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Analysis of lipids in seeds of double low rapeseed based on supercritical fluid extraction

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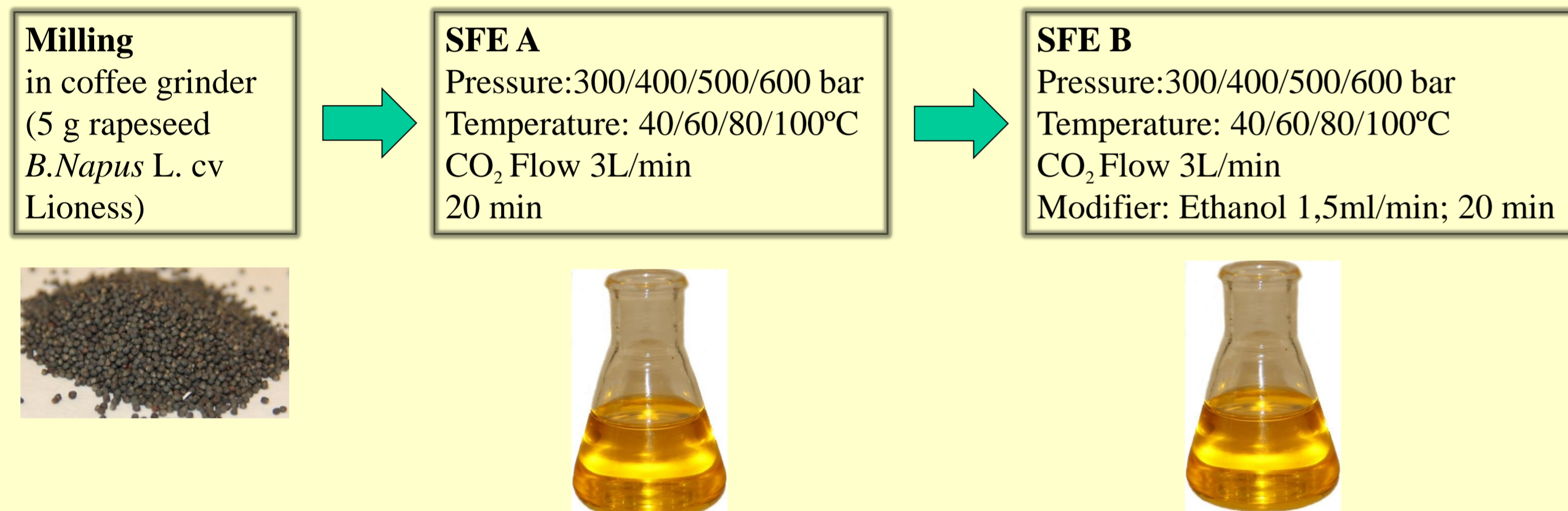
Introduction

Rapeseed (*Brassica napus* L.) is among the most used crops for production of oil for human consumption. Traditionally oil extraction is performed as solvent extraction combined with warm- or cold pressing. Cold-pressing is known to give the highest quality of the oil in terms of preservation of antioxidants and vitamins

Aim

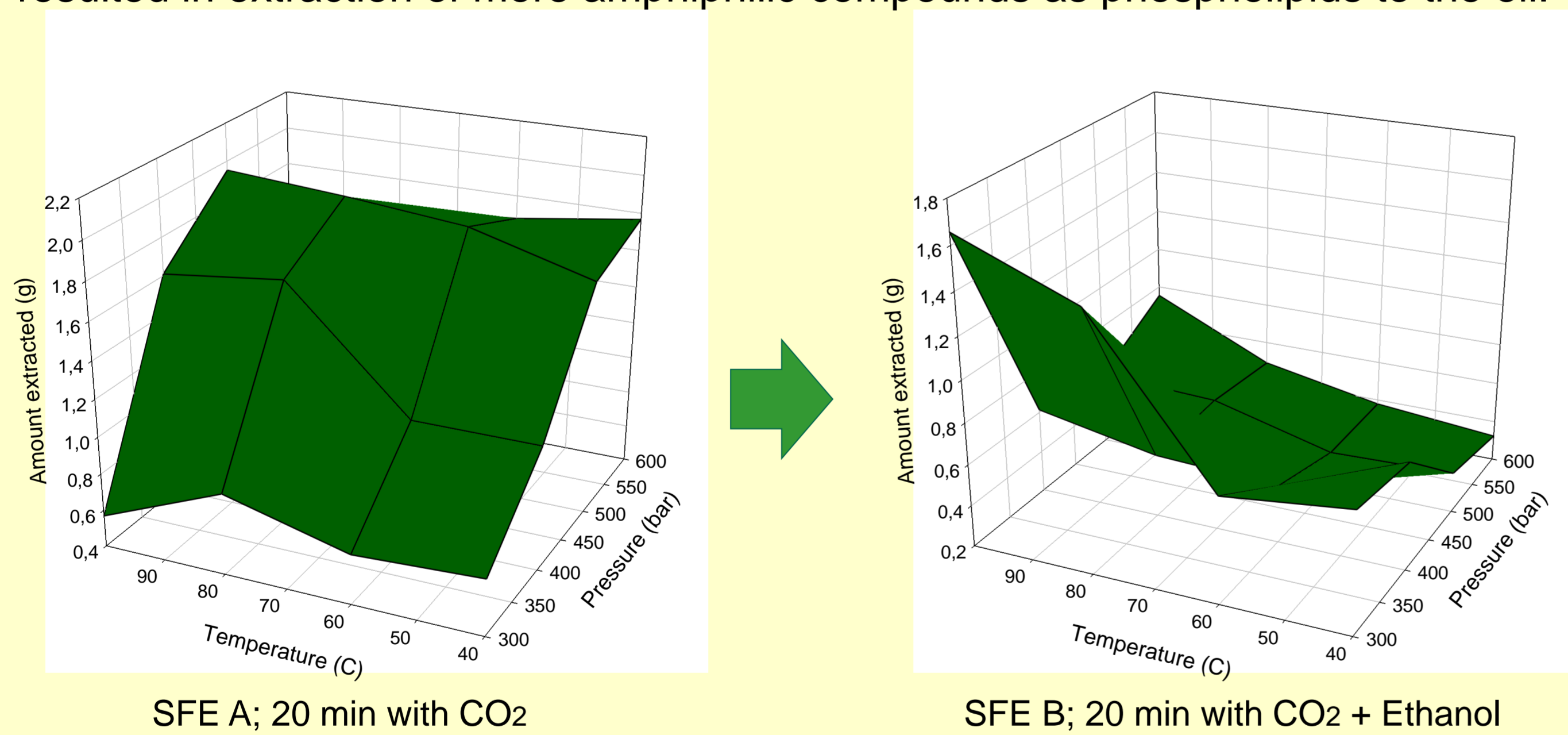
To develop an efficient and gentle supercritical extraction method for preparation of high quality rapeseed oil products

Experimental setup of Supercritical Fluid Extraction



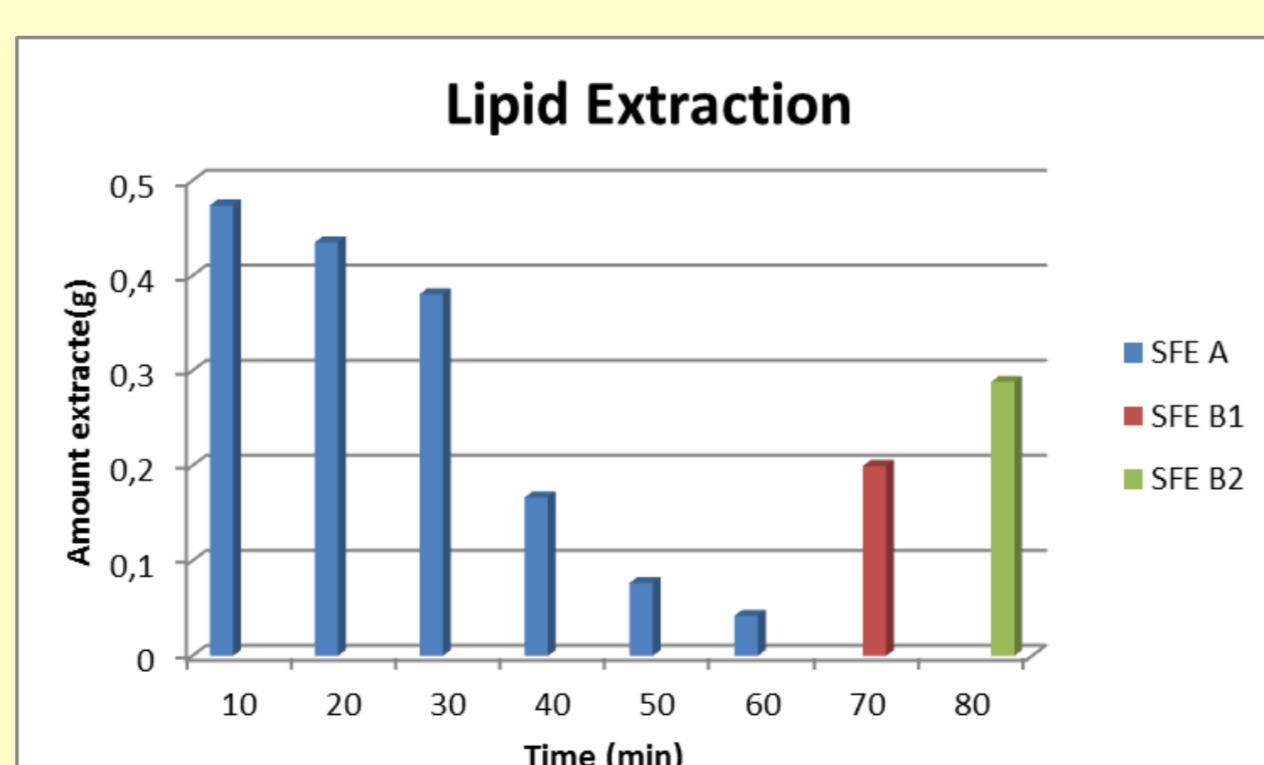
Extraction yield

The extractability of lipophilic compounds measured as amount extracted (g) varied as function of pressure and temperature. Addition of a polar modifier resulted in extraction of more amphiphilic compounds as phospholipids to the oil.

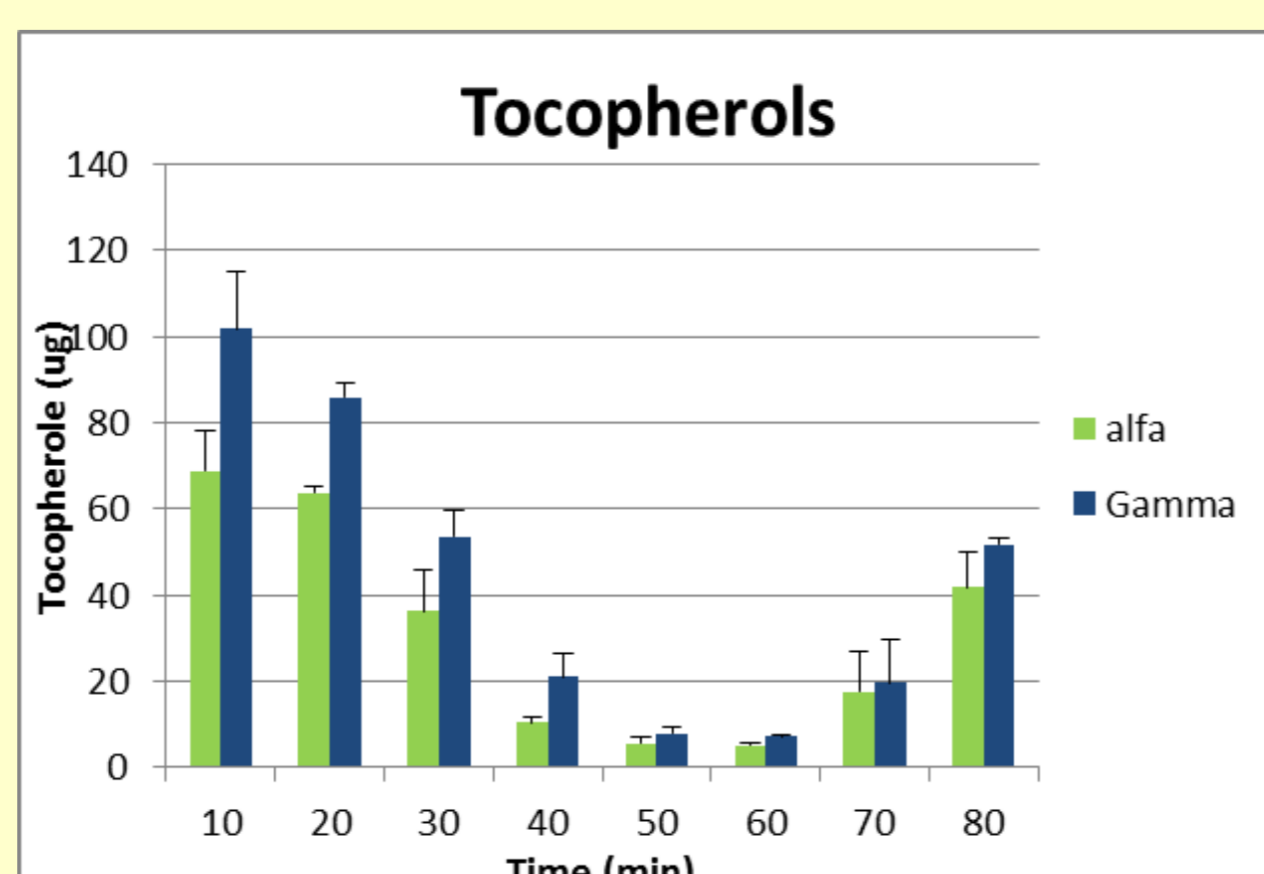


Effect of extraction time

SFE A: After 60 min. at 300 bar, 40° C the extraction is very low.
 SFE B1: Addition of ethanol as modifier leads to extraction of phospholipids
 SFE B2: Increased pressure and temperature extracts additional phospholipids (500 bar, 80 C)



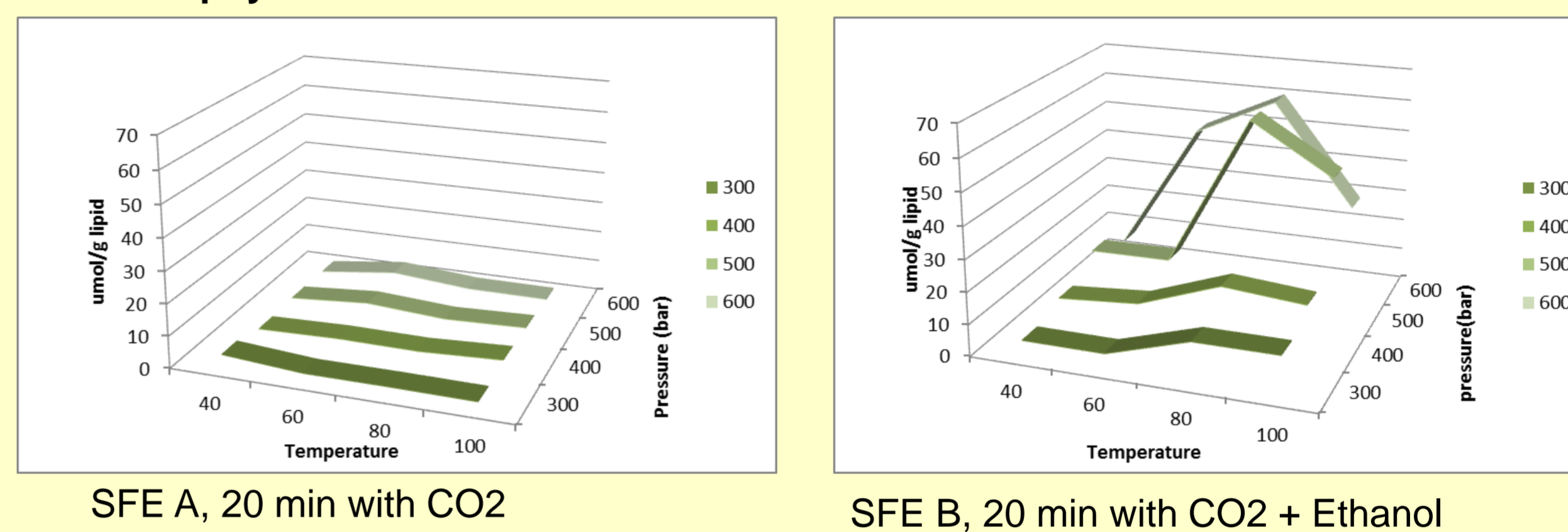
The extractability of antioxidants, tocopherols and carotenoids follows the extraction of TAGs, with the majority being extracted after 20 min. However, as seen from the TAG profile, not all TAGs were extracted after 60 min., they also appeared in the extraction fractions after 70 and 80 min.



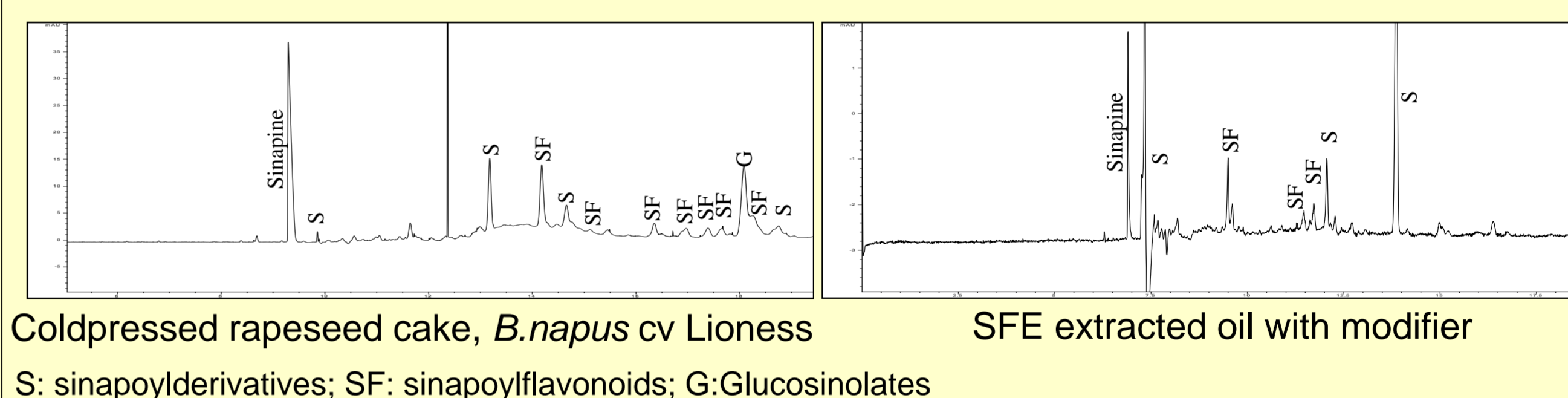
Sinapoyl derivatives

Rapeseed is rich in sinapine and other sinapoyl derivatives. During oilpressing the majority of sinapoyl derivatives stays in the rapeseed cake due to hydrophilic properties. Using SFE with or without modifier enables product tailoring with varying amounts of structurally different compounds extracted into the oil or left in the protein-fibre extraction residues.

Total sinapoyl derivatives determined from UV detection at 330 nm



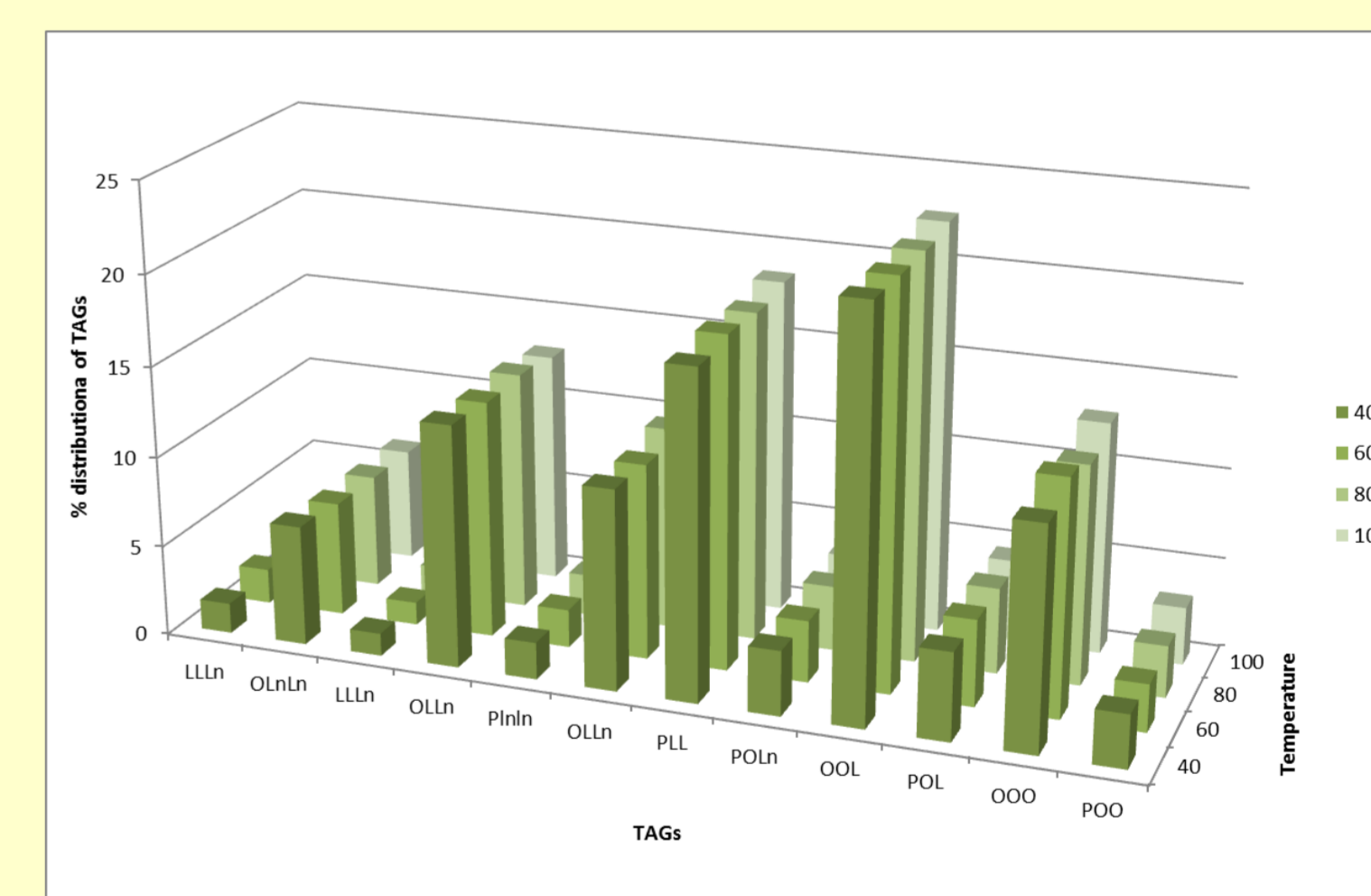
Profile of sinapoyl derivatives determined from MECC



TAG profile by EFLC

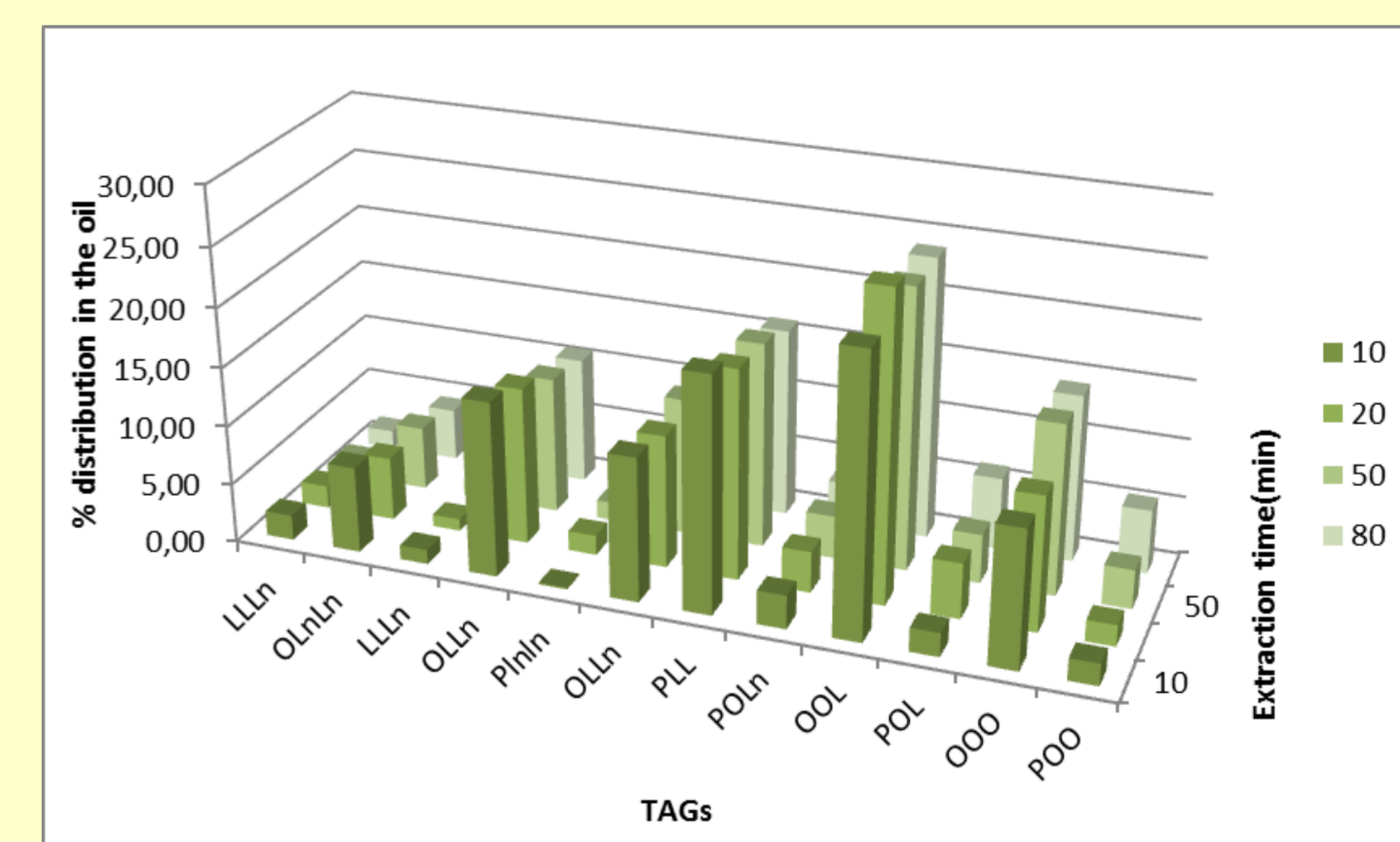
Enhanced fluid liquid chromatography (EFLC) is an analytical method lying in the region between SFC (supercritical fluid chromatography) and HPLC. EFLC uses a modifier phase accounting for 20-70% supplemented with supercritical carbon dioxide.

Distribution and contents of individual native triacylglyceroles (TAGs) from the different SFE oils were determined by EFLC. The extractability of the different TAGs were found to be comparable for of the investigated extraction conditions resulting in similar TAG profiles for all oils from the *B. napus* L cv Lioness seed oil. Application of modifier resulted in extraction of phospholipids and residual TAGs



Composition of TAG in rapeseed oil extracted at 300 bar at varying different temperatures, analysed with EFLC with UV and ELSD detection. The mobile phase was 30% CO₂ and 70 % buffer (80% acetonitrile, 20% 2-propanol)

P: palmitic acid; O: oleic acid; L: linoleic acid; Ln: linolenic acid



Effect of extraction time on TAG composition. Processing conditions as described in "Effect of extraction time"

Conclusions

SFE gives opportunities for creating high quality oil, with possibilities for tailoring the composition of the lipophilic product.