RIBOFLAVIN CONTENT IN SELECTED TRADITIONAL FOODS FROM BLACK SEA AREA COUNTRIES

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BACKGROUND

Riboflavin (vitamin B_2) is an essential water-soluble vitamin present in a wide variety of foods, namely in milk, dairy products, cereal products, meat products and green leafy vegetables. The primary form of the vitamin is an integral component of the coenzymes flavin mononucleotide and flavin-adenine dinucleotide. It is in these bound coenzyme forms that riboflavin functions as a catalyst for redox reactions in numerous metabolic pathways and in energy production. The daily recommended allowance for riboflavin is 1.3 mg/day and 1.1 mg/day, for males and females, respectively [1]. Due to its unquestionable importance in human nutrition, riboflavin was determined in the selected traditional foods analysed in the frame of the European Project BaSeFood (Sustainable exploitation of bioactive components from the Black Sea Area traditional foods) [2].

MATERIALS AND METHODS

Riboflavin determination

The quantitative determination of vitamin B_2 was based on EN 14152:2003 method, an accredited method, by ISO/IEC/17025 [3]. The laboratory also participates successfully in proficiency testing schemes.
The samples were extracted after acid hydrolysis followed by dephosphorylation (with enzymatic treatment) and quantified by High Performance Liquid Chromatography with fluorescence detection.

Sample extraction

- Triplicate samples (2 to 10 g) were submitted to acid hydrolysis with HCl 0.1 M for 30 min in an autoclave at 121 ºC
- After cooling at room temperature, pH value was adjusted to 4.5 with sodium acetate 2.5 M and samples were submitted to an overnight enzymatic treatment at 37 ºC: takadiastase (0.25 g/sample) and β-amylase (0.05 g/sample) (Figure 1)
- After cooling at room temperature, the solutions were diluted to 100 mL with ultra pure water and filtered with 150 mm Ø filter paper (Figure 1)
- Extracts were filtered again through a 0.45 µm PET syringe filter

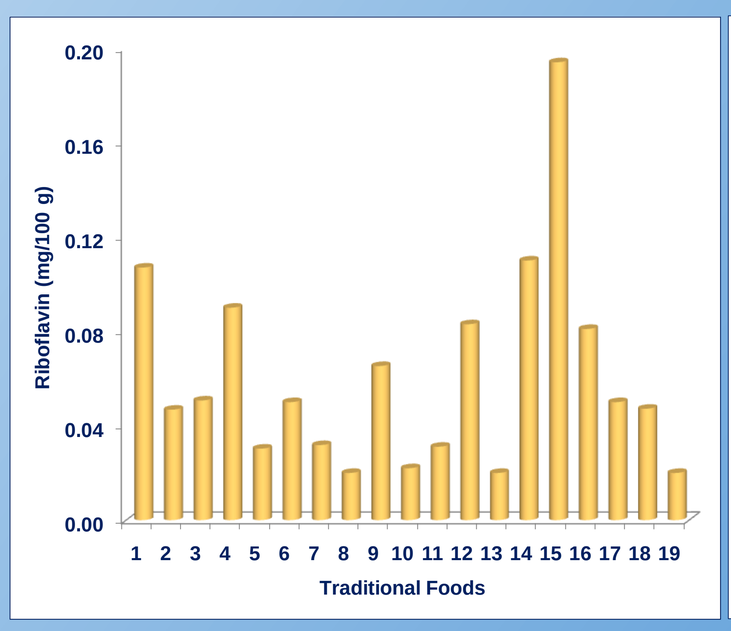
Chromatographic conditions

- ✓ Equipment: HPLC Waters 2695 Separations Module
- ✓ Detector: 2475 multi-wavelength fluorescence
- ✓ Column: Phenomenex Luna C18 (250 x 4.6 mm I.D., 5 µm particle size)
- ✓ Column temperature: 37 ºC
- ✓ Injection volume: 50 µL
- ✓ Flow rate: 1 mL/min
- ✓ Retention time: 10.3 min
- ✓ Detection: λ_{ex} = 422 nm and λ_{em} = 522 nm
- ✓ Mobile phase: 0.05 M acetate buffer + methanol (70:30, v/v)

Figure 1. Riboflavin extraction and quantification.
(A) and (B) Overnight incubation
(C), (D) and (E) Sample filtration
(F) Standard solutions of riboflavin
(G) HPLC equipment

RESULTS

Figure 2 shows the riboflavin content found in Traditional Foods from Black Sea Area countries. Roasted sunflower seeds presented the highest concentration of riboflavin (0.19 mg/100 g of edible portion) and approximately 42% of the analysed Traditional Foods had contents lower than the limit of quantification (<0.02 mg/100 g of edible portion). Chromatograms of (A) riboflavin standard solution and (B) Traditional food sample are illustrated in Figure 3.



Cereals and cereal based foods	1 – Baked layers of pastry stuffed with pumpkin 2 – Tsiteli Doli Bread 3 – Buckwheat porridge crumby 4 – Sour rye bread
Vegetables and vegetables based foods	5 – Rodopian dried beans 6 – Nettle sour soup 7 – Vegetable okroshka 8 – Kale soup 9 – Ukrainian borsch
Fruit or fruit based foods	10 – Churchkhela 11 – Plums jam 12 – Watermelon juice 13 – Fruit of the evergreen cherry laurel
Oilseeds or oilseed products	14 – Halva 15 – Roasted sunflower seeds
Herbs, spices and aromatic plants	16 – Wild plum sauce 17 – Herbal dish
Low or nonalcoholic fermented foods and beverages of plant origin	18 – Sautéed pickled green beans 19 – Sauerkraut

Figure 2. Riboflavin content (mg/100 g of edible portion) in Traditional Foods from Black Sea Area countries.

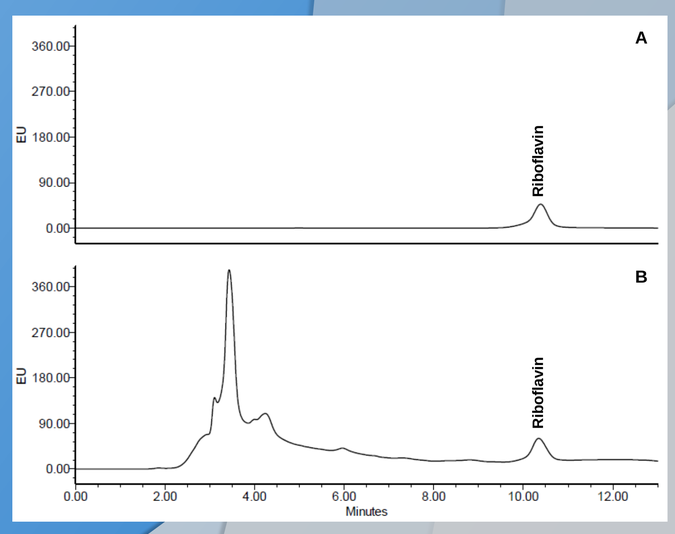


Figure 3. A - Chromatogram of a standard solution of riboflavin (0.080 µg/mL). B - Chromatogram of Churchkhela (0.064 µg/mL).

CONCLUSION

Our results show that 58% of the analysed Traditional Foods from Black Sea Area countries give a contribution to riboflavin dietary intake, especially the groups of oilseeds or oilseed products (roasted sunflower seeds and halva) and cereals and cereal based foods (baked layers of pastry stuffed with pumpkin and sour rye bread).

REFERENCES

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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.