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Frandsen, Heidi Blok; Sørensen, Susanne; Sørensen, Hilmer; Sørensen, Jens Christian

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ANALYSIS OF TAG PROFILES OF DIFFERENT COMMERCIAL OILS AND BRASSICACEAE SEED OILS

Heidi Blok Frandsen*, Susanne Sørensen, Hilmer Sørensen, Jens Christian Sørensen
Department of Food Science, University of Copenhagen, Denmark
**hbf79@food.ku.dk*

Introduction

Rapeseed oil production for human consumption is among the worlds largest together with production of sunflower and soybean oil. These oils differ in content and ratio of saturated and unsaturated fatty acids (FAs) affecting various oil properties and vegetable oils have been given substantial attention in relation to health beneficial effects
In particular the optimal balance between the essential long chain polyunsaturated FAs linolenic acid (18:3, ω3) and linoleic acid (18:2, ω6) is being debated. It is generally agreed that the ω3:ω6 ratio is too low in a normal western diet. The ratio in rapeseed oil is about 1:2 turning this oil into a promising commodity in a human health perspective thus contributing to a potential higher market value and requirements for verification of quality, authenticity and potential adulteration of the oil.

Aim

To demonstrate the potentials of EFLC as a tool to

- Simultaneously evaluate several vegetable oil quality parameters (phytosterols and FFAs)
- Provide fingerprint profiles of native triacylglycerols (TAGs) to distinguish between oil origin at seed as well as cultivar levels
- For quantitative determination of the total TAG composition (saturated and unsaturated TAGs)
- For determination of ratios between essential FAs

Supercritical Fluid Extraction

Supercritical fluid extraction (SFE) is an extraction method which utilizes carbon dioxide in its supercritical phase for extraction of lipophilic compounds. The combination of pressure, temperature and extraction with and without a polar modifier enables tailored extraction of structurally different compounds into different fractions.

Advantages using SFE:

- Environmentally friendly
- High solvating power, due to its high density.
- Low chemical solvent reactivity
- Easy solvent removal after extraction
- High extraction efficiency.

Enhanced Fluid Liquid Chromatography

Enhanced fluid liquid chromatography covers an analytical area between supercritical fluid chromatograhy (SFC) and High performance liquid chromatography (HPLC) (Sørensen et al.1999). EFLC employs supercritical CO2 as the mobile phase with a modifier phase constituting between 20-70% of the phase. The present work demonstrates the possibility for simultaneous analysis of TAG profiles, phytosterols and fatty acids (FA).

EFLC with evaporative light scattering detection (ELSD) (**Fig. 1**): Saturated FAs have a poor chromophore, and are difficult to detect with UV. ELSD allows quantitative determination of individual TAGs.

EFLC with diode array detection (DAD)-UV (**Figs. 2 + 3**): The more sensitive detection allows identification of TAGs with different FA composition.

The combination of UV and ELSD provides information on the saturation/poly-unsaturation of the FAs in TAGs

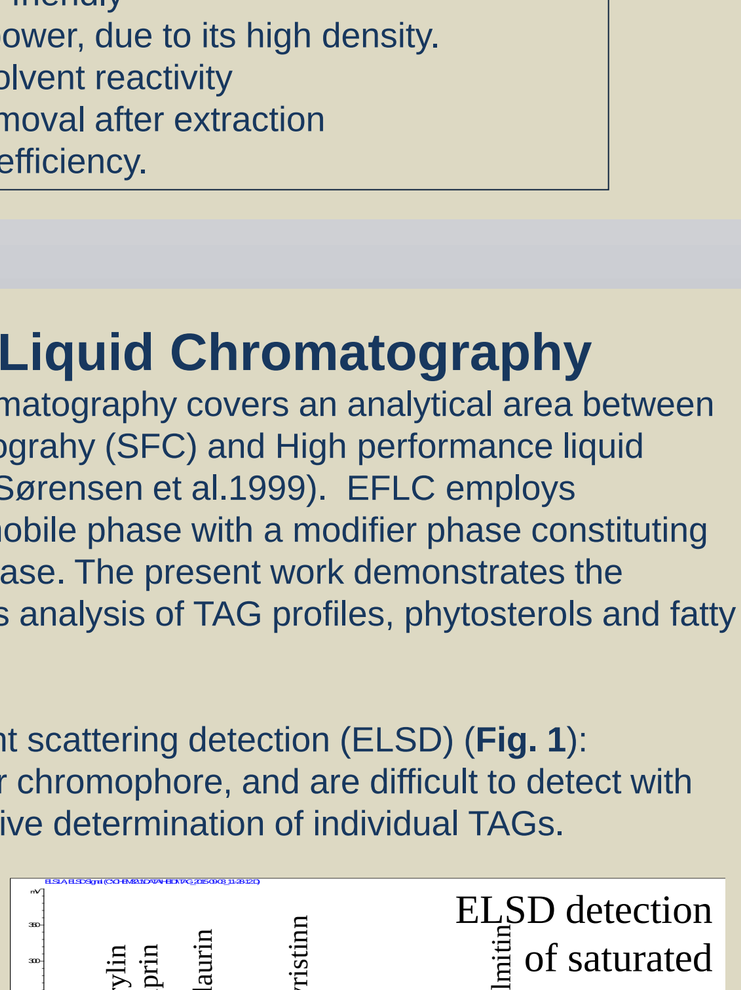


Figure 1. Separation by EFLC with ELSD detection using a Hypersil BDS C18 Column. The mobile phase consisted of 30 % CO2 and 70 % Buffer (80% acetonitrile, 20% 2-propanol), T=40°C

TAG Profile of different commercial oils - EFLC with (DAD)-UV detection

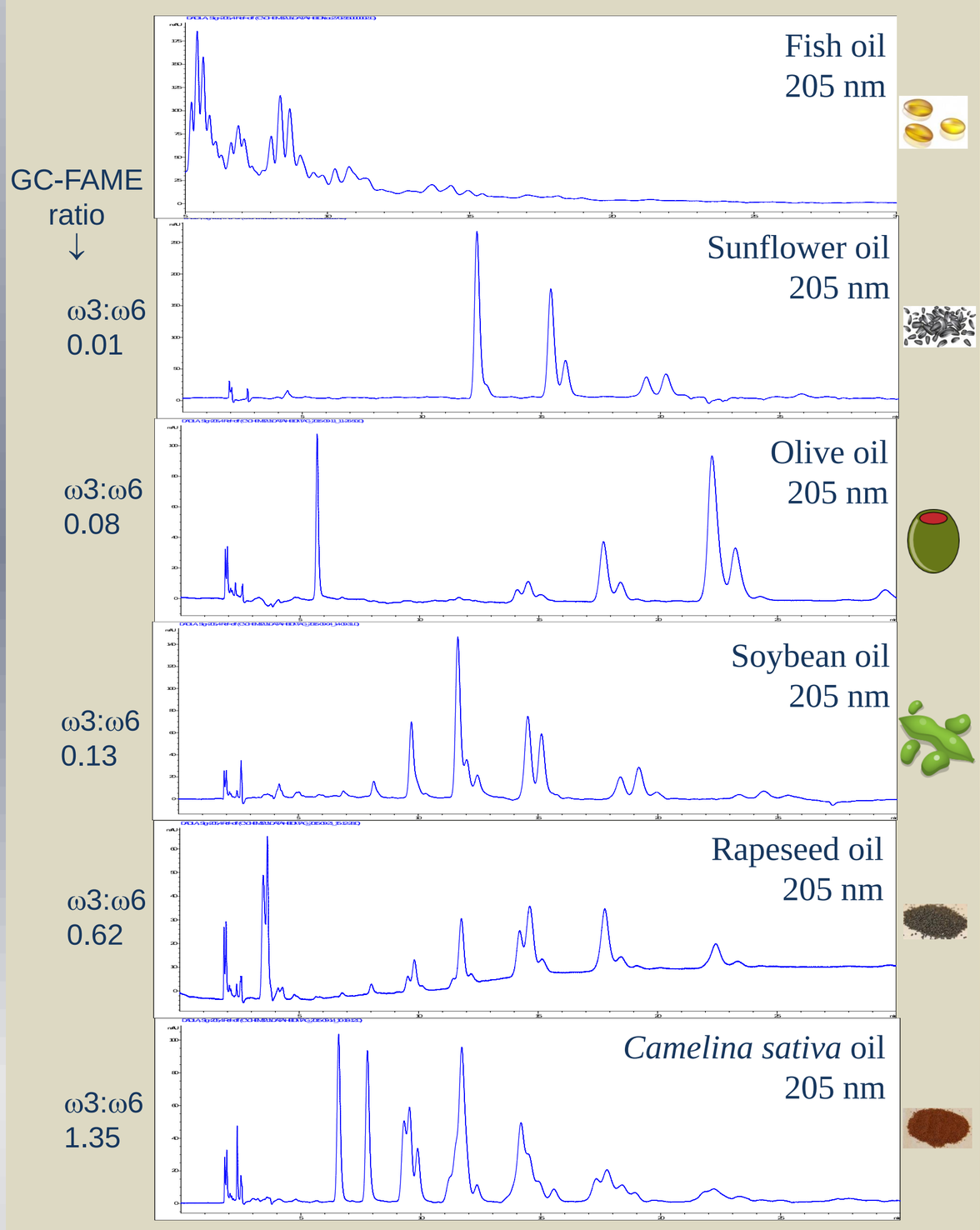
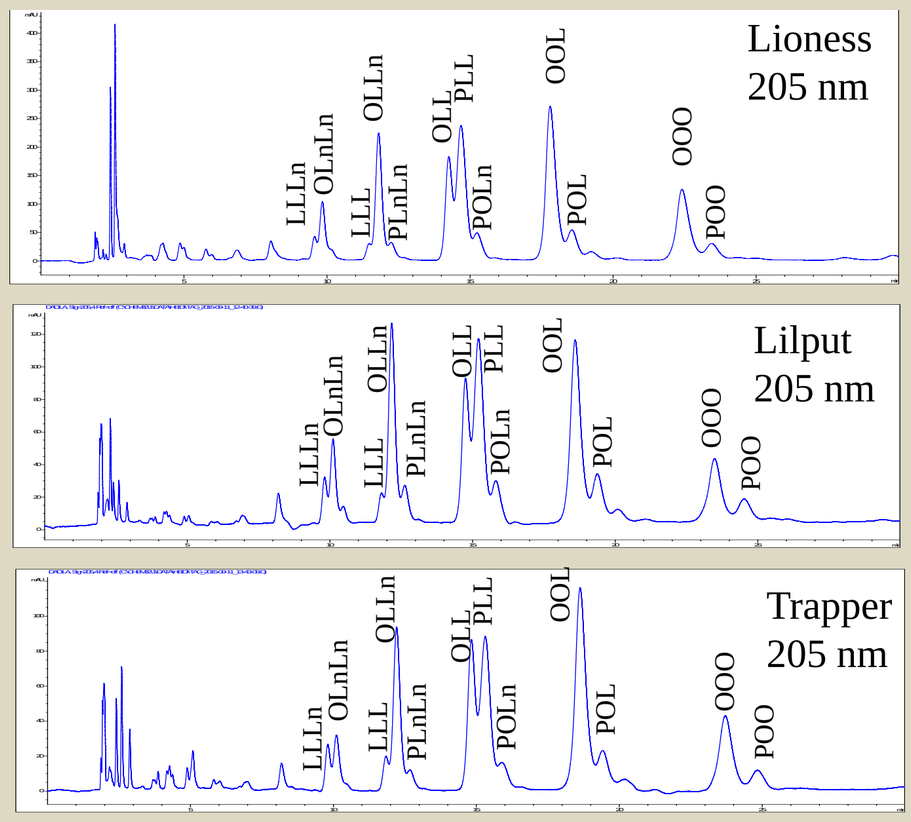


Figure 2. Separation by EFLC with (DAD)-UV detection using separation conditions as in Figure 1.

TAGs of different *Brassica napus* L. cultivars - EFLC with (DAD)-UV detection



P:palmitic acid; C16:0; O:oleic acid; C18:1; L: linoleic acid C18:2; Ln: linolenic acid C18:3

Figure 3. Separation by EFLC of TAGs extracted by SFE from rapeseed cultivars. Separation conditions as in Figure 1.

Conclusion

- SFE is a useful tool for selective extraction of lipophilic and amphiphilic lipids.
- EFLC analysis of TAG profiles enables determination of oil quality including authenticity and potential falsification of the oil

REF: Sørensen, H., Sørensen, S., Bjergegaard, C., Michaelsen, S.: Chromatography and capillary electrophoresis in food analysis. Royal Society of Chemistry, UK, (1999) 470 pp, ISBN 85404-561-9

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