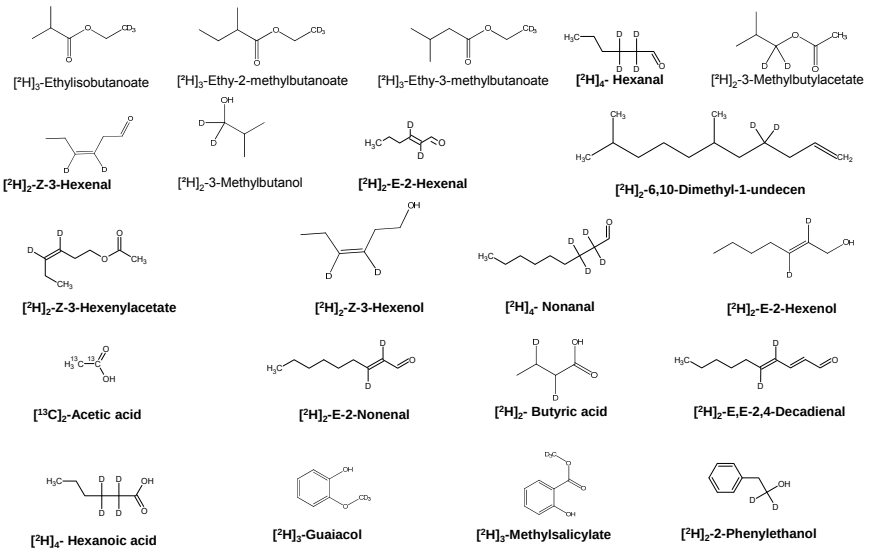
Headspace Solid-Phase Mikroextraction Stable-Isotope Dilution Assay



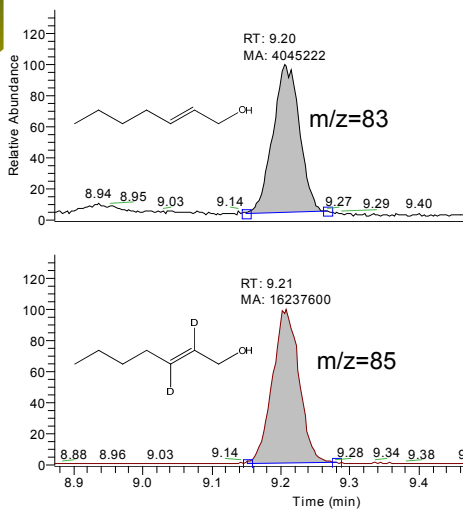
1,3 g olive oil | 1-2 µl standard | 35 min at 50 °C

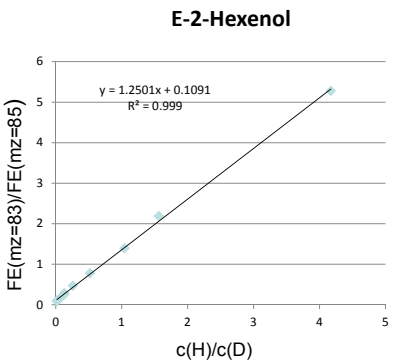
solid-phase: PDMS/DVB/Carboxen

Stable-Isotope labeled standards



Quantification



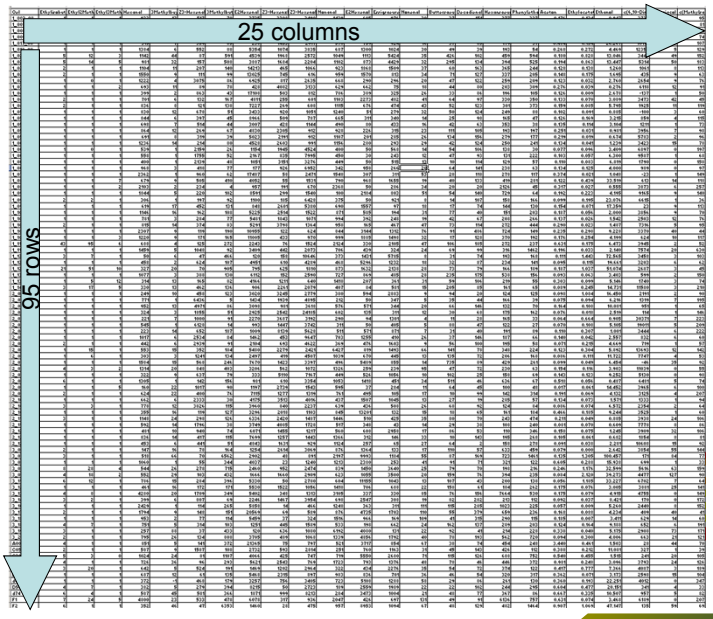


Samples

95 olive oils

2008 2009 2010

Results



Analysis

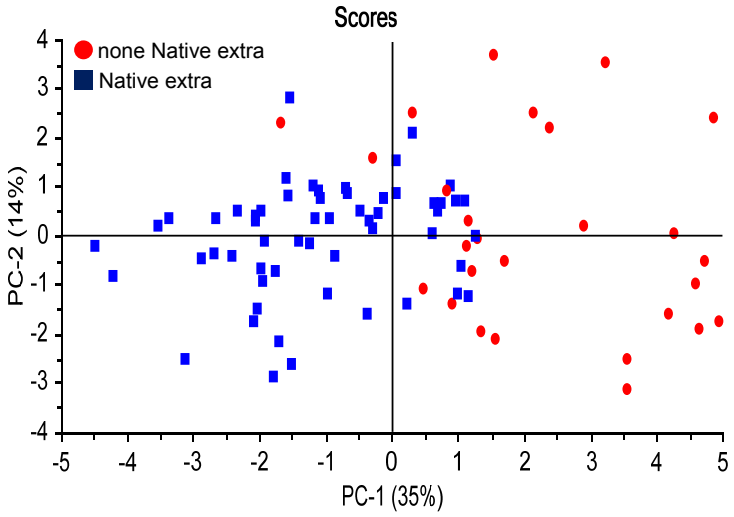
Objectives of the multivariate data analysis

- Data reduction
- Simplification
- Distinction between information and non-information
- Selection of variables
- Finding outliers
- Classification or Regression
- Prediction

Kessler, W. Multivariate Datenanalyse. Für die Pharma-, Bio- und Prozessanalytik; ein Lehrbuch, *Multivariate Datenanalyse* (2007).

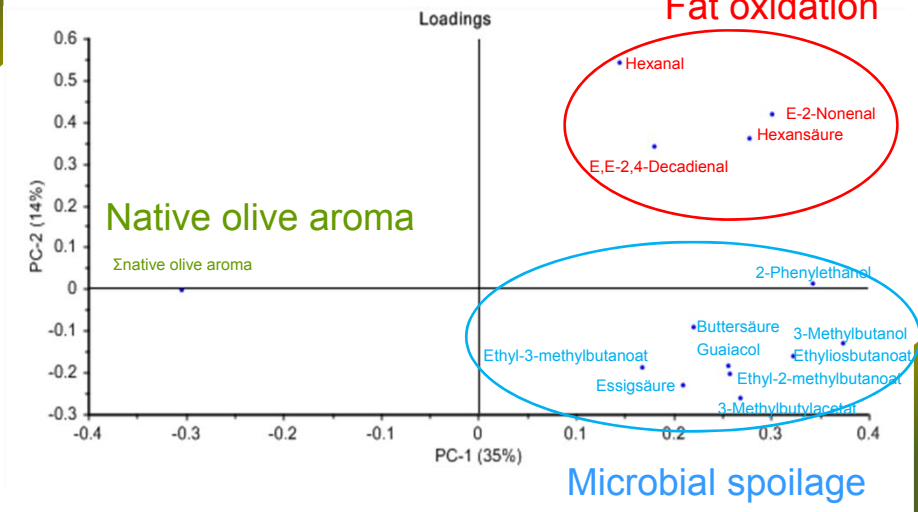
Principal components analysis

(PCA)

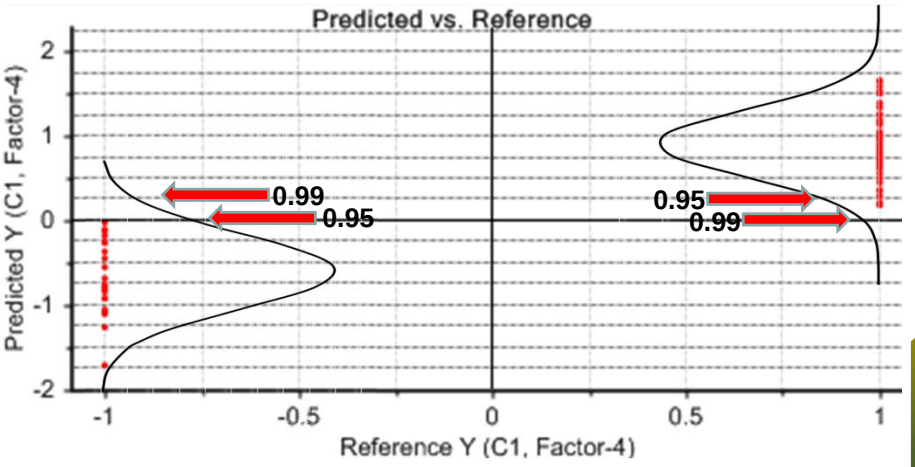


Principal components analysis

(PCA)



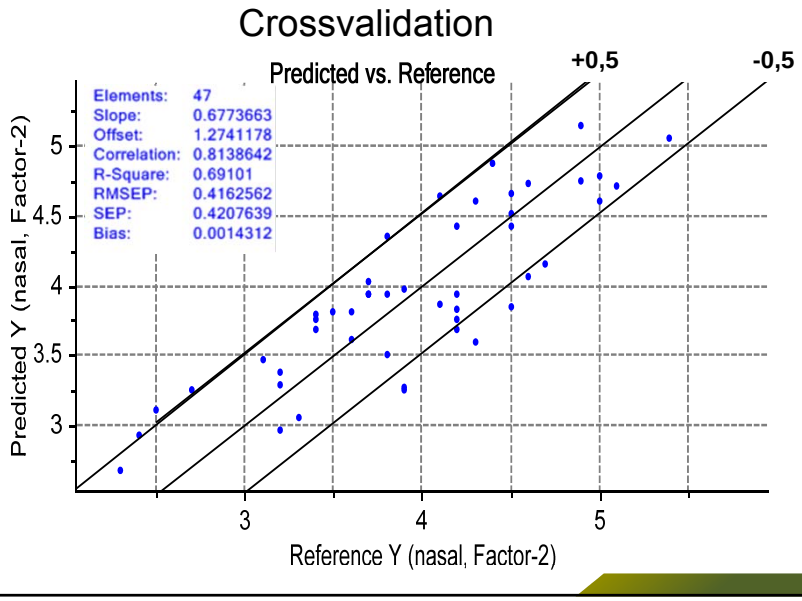
PLS-DA



Classification

PLS-DA / sensory	Native extra	none Native extra
Native extra	54	10
none Native extra	9	22

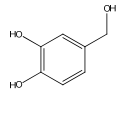
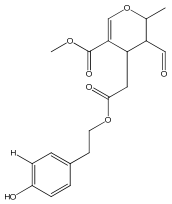
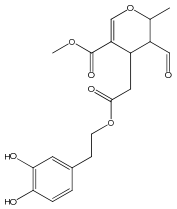
PLS-Regression



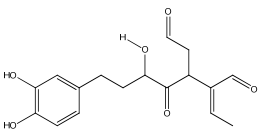
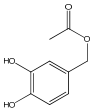
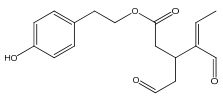
Applications

- Receiving inspection tests
- Quality assurance
- Process optimization

Outlook

Pungency and Bitterness

Acknowledgements

- Swiss Olive Oil Panel
- Annette Bongartz
- Research group Food Chemistry

Thank you for your attention