

ANALYSIS OF FATTY ACIDS IN SELECTED MACEDONIAN EDIBLE OILS

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Introduction

The fatty acid composition is different in different edible oils, depending on the type of seeds, variety, state of ripeness, area in which the plants are grown, climate conditions. In general, fatty acids are classified according to their degree of saturation: saturated or unsaturated with one double bond (mono-unsaturated) or more than one double bond (poly-unsaturated). The major unsaturated fatty acids are oleic acid (OA), linoleic acid (LA) and α -linolenic acid (ALA). An even number of carbon atoms, from 16 to 18, with a single carboxyl group, are the most common fatty acids present in vegetable oils.

✓This study reports data on the fatty acid composition in Macedonian edible oils determined for the first time after derivatisation with BF_3 -methanolic solution and quantified with GC-FID.

Materials and Methods

Oil samples

Sunflower, pumpkin seed, flax seed, rapeseed and sesame seeds produced in 2014.

Fatty acids derivatization

➤ 20 mg oil sample + 1 mL $\text{C}_{15}:0$ (IS) dried under N_2 . Residue redissolved in 6 mL 0.5M methanolic NaOH solution, shaken on a magnetic stirrer, at 80 °C, 30 min.

➤ 6 mL BF_3 -methanol solution added. Shaken again on a magnetic stirrer at 80 °C for 15 min.

➤ 10 mL H_2O and 10 mL heptane added, 10 min shaking on a magnetic stirrer and 1-2 min vortexing [1].

GC-FID analysis

HP 5890 GC-FID instrument

HP Innowax (30 m x 0.32 mm I.D.) capillary column, $\mu\text{O}.25$ m

Temperature programme: 1 min isothermal at 50 °C, 8°C/min to 140 °C followed by a temperature ramp of 8 °C/min to 240 °C (10 min)

Injector temperature: 220°C

Temperature of the detector : 260 °C [1]

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Results

✓Unsaturated fatty acids were dominant in all oils (Table 1). Rapeseed oil contained the highest percentage.

✓In terms of variety, α -linolenic acid ($\text{C}_{18}:3$) was the main unsaturated FA in flax seed oil, oleic acid ($\text{C}_{18}:1$) dominated in rapeseed and sesame oils and linoleic acid ($\text{C}_{18}:2$) was the dominant compound in sunflower and pumpkin seed oils.

✓Sunflower and pumpkin seed oils contained the saturated myristic acid ($\text{C}_{14}:0$) in same percentage (0.07 % of total FA), whereas myristic acid could not be identified in the other investigated oil samples [1].

Table 1. Fatty acids percent composition of different oil samples

FATTY ACIDS (%)	OIL SAMPLES				
	Flax seed	Rapeseed	Sesame	Sunflower	Pumpkin seed
C14:0	0.00	0.00	0.00	0.07	0.07
C14:1	0.00	0.00	0.00	0.00	0.00
C16:0	5.70	5.15	10.2	7.31	7.79
C16:1	0.07	0.22	0.09	0.09	0.09
C18:0	4.61	1.66	5.42	3.75	3.78
C18:1	17.8	65.3	43.0	29.5	28.7
C18:2	15.6	19.8	41.1	59.2	59.5
C18:3	56.2	7.86	0.14	0.07	0.09
Saturated	10.3	6.81	11.1	11.6	15.6
Unsaturated	89.7	93.2	88.9	88.4	84.4

Principal component analysis (PCA)

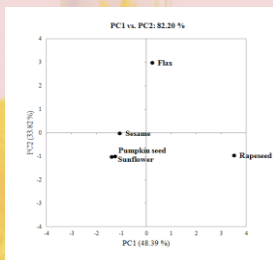


Figure 1. Classification of oils samples analysed in function of PC1 and PC2

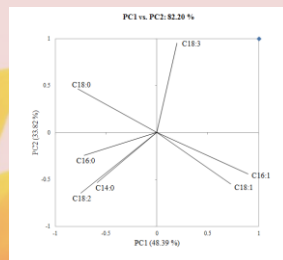


Figure 2. PCA loadings of all analysed fatty acids in samples

Conclusion

Palmitic acid ($\text{C}_{16}:0$) and stearic acid ($\text{C}_{18}:0$) were common in all oils. Oleic acid ($\text{C}_{18}:1$), linoleic acid ($\text{C}_{18}:2$) and α -linolenic acid ($\text{C}_{18}:3$) were dominant within the unsaturated FAs of all oils. Myristic acid ($\text{C}_{14}:0$) was present only in the sunflower and pumpkin seed oil in low amounts.

References

[1] Ivanova-Petropulos V, Mitrev S, Stafilov T, Markova N, Leitner E, Lankmayr E, Siegmund B. Characterization of fatty acid composition and volatile aroma profile of selected Macedonian edible oils, *Food Research International*, submitted for publication.