Effect of Oil Extraction Method on Oil Quality and Oxidative Stability

Katarzyna Ratusz, Paula Karwacka, Edyta Symoniuk, Małgorzata Wroniak
Department of Food Technology, Faculty of Food Sciences,
Warsaw University of Life Sciences Nowoursynowska St. 166, 02-787 Warsaw, Poland,

The increase in consumer interest in oils with high health-promoting values, observed in recent years, has contributed to the development of the market for these products. Increasingly, less traditional technologies are used to produce such health-promoting oils. On the Polish market, apart from cold-pressed oils, oils extracted with supercritical carbon dioxide are increasingly common.

The aim of study

The aim of this study was to compare the quality and oxidative stability of oils from three batches of flax seeds obtained by cold pressing and supercritical extraction with carbon dioxide.

Material and methods

The research material consisted of oils from three batches of flaxseeds, cold-pressed (C1, C2, C3) and extracted with supercritical carbon dioxide (E1, E2, E3, respectively). In the tested and compared oils, the most important indicators of their quality were determined:

- fatty acid composition, GC (ISO 5508:1996, ISO 5509:2001),
- acid value (ISO 660:2010),
- peroxide value (ISO 3960:2009),
- anisidine value (AOCS Cd 18-90),
- Totox index, (ISO 6885:2001),
- content of conjugated dienes and trienes (ISO 3656:2002),
- content of carotenoids (BS 684-2020) and chlorophylls (AOCS Cc 13i-96),
- oxidation induction time using the Rancimat test (3g, 20l/h, 70-100°C),(ISO 6886:1997)

Table 1. Characteristic fatty values of linseed oils

Sample	AV [mg KOH/g]	PV [mEq O_2/kg]	AnV	Totox
C1	0,8 ± 0,1	1,2 ± 0,1	0,88 ± 0,05	3,3
C2	0,8 ± 0,1	2,7 ±0,1	0,50 ± 0,06	5,9
C3	< 4,0* 1,2 ± 0,1	<15,0* 1,1 ±0,1	0,47 ± 0,08	2,7
E1	1,2 ± 0,2	0,9 ±0,1	0,47 ± 0,07	2,3
E2	1,7 ± 0,1	1,5 ±0,2	0,54 ± 0,03	3,5
E3	2,0 ± 0,2	1,8 ±0,2	0,57 ± 0,04	4,2

*Codex Alimentarius (2009): FAO/WHO: Codex standard for named vegetable oils. Codex ALINORM 09/32/17;

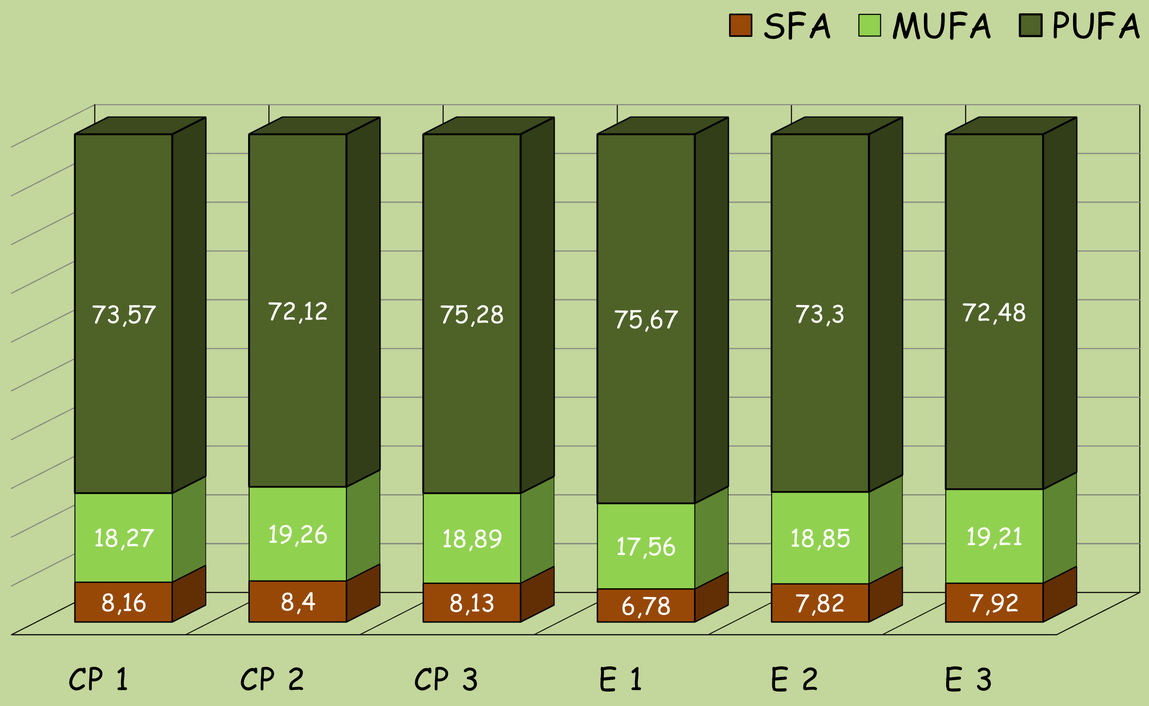

Figure 1. Fatty acids profile

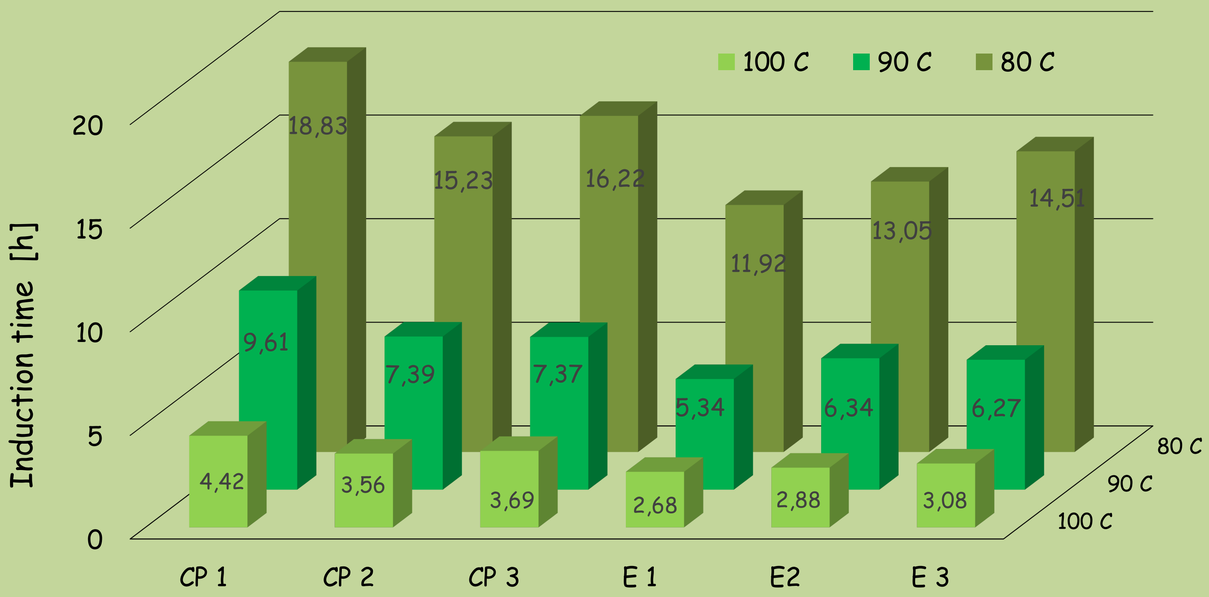

Figure 2. Induction time of cold pressed (CP) and extracted with supercritical carbon dioxide (E) flaxeed oils (by Rancimat method in 80, 90, 100 ^0C)

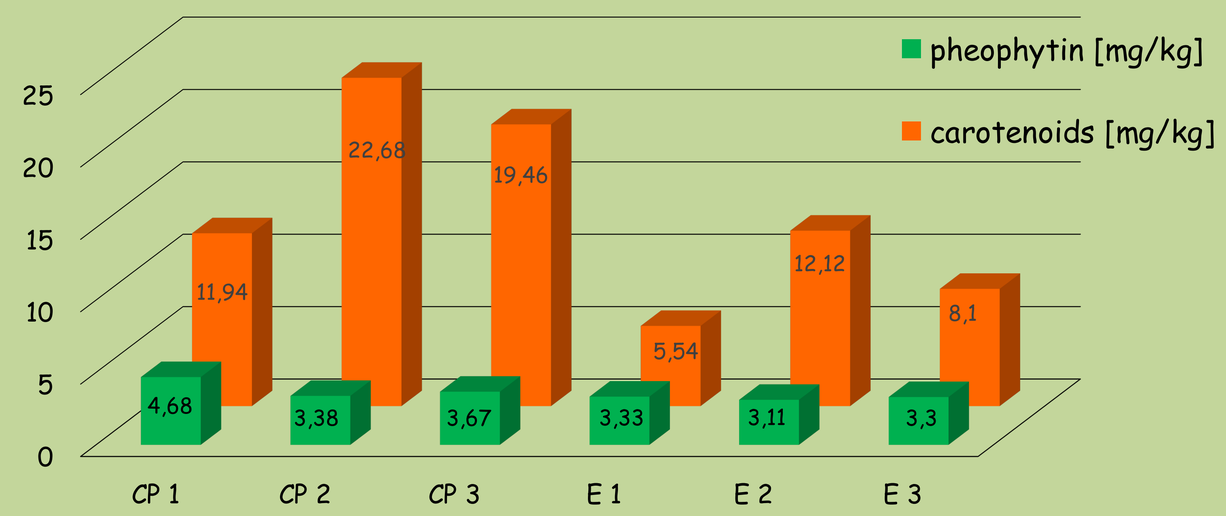

Figure 3. Carrotenoids and pheophytin a content

Summary

1. All oils analysed met the Codex Alimentarius requirements for Acid Value (4 mg KOH/g) and Peroxide Value (15 mEq O_2/kg). Cold pressed linseed oils were characterized by a lower acid value than their extracted counterparts. However, the method of extracting linseed oil had no influence on the value of its peroxide value, anisidine value and TOTOX index, and thus on the degree of oxidative changes (table 1). This was confirmed by the analysis of the content of conjugated dienes and trienes.
2. The fatty acid composition of cold-pressed linseed oils did not differ statistically from the oils extracted with supercritical carbon dioxide from the same batch of seeds (figure 1).
3. Flaxseed oils obtained by pressing showed higher oxidative stability than extracted ones. Tested cold pressed linseed oils had longer oxidation induction times than their extracted counterparts (figure 2).
4. Cold-pressed linseed oils contained more carotenoids than those extracted with carbon dioxide. However, no influence of the oil extraction method on the content of chlorophyll dyes was found (figure 3).