# FATTY ACID COMPOSITION OF EDIBLE OILS AND FATS

Vesna Kostik[1*], Shaban Memeti[1], Biljana Bauer[2]

[1*]Institute of Public Health of Republic of Macedonia

[2]Institute of Pharmacognosy, Faculty of Pharmacy, Ss. Cyril and Methodius University

SKOPJE SEPTEMBER 2013

Conference in Food Quality and Safety and Hygienic Engineering and Design 2013 Macedonia

## ✓ Introduction

- Edible oils and fats are biological mixtures of plant origin consisting of ester mixtures derived from glycerol with chain of fatty acids.
- The rate of unsaturated to saturated fatty acids in edible oils and fats is very important for human nutrition. While high levels of saturated fatty acids is desirable to increase oil stability, on the other hand nutritionally they become undesirable, because high levels of saturated fatty acids are frequently considered to have influence in increasing the concentration of low density lipoproteins (LDL), affecting the ratio of LDL to HDL (high density lipoproteins), promoting clothing and vascular smooth muscle proliferation.

## ✓ Objective of the study

- The main objective of this work was to identify the fatty acid composition of several vegetables oils and fats obtained from the market, in order to improve understanding of the oil quality, stability and applicability for human nutrition.

## ✓ Samples

- Samples of twelve different varieties of vegetable oils and fats as: coconut fat (7 samples), corn oil (10 samples), cottonseed fat (6 samples), linseed oil (8 samples), palm kernel fat (7 samples), olive oil (10 samples), soybean oil (5 samples), sunflower seed oil (15 samples), safflower oil (5 samples), canola oil variety 1 (20 samples); canola oil variety 2 (21 samples) and peanut oil (7 samples) were collected from the local market during the period between May 2012 to April 2013.

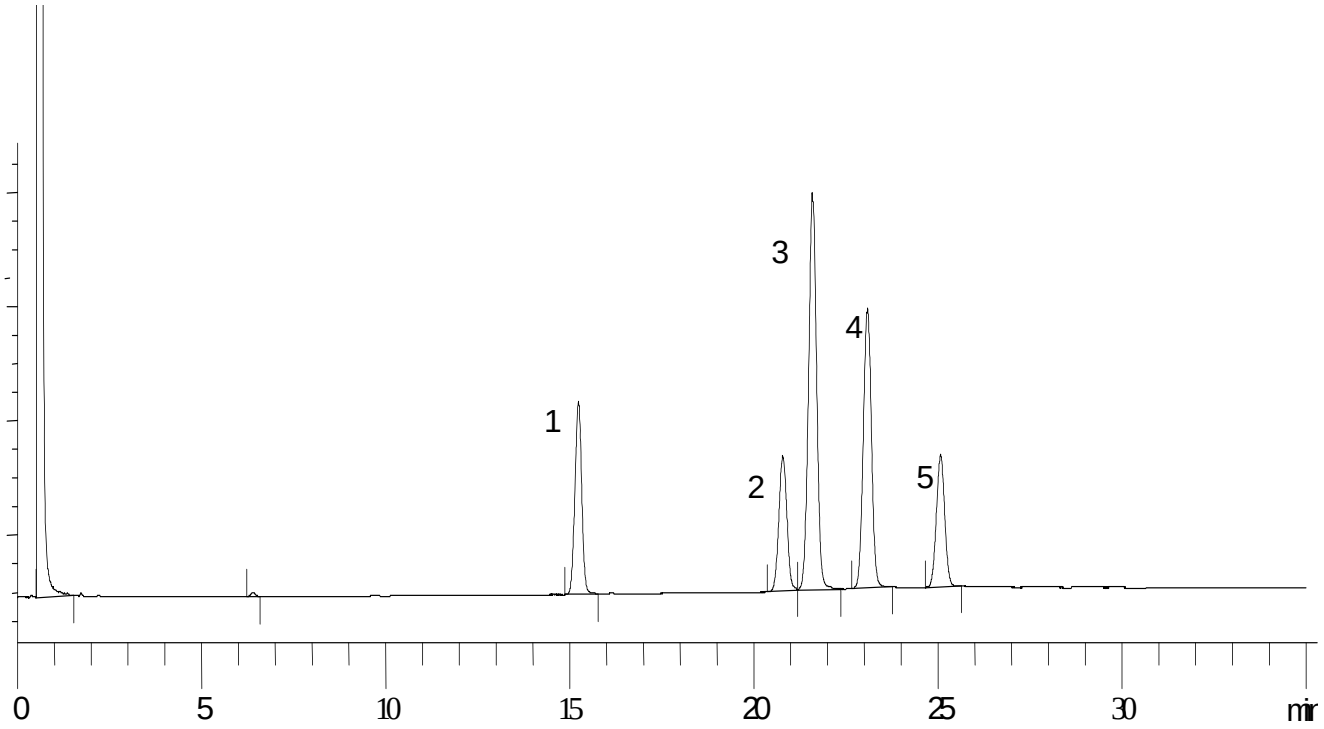
## ✓ Methods

- Fatty acid (FA) composition of the oils and fats was determined as their corresponding methyl esters, which were analyzed using gas chromatography (GC) with a flame-ionization detector (FID).

- Table 1. Instrumental conditions

- Column: polar a polyethylene glycol TPA modified polar column commercially available as HP-FFAP (25 m x 0.32 mm id x 0.52 mm )
- Carrier gas (nitrogen) flow rate - 1.5 mL· $min^{-1}$
- Split ratio - 1:10
- Injection port - 230 $^0$C
- FID - 260 $^0$C
- Oven program: 180 $^0$C (5 minutes) increasing for 2 $^0$C ·$min^{-1}$. The final oven temperature was maintained at 230 $^0$C (10 minutes).

# Chromatogram of some major fatty acids on HP-FFAP column




Chromatogram of fatty acids in standard oil on HP-FFAP
1. C16:0; 2. C18:0; 3. C18:1; 4. C18:2; 5. C18:3

# Chromatogram of some fatty acids on on SPB™-1 column

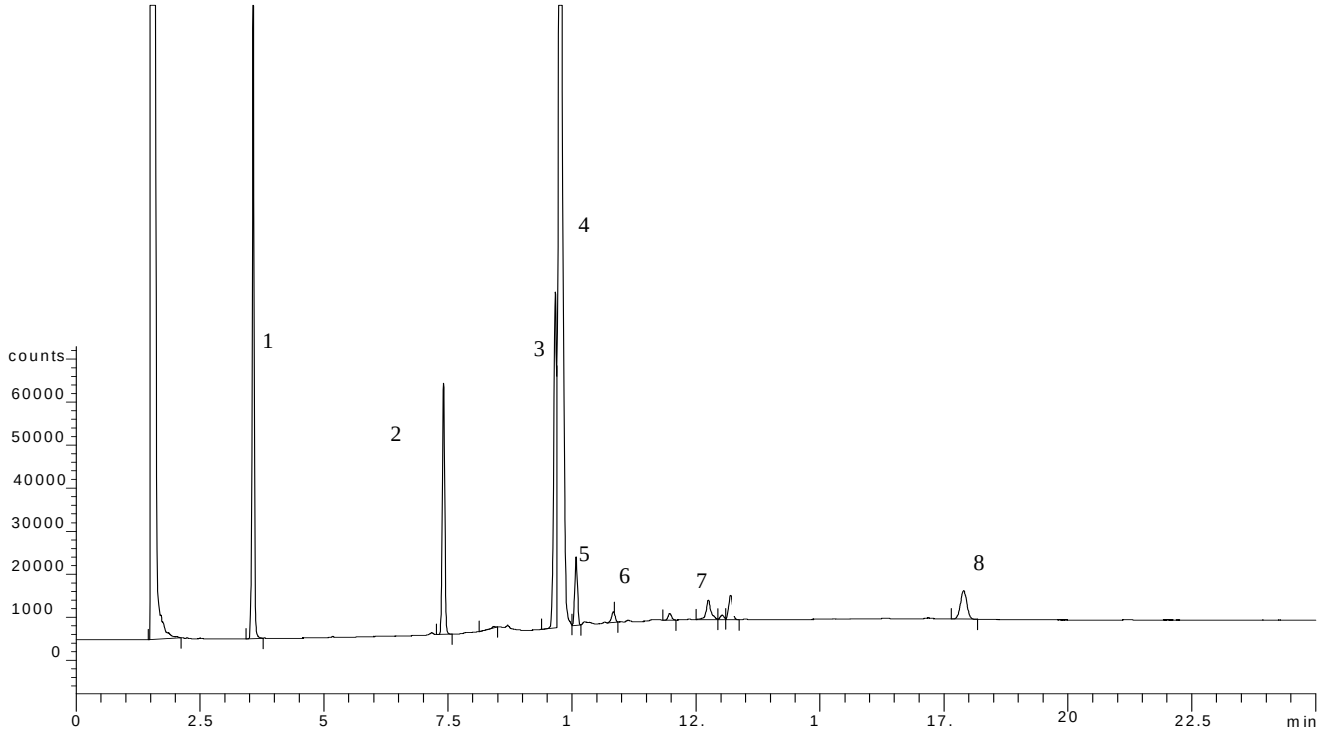



**Figure 1. Chromatogram of fatty acids in peanut oil on SPB™-1**
**1. lauric acid ($C_{12:0}$); 2. palmitic acid ($C_{16:0}$); , 3. linoleic acid ($C_{18:2}$); 4. oleic acid ($C_{18:1}$); 5. stearic acid ($C_{18:0}$); 6. arachidic acid ($C_{20:0}$); 7. behenic acid ($C_{22:1}$); 8. lignoceric acid ($C_{24:0}$)**

## ✓ Results

Determination of fatty acids

- The content of following saturated and unsaturated fatty acids was tested in the samples : caproic acid ($C_{6:0}$), caprylic acid ($C_{8:0}$), capric acid ($C_{10:0}$), lauric acid ($C_{12:0}$), myristic acid ($C_{14:0}$), palmitic acid ($C_{16:0}$), stearic acid ($C_{18:0}$), arachidic acid ($C_{20:0}$), behenic acid ($C_{22:0}$) , lignoceric acid ($C_{24:0}$), oleic acid ($C_{18:1}$), linoleic ($C_{18:2}$) and linolenic acid ($C_{18:3}$).

The mean of total saturated fatty acid (SFA), monounsaturated fatty acids (MFA), polyunsaturated fatty acids (PUFA) and the values of polyunsaturated/saturated indexes (P/S) are shown in Table 2 and Table 3 , respectively.

Table 2. The content of SFA and MUFA (% w/w) in different types of vegetable oils and fats

| Type of Oil/Fat | SFA (%) Mean ±SD | MUFA (%) Mean ± SD |
|---|---|---|
| Coconut (n = 7) | 90.5 ± 2.95 | 8.8 ± 0.85 |
| Corn (n =10) | 25.1 ± 1.8 | 26.8 ± 1.2 |
| Cottonseed (n = 6) | 22.4 ± 1.22 | 35.4 ± 2.4 |
| Linseed (n = 8) | 9.65 ± 1.05 | 22.1 ± 1.5 |
| Palm Kernel (n = 7) | 76 ± 1.95 | 22.5 ± 2.2 |
| Olive (n = 10) | 14.35 ± 1.9 | 78.4 ± 4.3 |
| Soybean (n = 5) | 13.5 ± 0.93 | 28.5 ± 1.2 |
| Sunflower seed (n = 15) | 8.8_± 0.8 | 31.5 ± 4.5 |
| Peanut (n = 7) | 19.2 ± 0.37 | 58.5 ± 5.8 |
| Safflower (n = 5) | 7.2 ± 0.73 | 16.6 ± 4.5 |
| Canola variety 1 (n = 20) | 9.6 ± 0.56 | 59.5 ± 1.907 |
| Canola variety 2 (n = 21) | 17.4 ± 0.67 | 23.2 ± 2.9 |

Table 3. The content of PUFA (% w/w) and the values of P/S indexes in different types of vegetable oils and fats

| Type of Oil/Fat | PUFA (%) Mean ± SD | P/S index |
|---|---|---|
| Coconut (n =7) | 0.5 ± 0.02 | 0.005 |
| Corn (n =10) | 48 ± 4.5 | 1.91 |
| Cottonseed (n = 6) | 42 ± 4.8 | 1.87 |
| Linseed (n = 8) | 68 ± 2.9 | 7.05 |
| Palm Kernel (n = 7) | 1.25 ± 0.55 | 0.016 |
| Olive (n =10) | 7.0 ± 3.3 | 0.49 |
| Soybean (n = 5) | 57.5 ± 2.2 | 4.26 |
| Sunflower seed (n = 15) | 59.5 ± 7.5 | 6.76 |
| Peanut (n = 7) | 20 ± 2.7 | 1.04 |
| Safflower (n = 5) | 76 ± 3 | 10.55 |
| Canola variety 1 (n = 20) | 30.7 ± 1.7 | 3.2 |
| Canola variety 2 (n = 21) | 59.2 ± 1.1 | 3.4 |

## ✓ Conclusion

- The results from this study, showed that the percentage of the total SFA ranged from 7.2% ± 0.73 for safflower oil to 90.5% ± 2.95 for coconut fat, with the predominant presence of lauiric acid ($C_{12:0}$) and myristic acid ($C_{14:0}$).
- Corn oil showed the similar content of PUFA (48.0% ± 4.5) as soybean oil (57.5% ± 2.2), which was in accordance with literature data [4]. Sunflower seed oil also showed high PUFA content (59.5% ± 7.5).
- The value of P/S index which is associated to the impact in the human health is also high for safflower (10.55) and sunflower oil (6.76), which makes them the most suitable edible oils for mass consumption.

# THANK YOU
# FOR YOUR ATTENTION