4ª REUNIÃO ANUAL PORTFIR

LIPID PROFILE OF TRADITIONAL FOODS FROM BLACK SEA AREA COUNTRIES

Tânia G. Albuquerque[1], Ana Sanches-Silva[1], Paul Finglas[2], Effie Vasilopoulou[3], Antonia Trichopoulou[3,4], Iordanka Alexieva[5], Katerina Fedosova[6], Zaza Kilasonia[7], Bike Kocaoglu[8], Nelya V. Koval[9], Alexandra Krechetnikova[10], Rodica Pamfilie[11], Filippo D'Antuono[12], Helena S. Costa[1]

[1] Departamento de Alimentação e Nutrição, Instituto Nacional de Saúde Doutor Ricardo Jorge, I.P.; [2] Institute of Food Research, Norwich Research Park, Colney, Norwich, NR47UA, United Kingdom; [3] Dept. of Hygiene, Epidemiology & Medical Statistics, Medical School, University of Athens, Greece; [4] Hellenic Health Foundation, Greece; [5] University of Food Technologies, Plovdiv, Bulgaria; [6] Department of Nutrition, Odessa National Academy of Food Technologies, Odessa, Ukraine; [7] Elkana, Biological Farming Association, Tbilisi, Georgia; [8] T C Yeditepe University, Istanbul, Turkey; [9] UzhNU (Uzhhorod National University), Uzhhorod, Ukraine; [10] State Educational Institution of the High Professional Education "Moscow State University of Food Productions", Russian Federation; [11] The Bucharest University of Economics, Romania; [12] Campus of Food Science, Cesena, University of Bologna, Italy.

E-mail: tania.albuquerque@insa.min-saude.pt

INTRODUCTION

This work was performed within the collaborative research program "Sustainable exploitation of bioactive components from the Black Sea Area (BSA) traditional foods – BaSeFood". In most of the BSA countries, there is a lack of information on the nutritional composition of traditional foods, therefore, nutritional research on such foods is of great importance. Phytosterols (PS) are bioactive compounds of many foodstuffs, especially in food items of plant origin. PS are known to have several bioactive properties with various implications on human health. Also, the consumption of fatty acids (FA) is important because it can be associated with both negative and beneficial health effects, depending on the FA. The aim of this study was to analyse the total fat, PS and FA profile of 33 traditional foods.

Figure 1. (A) Example of samples received from BSAC. (B) Homogenization in a blender. (C) Example of a sample (halva) after homogenization. (D) Packaging of samples. (E) and (F) Boil and filtration for total fat determination. (G) Gas chromatograph.

MATERIALS AND METHODS

TOTAL FAT

0.2 - 10 g of sample
+
75 mL ultra-pure water
+
45 mL HCl (37%)
↓
Boil for 20 min (Figure 1E)
↓
Filtration (Figure 1F)
↓
Extraction using a Soxhlet, with petroleum ether
↓
Residue was dried until constant weight

INDIVIDUAL FATTY ACIDS

0.2 - 0.5 g of sample
+
2 mL toluene
+
3 mL methanolic HCl
↓
Water bath (70 °C, for 2 h)
+
5 mL K_2CO_3
+
1 mL toluene
↓
Centrifugation
↓
Filtration
↓
Injection into chromatographic system

Chromatographic conditions

Equipment: HP 6890 N (Figure 1 G)
Column: HP-88 column (100 m x 0.25 mm i.d., 0.25 µm)
Detector: MS
Injection volume: 1.0 µL
Carrier gas: Helium

PHYTOSTEROLS and α-TOCOPHEROL

0.2 g of sample
+
2 mL ethanolic KOH
↓
Water bath (85 °C, 30 min)
↓
Centrifugation
↓
Upper layer was separated and evaporated to dryness under nitrogen
↓
Residue was derivatized with 200 µL of BSTFA:TMCS

Chromatographic conditions

Equipment: HP 6890 N (Figure 1 G)
Column: J&W DB-5 MS column (30 m × 0.25 mm i.d., 0.25 µm)
Detector: FID
Injection volume: 2.0 µL
Flow: 1.0 mL/min

RESULTS

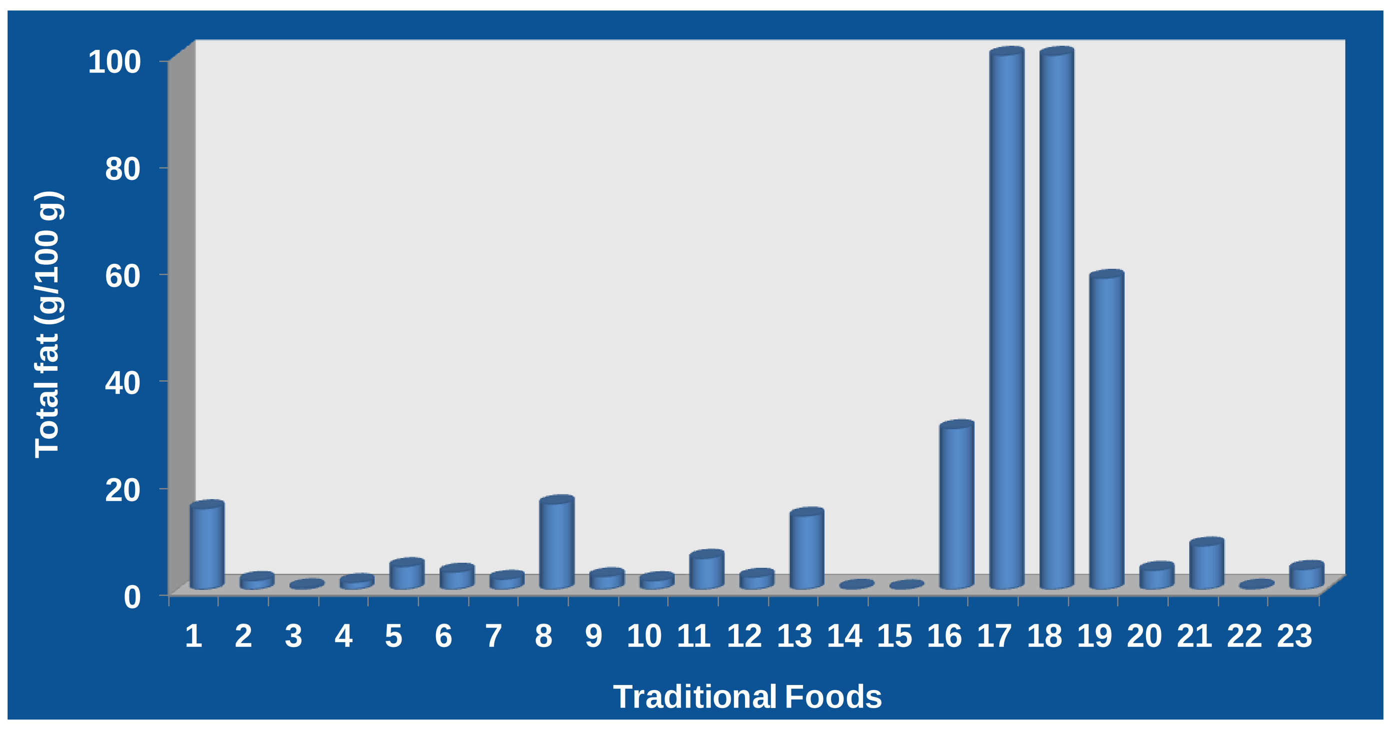
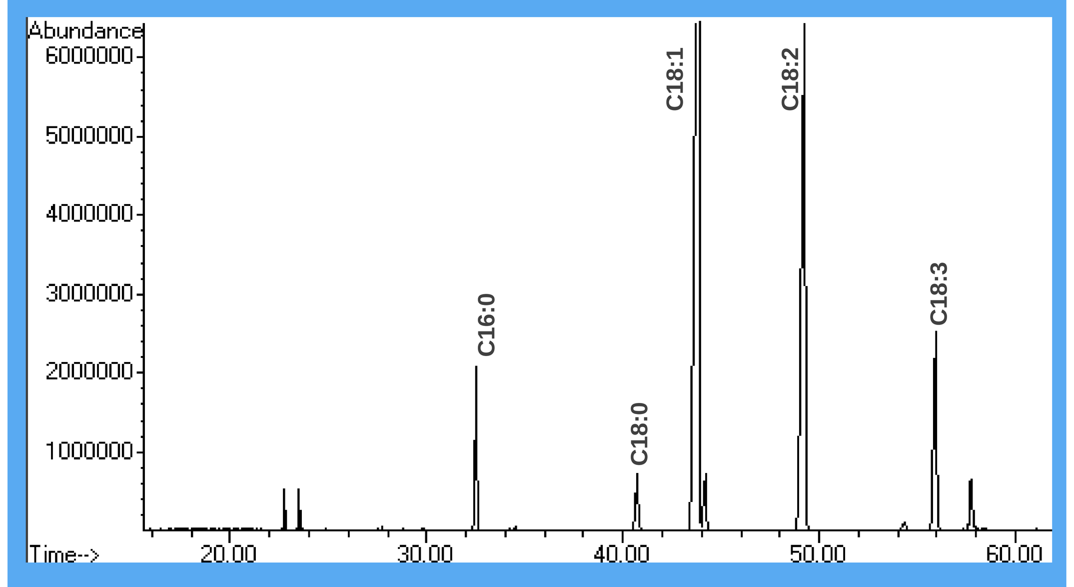


Figure 2. Total fat content of traditional foods from BSAC.

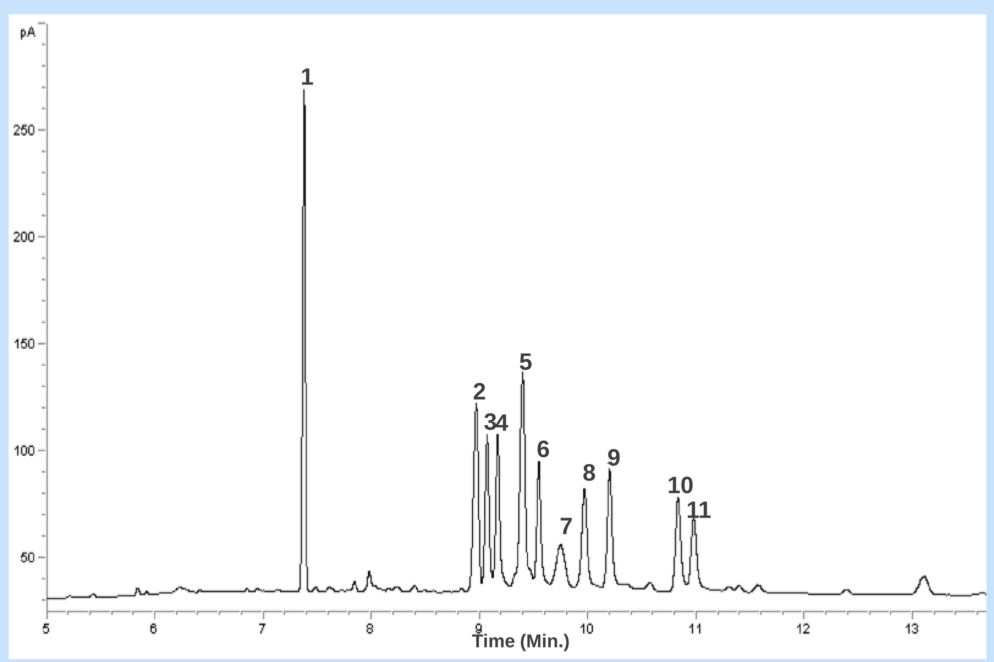
1 - Baked layers of pastry stuffed with pumpkin; 2 - Tsiteli Doli Bread; 3 - Cornmeal mush; 4 - Buckwheat porridge crumby; 5 - Bulgur pilaf; 6 - Sour rye bread; 7 - Rodopian dried beans; 8 - Nettles with walnut sauce; 9 - Nettle sour soup; 10 - Kale soup; 11 - Transcarpathian green borsch; 12 - Ukrainian borsch; 13 - Churchkhela; 14 - Plums jam; 15 - Uzvar; 16 - Halva; 17 - Flax oil; 18 - Mustard oil; 19 - Roasted sunflower seeds; 20 - Herbal dish; 21 – Cottage cheese with dill and garlic; 22 - Millet ale; 23 - Sautéed pickled green beans

- Figure 2 shows the results on total fat content. As expected mustard oil and flax oil had the highest fat content (99.9 g/100 g of edible portion), followed by roasted sunflower seeds (58.2 g/100 g) and halva (30.1 g/100 g)
- Uzvar had the lowest content of fat (0.14 g/100 g of edible portion)
- 30% of the analysed traditional foods had total fat content lower than the limit of quantification (<0.1 g/100 g)
- The applied method for individual fatty acids determination in the 33 selected traditional foods, allowed the identification of 51 different fatty acids, including 11 *trans* fatty acids isomers
- Mustard oil had the highest content of oleic acid (C18:1) (Figure 3)
- Roasted sunflower seeds have the highest content of γ-linolenic acid (C18:3, n-6)
- Flax oil had the highest content of α-linolenic acid (C18:3, n-3)
- The analytical method for phytosterols determination by GC was developed and optimized. The best conditions are shown in the method description, and the analyses are being carried out. This analytical method allows the identification of 11 phytosterols and α-tocopherol (Figure 4).



Palmitic acid (C16:0); Stearic acid (C18:0) ; Oleic acid (C18:1); Linoleic acid (C18:2); γ-Linolenic acid (C18:3 n-6)

Figure 3. Chromatogram of mustard oil sample.



(1) 5 α-Cholestane; (2) α-Tocopherol; (3) Cholesterol; (4) Dihydrocholesterol; (5) Desmosterol + Brassicasterol; (6) Lathosterol; (7) Ergosterol; (8) Campesterol; (9) Stigmasterol; (10) β-Sitosterol; (11) Stigmastanol

Figure 4. Chromatogram of a standards mix of 11 phytosterols and vitamin E (α-Tocopherol).

CONCLUSION

Our results show that the total fat and individual fatty acids content varied among the analysed traditional foods. In general, the selected traditional foods from BSAC have lower fat contents, except for the oils and oilseeds group (samples 16, 17, 18 and 19). Nevertheless, food composition data is required to provide accurate dietary advice and to promote its consumption. Also, these foods can be considered good sources of MUFA and PUFA, since they have been associated with improved serum lipid concentrations and reduced risk of cardiovascular diseases.

ACKNOWLEDGEMENTS

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement n.º 227118.