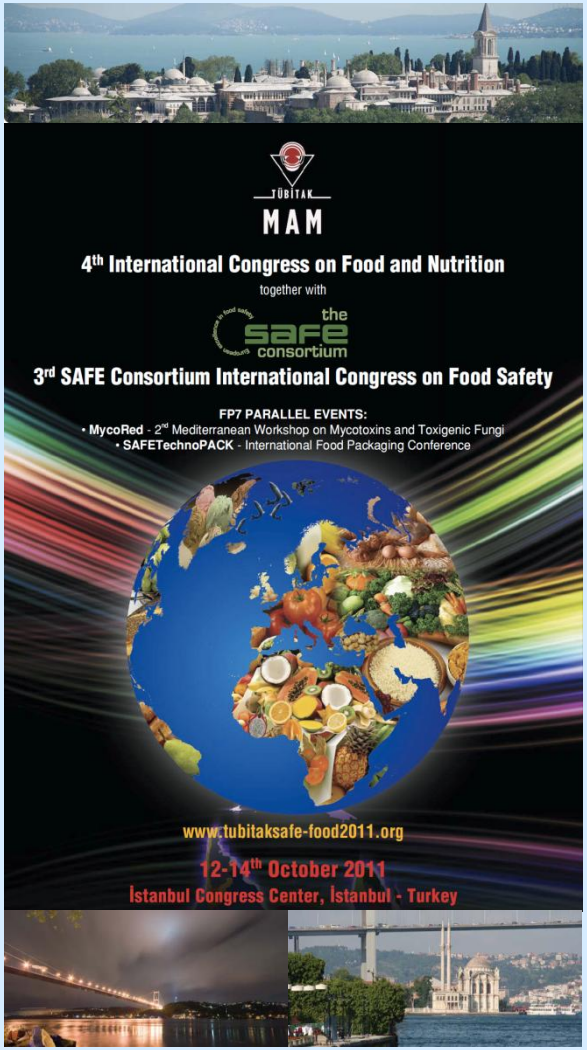


Traditional foods: a contribution to biodiversity and sustainable diets

Helena Soares Costa

National Institute of Health Dr. Ricardo Jorge (INSA), Portugal

helena.costa@insa.min-saude.pt

4th International Congress on Food and Nutrition
together with
3rd SAFE Consortium International Congress on Food Safety
12th to 14th October 2011, Istanbul, Turkey

Outline

EuroFIR and BaSeFood Projects

- Traditional foods
- Prioritisation of foods and components
- Selection of laboratories
- Nutritional composition
- Dissemination
- Output and benefits

EuroFIR

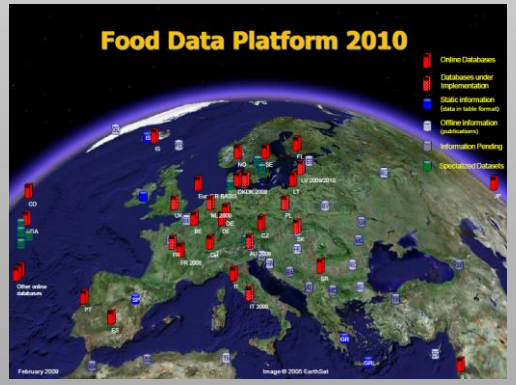
European Food Information Resource

European Food Information Resource Network project

Coordinator - Paul Finglas
Institute of Food Research (IFR) – United Kingdom

Network of Excellence (NoE) comprising of 48 partners from academia, research organisations and small-and-medium size enterprises (SMEs) in 27 countries.

Funded by the European Community's Sixth Framework Programme



http://www.eurofir.org/

EuroFIR
European Food Information Resource

EuroFIR AISBL

Your source of food information

Paul Finglas (Managing Director)
Simone Bell (Research and Development Manager)

EuroFIR AISBL

- International non-profit association based in Brussels
- Of food composition data compilers, experts and stakeholders
- Your source for best available food information
- All European food composition datasets
- Membership open for individuals or organisations

EuroFIR
European Food Information Resource

Unique range of standardised food information

28
Food composition databases online

> 50,000
Foods

> 13,000
Recipes

> 3,500
Branded foods

Specialised datasets (e.g. eBasis)

EuroFIR
European Food Information Resource

Why join EuroFIR AISBL

EuroFIR AISBL offers a single and unique food information resource to academia, industry, public sector funding bodies and regulators, as well as researchers, dietitians and students, who are all welcome to join the association as a member.

Apply for a free trial membership at:
www.eurofir.org

Traditional Foods

- Expression of culture, history and lifestyle
- Key elements that differentiate dietary patterns of each country
- Development and economic sustainability of rural areas
- Preservation of biodiversity
- Lack of nutrient data on traditional foods in most current national food composition table

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WP 2.3.1 Traditional Foods

Participating countries

WP-Leader

NOE Coordinator

WP 2.3.1 - Objectives

To define the term “traditional”

To establish a common methodology for the systematic investigation of traditional foods across Europe

To provide new data on the nutritional composition of traditional foods for inclusion in national food composition tables with representative raw ingredients and recipes

To develop dissemination material on traditional foods for each country

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Systematic Study of Traditional Foods

- Definition of the term “Traditional”
- Selection procedure of the Traditional Foods and recipes
- Recording and sampling of Traditional foods
- Laboratory selection
- Nutritional Composition of Traditional Foods

EuroFIR definition on Traditional Foods

TRADITIONAL

Means conforming to established practice or specifications prior to the Second World War.

TRADITIONAL FOOD

Is a food of a specific feature or features, which distinguish it clearly from other similar products of the same category in terms of the use:

- "traditional ingredients" (raw materials or primary foods)
- "traditional composition"
- "traditional type of production and / or processing method".

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Selection of Traditional Foods

DOCUMENTATION	PRIORITISATION	EVALUATION AND SELECTION
• Description of food • Documentation of traditional character • Consumption data • Availability or not of composition data • Coded references	• Traditional character • Availabilty and quality of composition data • Consumption data *"Frequent" or "Not frequent"* • Health implications • Marketing potential	• List of foods per country were evaluated • Prioritised list of traditional foods • 5 Traditional Foods per country were selected : Starter ➡ Two Main dishes ➡ Dessert ➡ Special traditional food

SELECTED TRADITIONAL FOODS PER COUNTRY

Austria Vegetable soup (National name: Gemüsesuppe) **Viennese Schnitzel** **(National name: Wiener Schnitzel – see opposite)** Cabbage and Noodles (National name: Krautfleckerl) Potato dumplings (National name: Erdäpfelknödel) Apple strudel (National name: Apfelstrudel)	
Belgium Shrimp croquette (Dutch name: garnaalkroket) Flemish stew (Dutch name: Vlaamse stoofkarbonnade) Meat loaf, meat balls (Dutch name: vleesbrood, vleesballetjes) Gratin of Belgian endives with ham and cheese sauce (Dutch name: gegratineerde hespenrolletjes met witloof en kaassaus) **Belgian (Brussels) waffles (Dutch name: Brusselse beslagwafel) – see opposite**	
Bulgaria Cold soup Tarator (National name: Tarator) Veal " Priest's " stew (National name: Teleshko " Popska" yahnia) **Nettles with rice (National name: Kopriva s oriz) – see opposite** Pepper relish (National name: Lyutenitsa) Pumpkin pastry (National name: Sladkish ot tikva)	

SELECTED TRADITIONAL FOODS PER COUNTRY

Denmark Patty shells with chicken and asparagus (National name: Tarteletter med høns i asparges) Hamburger steak (National name: Hakkebøf) Fried plaice (National name: Stegt rødspætte) Strawberry stew with cream (National name: Jordbærgrød med fløde) **Apple charlotte (National name: Æblekage) – see opposite**	
Germany **Smoked ham (Black forest) (National name: Schwarzwälder Schinken) – see opposite** Fried sausage from Thüringen (National name: Thüringer Rostbratwurst) German ravioli "Swabian" (National name: Maultaschen) Fruit loaf from Dresden (National name: Dresdener Stollen) Pumpernickel bread (National name: Pumpernikel Brot)	
Greece Leek sausages (National name: Loukanika me prasso) **Rabbit stew (National name: Kouneli stifado) – see opposite** Chickpea soup (National name: Revithia soupa) Must jelly (National name: Moustalevria) Small tomato of Santorini island (National name: Tomataki Santorinis)	

SELECTED TRADITIONAL FOODS PER COUNTRY

Poland Cold soup "chlodnik" (National name: chlodnik) Pork chop (National name: kotlet schabowy) Stewed dish made of sauerkraut, meat and mushrooms (National name: bigos) **Tree cake (National name: sekacz) – see opposite** Smoked ewe's milk cheese (National name: oscypek)	
Portugal Green cabbage soup (National name: Caldo verde) **Cod fish with chickpeas (National name: Bacalhau com grão) – see opposite** Portuguese boiled dinner – meat, sausages and vegetables (National name: Cozido à portuguesa) Roasted goat kid (National name: Cabrito assado) Egg and almond sweet from Murça (National name: Toucinho do céu de Murça)	
Spain Hot sauce of vegetables (National name: Mojo Picón) Thistles in almond sauce (National name: Cardo con salsa de almendras) Roasted pepper/aubergine salad (National name: Escalivada) **Galician octopus (National name: Pulpo Feira) – see opposite** Almond cake from the Alpujarra (National name: Soplillos alpujarreños)	

Turkey - Selected Traditional Foods

Baklava

Anchovy stew

hamsi buğulama

Iskender kebap

Pastırma

Tarhana

EuroFIR
European Food Information Resource

Recipe – Apple Strudel

1

2

3

4

EuroFIR
European Food Information Resource

Recipe – Apple Strudel

5

6

Recording of Recipe Preparation

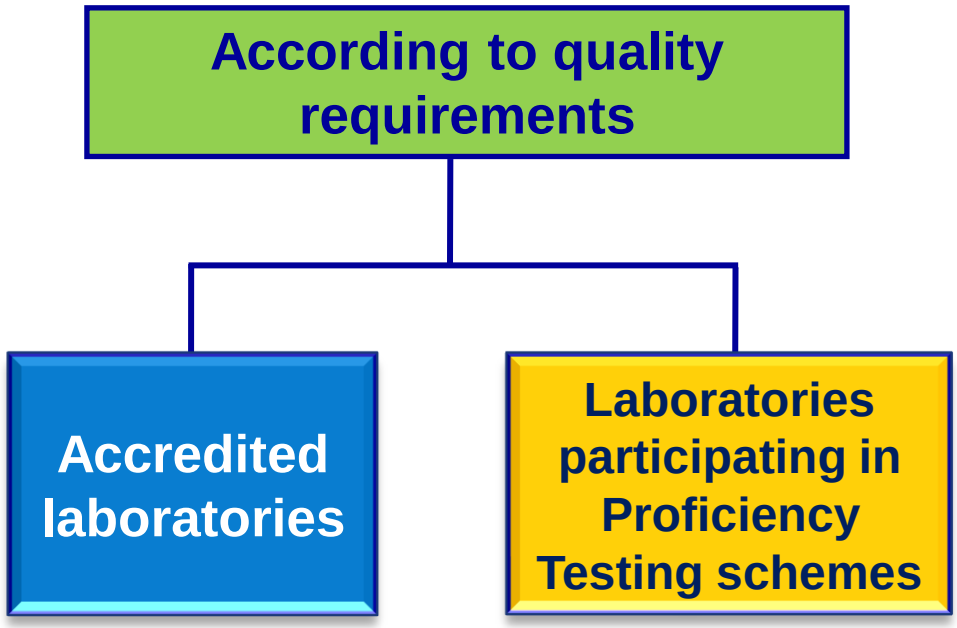
1. Italian Traditional Food:
   "Brasato al Barolo"- Braised beef in Barolo wine
   National Institute for Food and Nutrition Research (INRAN)
   Centro per lo Studio e la Prevenzione Oncologia (CSPO).

2. Spanish Traditional Food:
   "Soplillos de La Alpujarra"- Almond cakes from "La Alpujarra"
   University of Granada (UGR).


PREPARATION OF THE MARINADE

Laboratory Selection

Country	Selected Labs
Austria	WEJ, Kurz,Kuhlmann
Belgium	RUG
Bulgaria	NCH
Denmark	DVFA-N
Germany	WEJ, Kurz,Kuhlmann
Greece	ETAT, MAICH
Iceland	DVFA-N
Italy	CHELAB
Lithuania	NVL
Poland	NFNI
Portugal	INSA
Spain	CEINAL
Turkey	TUBITAK



Prioritisation of components

55 traditional foods were analyzed

Macronutrients and their components	**Water, ash, total nitrogen (for protein), total fat (individual fatty acids), cholesterol, dietary fibre, total sugars, individual sugars (glucose, fructose, galactose, sucrose, maltose, lactose), oligosacharides and starch**
Minerals & trace elements	**Sodium, potassium, calcium, magnesium, iron, copper, phosphorus, selenium, zinc**

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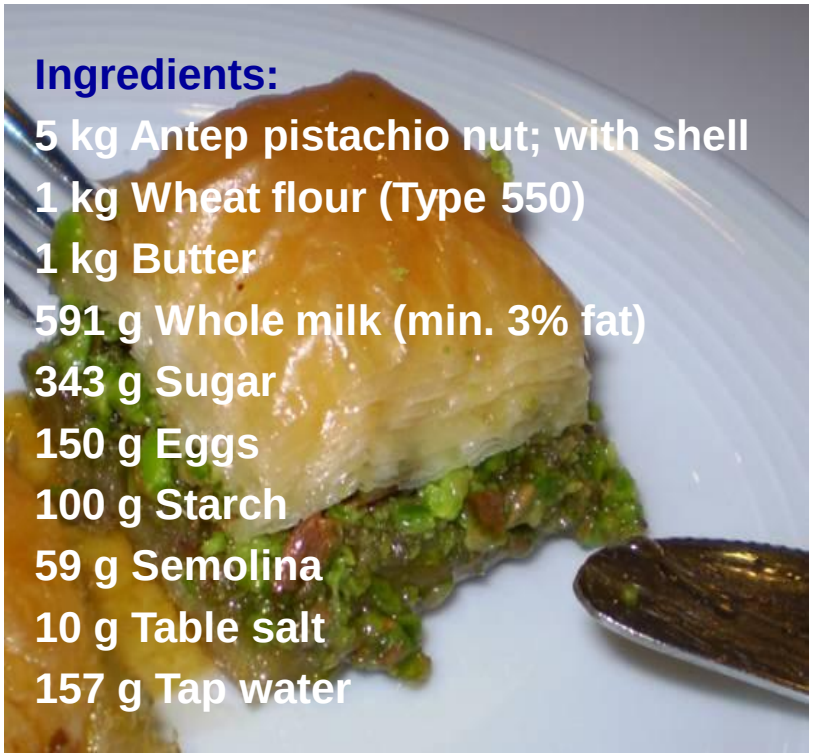
Nutritional Information

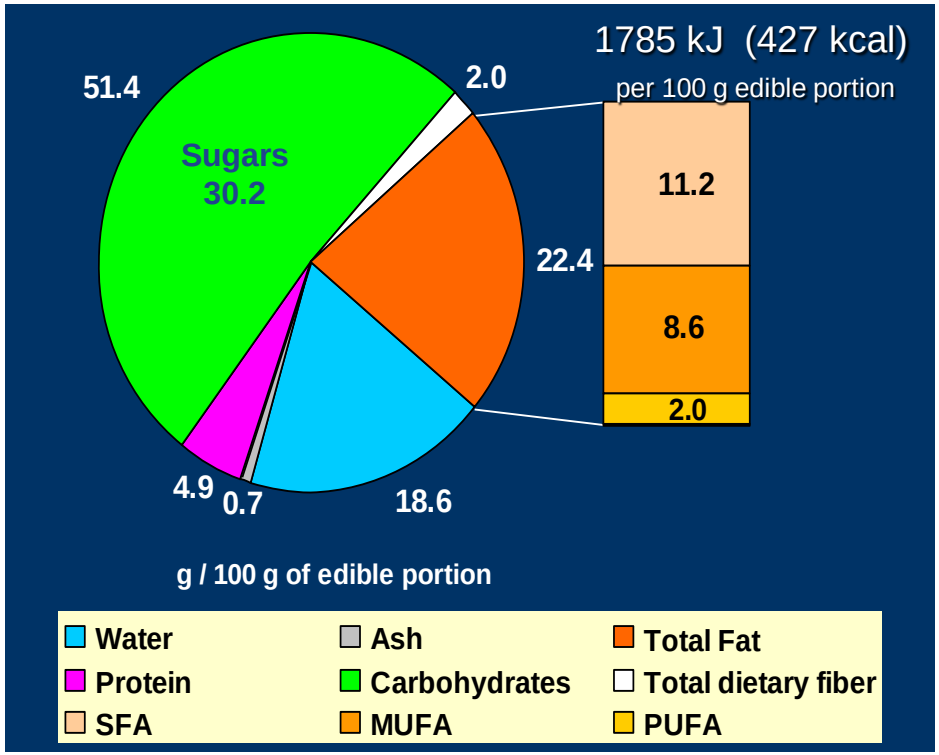
Baklava *(Gaziantep)*

It's one of the most produced and consumed Turkish traditional desserts. The main ingredient is pistachio nut.



Ingredients:

5 kg Antep pistachio nut; with shell
1 kg Wheat flour (Type 550)
1 kg Butter
591 g Whole milk (min. 3% fat)
343 g Sugar
150 g Eggs
100 g Starch
59 g Semolina
10 g Table salt
157 g Tap water



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Dissemination

Trends in Food Science & Technology 18 (2007) 420–427

FOOD SCIENCE & TECHNOLOGY

Review

Traditional foods: a science and society perspective

Antonia Trichopoulou*, Stavroula Soukara and Effie Vasilopoulou†

Department of Hygiene and Epidemiology, School of Medicine, National and Kapodistrian University of Athens, Mikras Asias 75, 115 27 Athens, Greece (Tel.: +30 210 7462074; fax: +30 210 7462079; e-mail: antonia@nut.uoa.gr)

Traditional foods reflect cultural inheritance and have their imprints on contemporary dietary patterns. They key elements for the dietary patterns in different count and consequently are important to accurately estimate pop tion dietary intakes. However, this information is missing fi most current national food composition databases. Euro aims to enrich national food composition tables that lack trient data on traditional foods and to provide data on selec bioactive components. In this context, a common definitio traditional foods has been agreed upon for the classificat of traditional foods in European food composition tables list of traditional foods, for which analytical nutritional bioactive data will be provided, has been developed.

Introduction

Traditional foods are an expression of culture, hist and lifestyle. Despite the fact that we are living in a wo of globalization, different dietary patterns between co tries do exist, as Slimani et al. (2002) have reported. study of traditional foods offers an important insight into tary patterns and how these have been shaped through ti Traditional foods and patterns may have potential he properties which, importantly, have been tested over ti

* Corresponding author.
† On behalf of the participants of the Traditional Foods Work pac (see Acknowledgements for full list).

0924-2244/$ - see front matter © 2007 Elsevier Ltd. All rights reserva doi:10.1016/j.tifs.2007.03.007

Trends in Food Science & Technology 17 (2006) 496–504

FOOD SCIENCE & TECHNOLOGY

Review

Traditional foods: Why and how to sustain them

A. Trichopoulou*, E. Vasilopoulou, K. Georga, S. Soukara and V. Dilis

Department of Hygiene and Epidemiology, School of Medicine, National and Kapodistrian University of Athens, Mikras Asias 75, 115 27 Athens, Greece (Tel.: +30 210 746 2074/210 746 2075; fax: +30 210 746 2079; e-mail: antonia@nut.uoa.gr)

The longevity associated with the Mediterranean Diet co be partly attributed to Mediterranean traditional foo which this diet incorporates. A weekly menu, representat of the Greek traditional diet, was found compatible with t nutritional recommendations of the European Commissi and with a high flavonoid content. The analysis of seve traditional Greek foods indicated that they may contribute the apparent health benefits of the Greek version of t Mediterranean diet. The methodology for the study traditional foods in Greece is currently being expanded 12 European countries in the 'EuroFIR' project. One of t aims is to define the term 'traditional' ensuring t classification and exclusive registration of traditional foo

to the EFFoST conference. Is a definition of the term "traditional" necessary?

Traditional foods are an integral part of the Mediterranean diet and there is a need to investigate them in order to elucidate their role in the beneficial effects of this diet. Traditional foods are generally considered healthy; therefore, the study of the nutrient and non-nutrient composition

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www.nature.com/ejcn

ORIGINAL ARTICLE

New nutritional data on traditional foods for European food composition databases

HS Costa[1], E Vasilopoulou[2], A Trichopoulou[2] and P Finglas[3] on behalf of the participants of the EuroFIR Traditional Foods Work Package

[1]Departamento de Alimentação e Nutrição, Instituto Nacional de Saúde Doutor Ricardo Jorge, Lisbon, Portugal; [2]Department of Hygiene Epidemiology and Medical Statistics, Medical School, National and Kapodistrian University of Athens, Athens, Greece and [3]Institute of Food Research, Norwich, UK

Background/Objectives: There are many different cultures within Europe, each with its own distinct dietary habits. Traditional ...ms of each country. Unfortunately, in most countries, there is little ...herefore, there is a need to study traditional foods to preserve these ...improve dietary habits across the continent. The Traditional Foods ...ource (EuroFIR) project aimed to provide new nutritional data on ...

...th standardised procedures was applied for the systematic study of ...es. Traditional foods were selected on the basis of the EuroFIR ...ding to specific criteria. From the prioritised list, the five traditional ...ent a full course meal. Protocol with guidelines for the recording of ...ution of laboratory samples, as well as quality requirements for ...approach for use by all countries for the acquisition of reliable data. ...en documented and traditional recipes have been recorded. Chemical ...litional foods were performed and the data were evaluated and fully ...food description, the recipe, component identification, sampling plan, ...Selected for each of the 55 investigated traditional foods. ...study of traditional foods will enable countries to further investigate ...al food composition databases and EuroFIR's food databank system.

...; doi:10.1038/ejcn.2010.215

...tabases; nutritional composition; value documentation

Specific eating habits and foods have an important role in the traditional habits of many cultures (Weichselbaum et al., 2009). Lifestyle changes are affecting eating habits across Europe and some traditional foods are at risk of disappearing. In most countries, there is currently a lack of information on the nutritional composition of traditional foods, and consequently there is a need to investigate, register and promote such foods.

Food composition databases (FCDBs) that provide detailed and reliable information on the nutritional composition of foods are essential in a range of applications, including public health nutrition, clinical practice, research, the food industry, food consumption surveys, sports nutrition, nutrition education, as well as in the development and implementation of

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Traditional foods recipe cards

Apple strudel: (Apfelstrudel)

The Austrian cuisine is internationally famous for catering to the sweet tooth. Very similar to Bohemian cooking, sweet meals ("Mehlspeisen") are often served as main courses. It is a mix of culinary styles originating from the many ethnicities of the former multinational Austrian Empire.

The quantities are given for 10 portions. Preparation time is about 3 hours 10 minutes.

Ingredients

Strudel pastry jacket:
330 g Wheat flour (type: 480)
10 g Salt
6 g Vegetable oil
175 ml Tap water (soft and lukewarm)
10 g Wheat flour (type: 480) to besprinkle the worktop
3 g Vegetable oil to spread the pastry jacket

Breadcrumb mix:
65 g Butter
32 g Margarine
90 g Sugar
60 g Breadcrumbs

Raisins mix:
34 g Raisins
12 g Rum

Apple mix:
1850 g Tartish apples,
140 g Sugar,
12 g Cinnamon

In addition:
10 g Butter to butter the baking-tin,
60 g Butter to butter the pastry jacket

Preparation

First the strudel pastry jacket is prepared by mixing the respective ingredients and kneading them into dough. The surface is sprinkled with the vegetable oil and left untouched for about 1 hour.

For the breadcrumb mix, butter and margarine are liquefied in a pan until churned; sugar and breadcrumbs are added and roasted until golden brown. The apples are peeled, rasped, and mixed with sugar and cinnamon.

Then the pastry is rolled out on a dish cloth which was besprinkled with wheat flour. Vegetable oil is applied to the surface of the dough. The dough is stretched very thinly, laid out again on the dish towel. One third of the pastry jacked is filled with the breadcrumb mix, the raisins (soaked in rum), and lastly with the apple mix, and then rolled up with help of the towel.

The liquefied butter is repeatedly applied to the surface of the pastry jacket.

Finally the strudel is baked on a tray in the oven at 180 degrees Celsius until golden brown (approx. 1 hour).

Nutritional value per 100 g of edible portion	
Energy (kcal / kJ)	190 800
Protein (g) (N x 6.25)	2.2
Total Fat (g)	5.9
of which saturated fatty acids (g)	2.9
Carbohydrates (g)	32.0
of which sugars (g)	25.3
Dietary fibre (g)	2.4
Sodium (mg)	123

For more information on Austrian traditional foods, contact the University of Vienna at http://www.univie.ac.at/

The work was completed within the EuroFIR project funded by the European Commission. Thanks to Gertrud Rohrer from the local household for inviting us for recipe recording and to Katharina Fritz for her assistance in reproducing the recipe.

EuroFIR
www.eurofir.net

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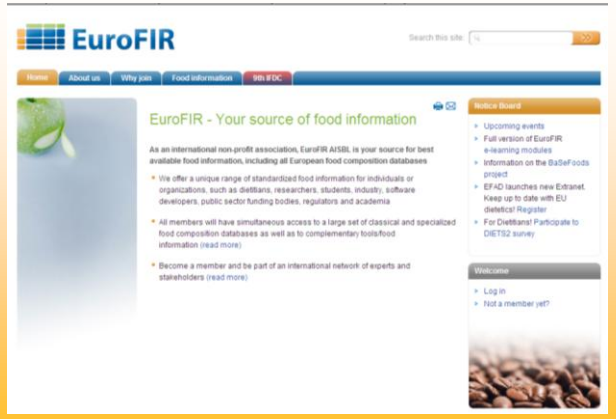
EuroFIR Network of Excellence

Coordinator – Paul Finglas



A story of success....

BaSeFood

Coordinator – L. Filippo D'Antuono

BaSeFood Project

Sustainable exploitation of bioactive components from the Black Sea Area traditional foods (FP7-KBBE-227118)
Coordinator - L. Filippo D'Antuono

BaSeFood Project 2009-2012

To **identify** and **characterise bioactive compounds in traditional food products** that can be **beneficial for human health** and are typical for the diet of EU neighbouring regions.

EXPECTED IMPACT

To increase knowledge of nutrients, food components and/or bioactive compounds effects on human health, **substantiating health and nutritional claims**.

Enhance the cooperation between scientific disciplines and stakeholders **(nutrition, practitioners, local food companies, etc.).**

Assist EU food industry to increase its innovation potential and competitiveness, in particular regarding **traditional foods** and SMEs.

Work Packages

WP1

Surveying, recording and describing traditional foods

WP2

Bioactive components, nutritional and microbiological characterization of traditional foods

WP3

Health-promoting properties, absorption and bioactivity of target components

SEVENTH FRAMEWORK PROGRAMME

WP7

Management

WP4

Technological-chain effects on bioactives in traditional foods

WP 5

Chain development and consumer issues in health-promoting traditional foods

WP6

Dissemination

Black Sea Area Countries (BSAC)

Bulgaria | Georgia | Romania | Russian Federation | Turkey | Ukraine

WP1 - Prioritisation of Traditional Foods


Cereal or cereal based foods


Herbs, spices and aromatic plants


Fruit or fruit based foods


Low or non-alcoholic fermented products


Vegetable or vegetable based foods

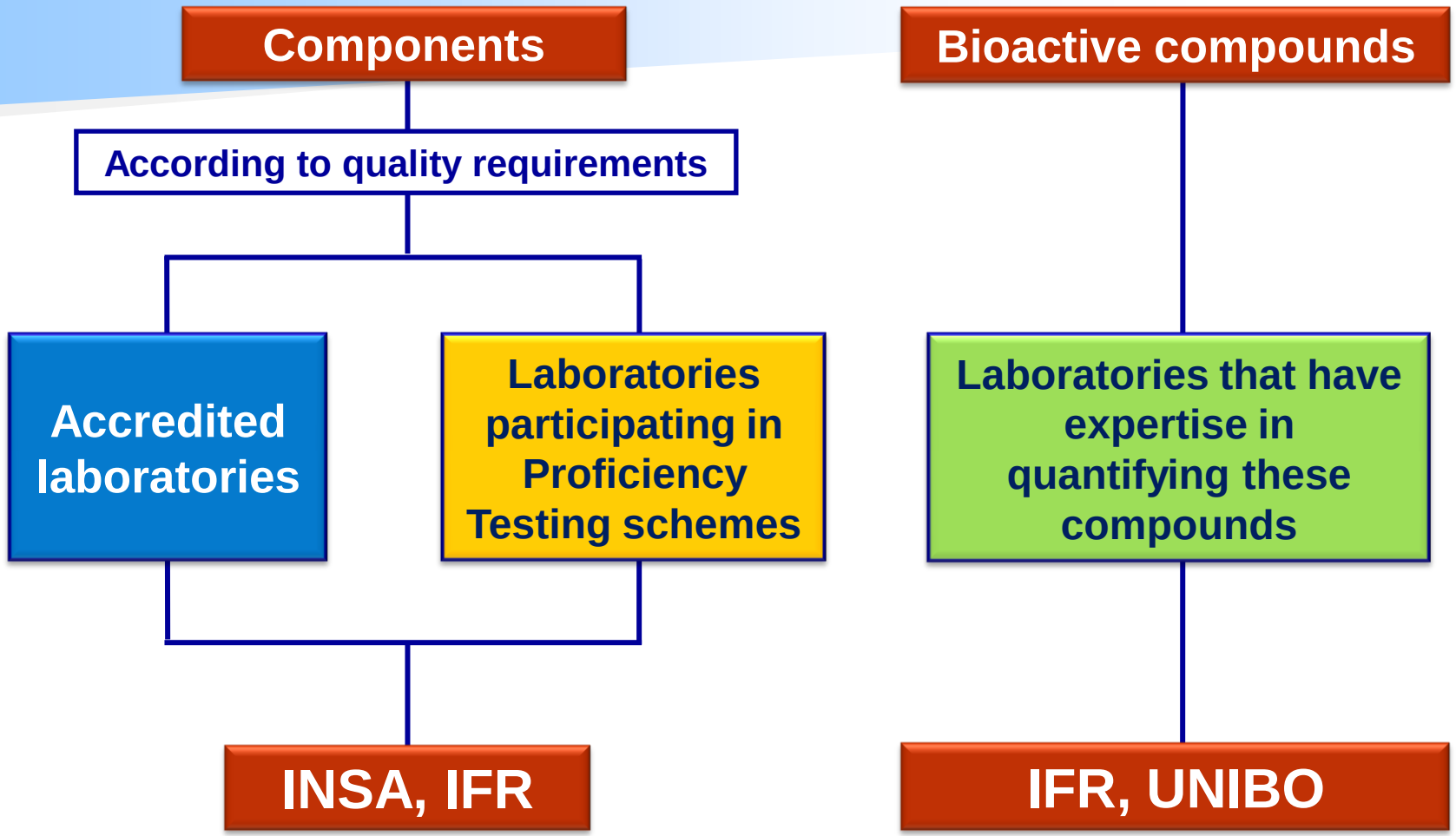

Oilseeds or oilseed products

Prioritisation of components and bioactive compounds

- Inclusion relevant data in national food composition databases
- Most relevant components to be analysed for each food
- Their importance in relation to the increased risk of diet-related chronic diseases

Proximates	**Moisture, ash, total nitrogen (for protein), total fat (individual fatty acids, cholesterol), dietary fibre, total sugars and starch**
Vitamins	**Vitamin A (all-*trans*-retinol), vitamin C, vitamin E (α-tocopherol), vitamin B_2 (riboflavin) and total folate**
Minerals & trace elements	**Sodium, iron, zinc and selenium**
Bioactive compounds	**Phenolics, glucosinolates and carotenoids**

Selection of laboratories







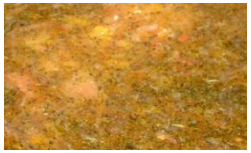




















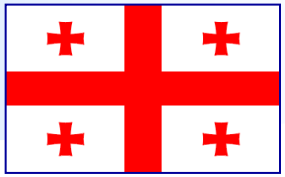


Nutritional composition of 33 Traditional Foods

4th International Congress on Food and Nutrition and 3rd SAFE Consortium International Congress on Food Safety
12th to 14th October 2011, Istanbul, Turkey

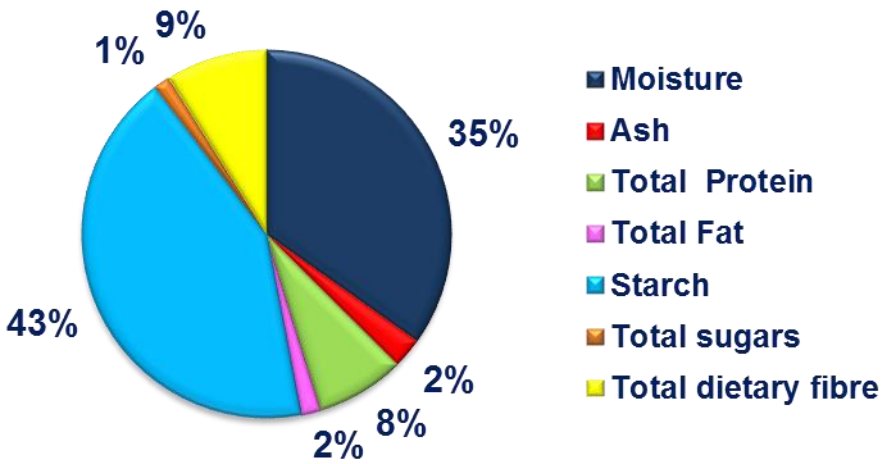
Cereal or cereal based foods

Traditional Food (English name)	Traditional Food (National language)
Baked layers of pastry stuffed with pumpkin	*Tikvenik*
Tsiteli Doli Bread	*Makhobeliani dolis puri*
Cornmeal mush	*Mămăligă*
Buckwheat porridge crumby	*Каша гречневая рассыпчатая*
Bulgur pilaf	*Bulgur pilavı*
Sour rye bread	*Хліб житній*



Tsiteli doli bread

A light blue tinged bread of oblong or oval shape, containing a small amount of floured makhobeli

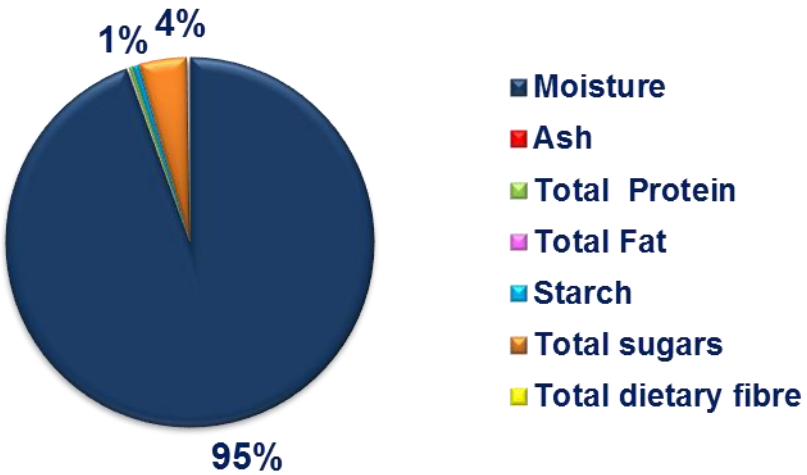


Vegetable or vegetable based foods

Traditional Food (English name)	Traditional Food (National language)
Rodopian dried beans	*Rodopski fasul*
Nettles with walnut sauce	*Chinchris mkhali nigvzit*
Nettle sour soup	*Ciorbă de urzici*
Vegetable okroshka	*Овощная окрошка*
Kale soup	*kara lahana corbasi*
Transcarpathian green borsch	*Zelenyj borshch Zakarpats'kyj*
Ukrainian borsch	*Борщ український пісний*

Vegetable okroshka

A cold soup with shredded vegetables and bread kvass.

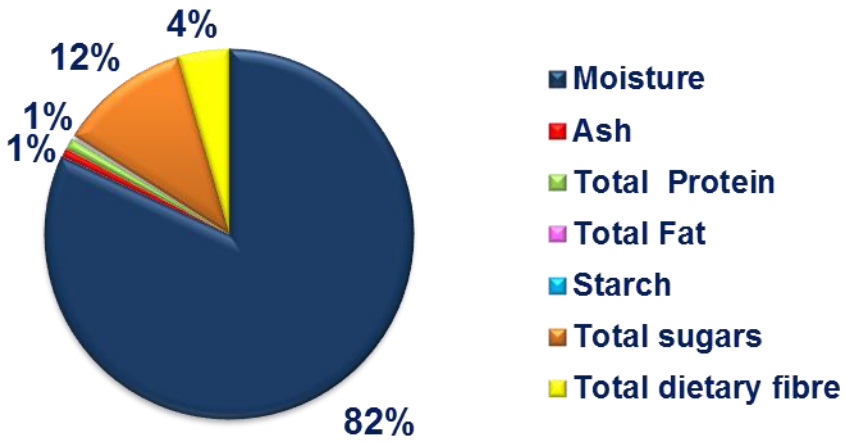


Fruit or fruit based foods

Traditional Food (English name)	Traditional Food (National language)
Rose jam	*Dko ot rozi*
Churchkhela	*Churchkhela*
Plums jam	*Magiun de prune*
Watermelon juice	*Арбузный сок*
Fruit of the evergreen cherry laurel	Karayemiş
Uzvar	*Узвар*

Fruit of evergreen cherry laurel

Fruit of evergreen cherry laurel *Prunus laurocerasus* L.

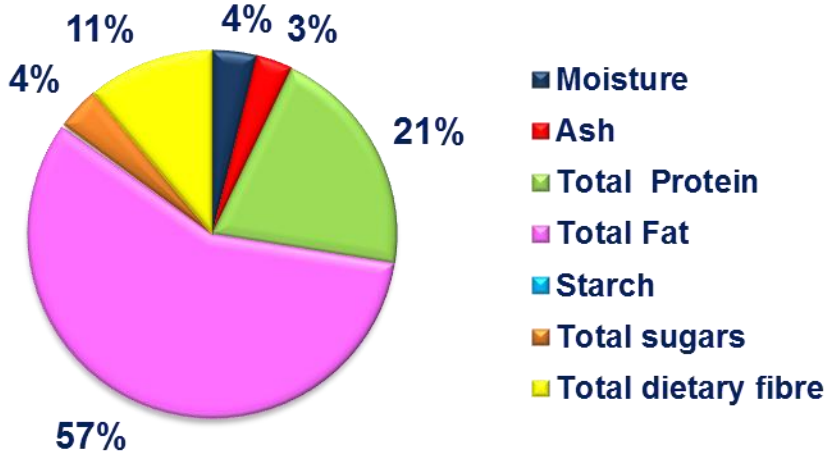


Oilseeds or oilseed products

Traditional Food (English name)	Traditional Food (National language)
Halva	*Tahan Halva*
Flax oil	*Selis zeti*
Mustard oil	*Горчичное масло*
Roasted sunflower seeds	*Smazhene nasinnya*

Roasted sunflower seeds

Roasted sunflower seeds (*Helianthus annuus* L.)

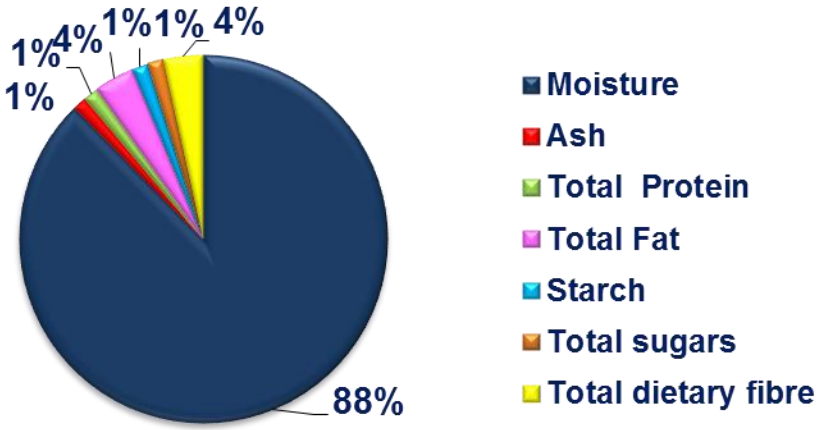


Herbs, spices and aromatic plants

Traditional Food (English name)	Traditional Food (National language)
Mursal tea	*Mursalski chai*
Wild plum sauce	*Tkhemlis satsebeli*
Herbal dish	*Mâncărică de verdeață*
Black tea	*Çay*
Pomazanka	*Pomazanka*

Herbal dish

Onions, green dill, green parsley, mint leaves, sweet basil leaves, sage leaves, tomato paste, peppers paste, sunflower oil, salt, black peppercorns, wheat flour

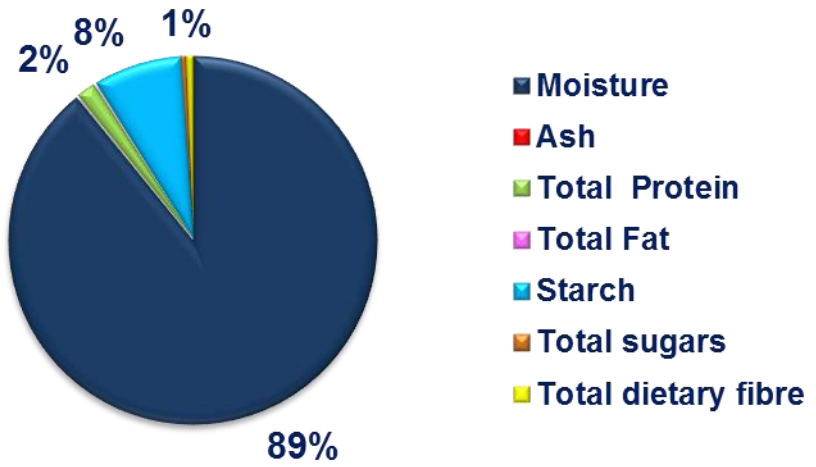


Low or non-alcoholic fermented products

Traditional Food (English name)	Traditional Food (National language)
Millet ale	*Boza*
Elderberry soft drink	*Socata*
Kvass southern	*Квас южный*
Sautéed pickled green beans	*Fasulye turşusu kavurması*
Sauerkraut	*Капуста білокачанна квашена*

Millet ale

A thick, fermented cereal based beverage with a sourish or sweetish taste



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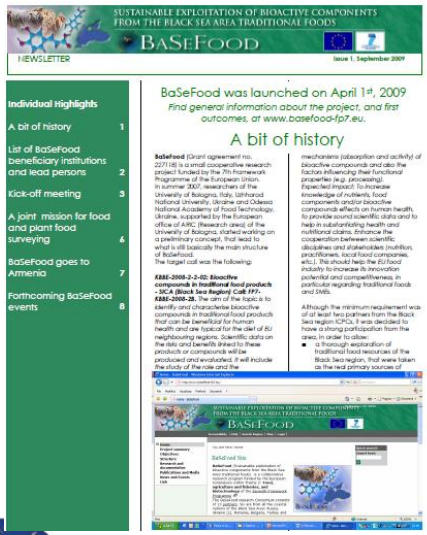

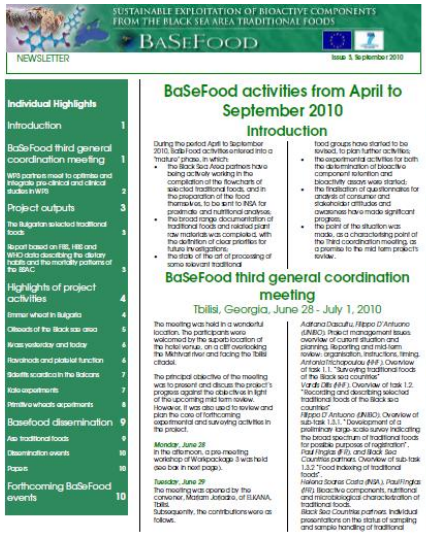

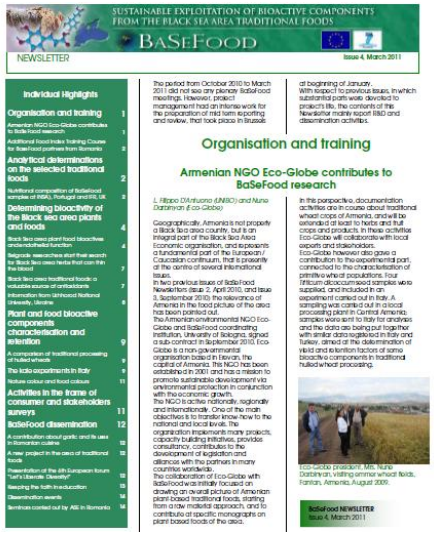

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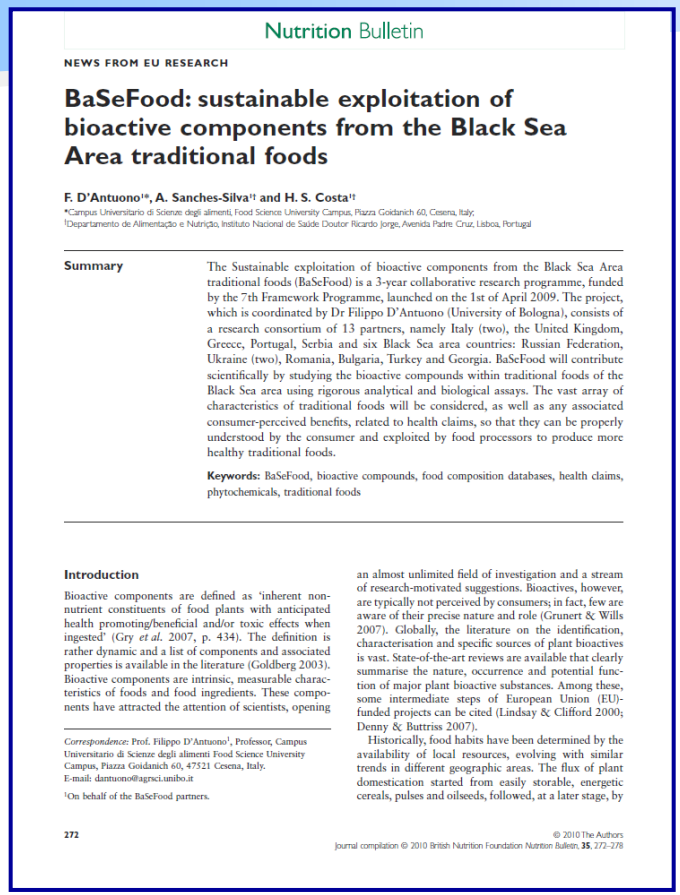

Nutrition Bulletin

NEWS FROM EU RESEARCH

BaSeFood: sustainable exploitation of bioactive components from the Black Sea Area traditional foods

F. D'Antuono[1]*, A. Sanches-Silva[†1] and H. S. Costa[†1]

*Campus Universitario di Scienze degli alimenti, Food Science University Campus, Piazza Goidanich 60, Cesena, Italy;
[1]Departamento de Alimentação e Nutrição, Instituto Nacional de Saúde Doutor Ricardo Jorge, Avenida Padre Cruz, Lisboa, Portugal

Summary

The Sustainable exploitation of bioactive components from the Black Sea Area traditional foods (BaSeFood) is a 3-year collaborative research programme, funded by the 7th Framework Programme, launched on the 1st of April 2009. The project, which is coordinated by Dr Filippo D'Antuono (University of Bologna), consists of a research consortium of 13 partners, namely Italy (two), the United Kingdom, Greece, Portugal, Serbia and six Black Sea area countries: Russian Federation, Ukraine (two), Romania, Bulgaria, Turkey and Georgia. BaSeFood will contribute scientifically by studying the bioactive compounds within traditional foods of the Black Sea area using rigorous analytical and biological assays. The vast array of characteristics of traditional foods will be considered, as well as any associated consumer-perceived benefits, related to health claims, so that they can be properly understood by the consumer and exploited by food processors to produce more healthy traditional foods.

Keywords: BaSeFood, bioactive compounds, food composition databases, health claims, phytochemicals, traditional foods

Introduction

Bioactive components are defined as 'inherent non-nutrient constituents of food plants with anticipated health promoting/beneficial and/or toxic effects when ingested' (Gry *et al.* 2007, p. 434). The definition is rather dynamic and a list of components and associated properties is available in the literature (Goldberg 2003). Bioactive components are intrinsic, measurable characteristics of foods and food ingredients. These components have attracted the attention of scientists, opening an almost unlimited field of investigation and a stream of research-motivated suggestions. Bioactives, however, are typically not perceived by consumers; in fact, few are aware of their precise nature and role (Grunert & Wills 2007). Globally, the literature on the identification, characterisation and specific sources of plant bioactives is vast. State-of-the-art reviews are available that clearly summarise the nature, occurrence and potential function of major plant bioactive substances. Among these, some intermediate steps of European Union (EU)-funded projects can be cited (Lindsay & Clifford 2000; Denny & Buttriss 2007).

Historically, food habits have been determined by the availability of local resources, evolving with similar trends in different geographic areas. The flux of plant domestication started from easily storable, energetic cereals, pulses and oilseeds, followed, at a later stage, by

Correspondence: Prof. Filippo D'Antuono[1], Professor, Campus Universitario di Scienze degli alimenti Food Science University Campus, Piazza Goidanich 60, 47521 Cesena, Italy.
E-mail: dantuono@agrsci.unibo.it

[1]On behalf of the BaSeFood partners.

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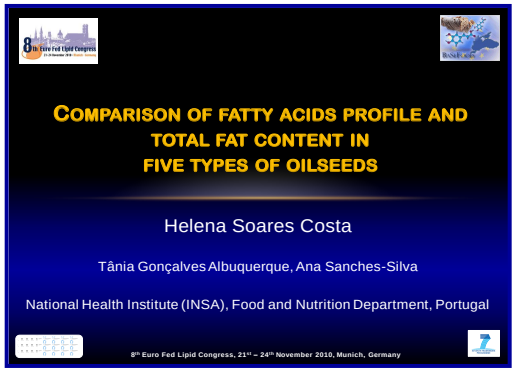

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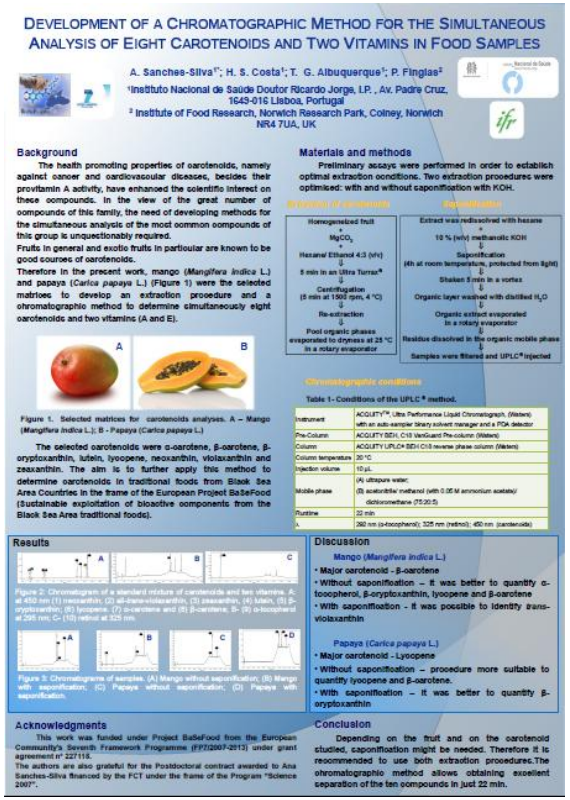

DEVELOPMENT OF A CHROMATOGRAPHIC METHOD FOR THE SIMULTANEOUS ANALYSIS OF EIGHT CAROTENOIDS AND TWO VITAMINS IN FOOD SAMPLES

A. Sanches-Silva[1]*; H. S. Costa[1]; T. G. Albuquerque[1]; P. Finglas[2]

[1]Instituto Nacional de Saúde Doutor Ricardo Jorge, I.P. , Av. Padre Cruz, 1649-016 Lisboa, Portugal

[2] Institute of Food Research, Norwich Research Park, Colney, Norwich NR4 7UA, UK

Background

The health promoting properties of carotenoids, namely against cancer and cardiovascular diseases, besides their provitamin A activity, have enhanced the scientific interest on these compounds. In the view of the great number of compounds of this family, the need of developing methods for the simultaneous analysis of the most common compounds of this group is unquestionably required.

Fruits in general and exotic fruits in particular are known to be good sources of carotenoids.

Therefore in the present work, mango (*Mangifera indica* L.) and papaya (*Carica papaya* L.) (Figure 1) were the selected matrices to develop an extraction procedure and a chromatographic method to determine simultaneously eight carotenoids and two vitamins (A and E).

Materials and methods

Preliminary assays were performed in order to establish optimal extraction conditions. Two extraction procedures were optimised: with and without saponification with KOH.

Extraction of carotenoids

Homogenized fruit → $MgCO_3$ → Hexane/ Ethanol 4:3 (v/v) → 5 min in an Ultra Turrax® → Centrifugation (5 min at 1500 rpm, 4 °C) → Re-extraction → Pool organic phases evaporated to dryness at 25 °C in a rotary evaporator

Saponification

Extract was redissolved with hexane → 10 % (w/v) methanolic KOH → Saponification (4h at room temperature, protected from light) → Shaken 5 min in a vortex → Organic layer washed with distilled H_2O → Organic extract evaporated in a rotary evaporator → Residue dissolved in the organic mobile phase → Samples were filtered and UPLC® injected

Figure 1. Selected matrices for carotenoids analyses. A – Mango (*Mangifera indica* L.); B - Papaya (*Carica papaya* L.)

The selected carotenoids were α-carotene, β-carotene, β-oryptoxanthin, lutein, lycopene, neoxanthin, violaxanthin and zeaxanthin. The aim is to further apply this method to determine carotenoids in traditional foods from Black Sea Area Countries in the frame of the European Project BaSeFood (Sustainable exploitation of bioactive components from the Black Sea Area traditional foods).

Chromatographic conditions

Table 1- Conditions of the UPLC ® method.

Instrument	ACQUITY®, Ultra Performance Liquid Chromatograph, (Waters) with an auto-sampler library solvent manager and a PDA detector
Pre-Column	ACQUITY BEH, C18 VanGuard Pre-column (Waters)
Column	ACQUITY UPLC® BEH C18 reverse phase column (Waters)
Column temperature	20 °C
Injection volume	10 µL
Mobile phase	(A) ultrapure water; (B) acetonitrile/ methanol (with 0.05 M ammonium acetate)/ dichloromethane (75:20:5)
Runtime	20 min
λ	292 nm (α-tocopherol); 325 nm (retinol); 450 nm (carotenoids)

Results

Figure 2. Chromatogram of a standard mixture of carotenoids and two vitamins. A- at 450 nm (1) neoxanthin; (2) all-*trans*-violaxanthin, (3) zeaxanthin, (4) lutein, (5) β-cryptoxanthin; (6) lycopene; (7) α-carotene and (8) β-carotene; B- (9) α-tocopherol at 295 nm; C- (10) retinol at 325 nm.

Figure 3. Chromatograms of samples. (A) Mango without saponification; (B) Mango with saponification; (C) Papaya without saponification; (D) Papaya with saponification.

Discussion

Mango (*Mangifera indica* L.)

- Major carotenoid - β-carotene
- Without saponification – it was better to quantify α-tocopherol, β-oryptoxanthin, lycopene and β-carotene
- With saponification - it was possible to identify *trans*-violaxanthin

Papaya (*Carica papaya* L.)

- Major carotenoid - Lycopene
- Without saponification – procedure more suitable to quantify lycopene and β-carotene.
- With saponification – it was better to quantify β-oryptoxanthin

Conclusion

Depending on the fruit and on the carotenoid studied, saponification might be needed. Therefore it is recommended to use both extraction procedures.The chromatographic method allows obtaining excellent separation of the ten compounds in just 22 min.

Acknowledgments

This work was funded under Project BaSeFood from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement nº 227115.

The authors are also grateful for the Postdoctoral contract awarded to Ana Sanches-Silva financed by the FCT under the frame of the Program "Science 2007".

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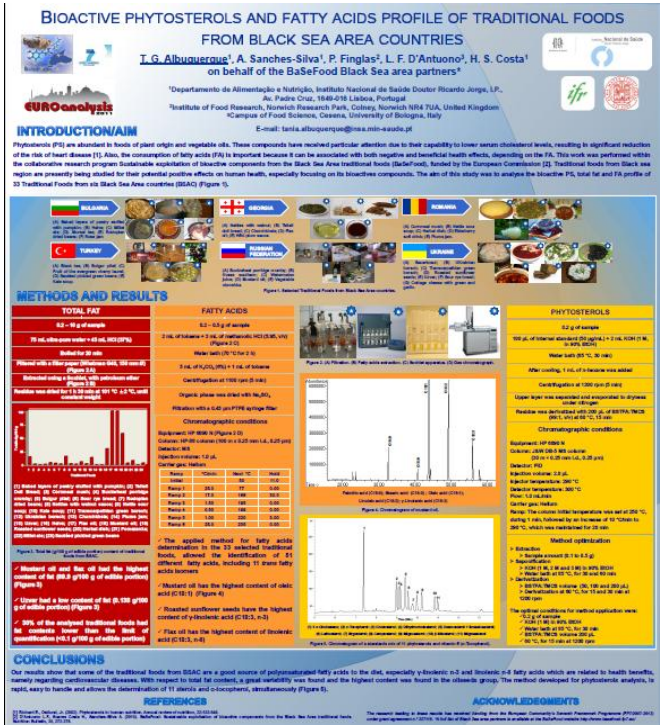

BIOACTIVE PHYTOSTEROLS AND FATTY ACIDS PROFILE OF TRADITIONAL FOODS FROM BLACK SEA AREA COUNTRIES

T.G. Albuquerque[1], A. Sanches-Silva[1], P. Finglas[2], L. F. D'Antuono[3], H. S. Costa[1] on behalf of the BaSeFood Black Sea area partners*

[1]Departamento de Alimentação e Nutrição, Instituto Nacional de Saúde Doutor Ricardo Jorge, I.P., Av. Padre Cruz, 1649-016 Lisboa, Portugal

[2]Institute of Food Research, Norwich Research Park, Colney, Norwich NR4 7UA, United Kingdom

[3]Campus of Food Science, Cesena, University of Bologna, Italy

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

INTRODUCTION/AIM

Phytosterols (PS) are abundant in foods of plant origin and vegetable oils. These compounds have received particular attention due to their capability to lower serum cholesterol levels, resulting in significant reduction of the risk of heart disease [1]. 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. This work was performed within the collaborative research program Sustainable exploitation of bioactive components from the Black Sea Area traditional foods (BaSeFood), funded by the European Commission [2]. Traditional foods from Black sea region are presently being studied for their potential positive effects on human health, especially focusing on its bioactives compounds. The aim of this study was to analyse the bioactive PS, total fat and FA profile of 33 Traditional Foods from six Black Sea Area countries (BSAC) (Figure 1).

Figure 1. Selected Traditional Foods from Black Sea Area countries.

METHODS AND RESULTS

TOTAL FAT

0.2 – 10 g of sample → 70 mL ultra-pure water + 65 mL HCl (37%) → Refluxed for 30 min → Filtered with a filter paper (Whatman 541, 150 mm Ø) (Figure 2A) → Extracted using 3 fractions, with petroleum ether (Figure 2 B) → Residue was dried for 1 h 30 min at 101 °C ± 5 °C, until constant weight

FATTY ACIDS

0.2 – 0.5 g of sample → 2 mL of toluene + 2 mL of methanolic HCl (5.0E, v/v) (Figure 2 C) → Water bath (70 °C for 2 h) → 3 mL of H_2SO_4 (5%) + 1 mL of toluene → Centrifugation at 1500 rpm (5 min) → Organic phase was dried with Na_2SO_4 → Filtration with a 0.45 µm PTFE syringe filter

Chromatographic conditions

Replacement: HP 6890 N (Figure 3 D)
Column: HP-88 column (100 m x 0.25 mm i.d., 0.25 µm)
Detector: FID
Injection volume: 1.0 µL
Carrier gas: Helium

Ramp	°C/min	Next °C	Hold
Initial		50	10.00
Ramp 1	25.0	175	0.00
Ramp 2	17.0	185	10.0
Ramp 3	3.00	215	5.00
Ramp 4	0.50	195	0.00
Ramp 5	1.00	220	0.00
Ramp 6	25.0	250	0.00

Figure 3. Total fat (g/100 g of edible portion) content of traditional foods from BSAC.

✓ Mustard oil and flax oil had the highest content of fat (65.8 g/100 g of edible portion) (Figure 3)

✓ Liver had a low content of fat (5.130 g/100 g of edible portion) (Figure 3)

✓ 39% of the analysed traditional foods had fat contents lower than the limit of quantification (<0.1 g/100 g of edible portion)

Figure 2. (A) Filtration; (B) Fatty acids extraction; (C) Sample separation; (D) Gas chromatograph.

Chromatographic conditions

Replacement: HP 6890 N
Column: ...(100 m x 0.25 mm i.d., 0.25 µm)
Injection: PSS
Injection volume: 2.0 µL
Injector temperature: 290 °C
Detector temperature: 300 °C
Flow: 1.0 mL/min
Carrier gas: Helium
Ramp: The column initial temperature was set at 250 °C, then it was increased at a rate of 10 °C/min to 290 °C, which was maintained for 20 min.

Figure 4. Chromatogram of crude fruit.

Figure 5. Chromatogram of standards mix of (1) phytosterols and vitamin E (α-Tocopherol).

PHYTOSTEROLS

0.2 g of sample → 100 µL of Internal standard (5α-cholestane) + 2 mL KOH (1 M, in 90% EtOH) → Water bath (85 °C, 30 min) → After cooling, 1 mL of n-hexane was added → Centrifugation at 1300 rpm (5 min) → Upper layer was separated and evaporated to dryness under nitrogen → Residue was derivatized with 200 µL of BSTFA:TMCS (99:1, v/v) at 60 °C, 15 min

Chromatographic conditions

Replacement: HP 6890 N
Column: ...(30 m I.D. x 0.25 mm I.d., 0.25 µm)
Injector: PSS
Injection volume: 2.0 µL
Injector temperature: 290 °C
Detector temperature: 300 °C
Flow: 1.0 mL/min
Carrier gas: Helium
Ramp: The column initial temperature was set at 250 °C, then it was increased at a rate of 10 °C/min to 290 °C, which was maintained for 20 min.

Method optimization

- Extraction
  - Sample amount (0.1 to 0.5 g)
- Saponification
  - KOH (1 M, 2 M and 3 M) in 90% EtOH
  - Water bath at 65 °C, for 30 and 60 min
- Derivatization
  - BSTFA:TMCS volume (50, 100 and 200 µL)
  - Derivatization at 60 °C, for 15 and 30 min at 1200 rpm

The optimal conditions for method application were: 0.2 g of sample; KOH (1 M) in 90% EtOH; Water bath at 65 °C, for 30 min; BSTFA:TMCS volume 200 µL; 60 °C, for 15 min at 1200 rpm.

✓ The applied method for 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 has the highest content of oleic acid (C18:1) (Figure 4)

✓ Roasted sunflower seeds have the highest content of γ-linolenic acid (C18:3, n-3)

✓ Flax oil has the highest content of linolenic acid (C18:3, n-6)

CONCLUSIONS

Our results show that some of the traditional foods from BSAC are a good source of polyunsaturated fatty acids to the diet, especially γ-linolenic n-3 and linolenic n-6 fatty acids which are related to health benefits, namely regarding cardiovascular diseases. With respect to total fat content, a great variability was found and the highest content was found in the oilseeds group. The method developed for phytosterols analysis, is rapid, easy to handle and allows the determination of 11 sterols and cis-isomers, simultaneously (Figure 5).

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[2] D'Antuono L.F., Aparo Carlo V., Bertoni Mirko F. (2012). BaSeFood: Sustainable exploitation of bioactive components from the Black Sea Area traditional foods. Nutrition Bulletin, 37: 272-276.

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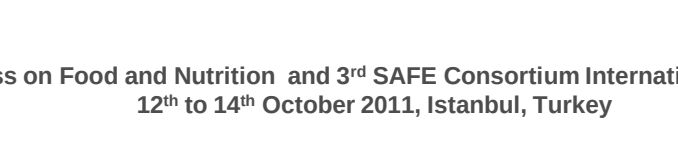

ANALYSIS OF CAROTENOIDS, VITAMINS AND FOLATES IN TRADITIONAL FOODS FROM BLACK SEA AREA

A. Sanches-Silva[1], T. G. Albuquerque[1], T. Ribeiro[1], A. Valente[1], P. Finglas[2], A. C. Flores[1], M. Santos[1], L. F. D'Antuono[3], H. S. Costa[1] on behalf of the BaSeFood Black Sea area partners*

[1]Departamento de Alimentação e Nutrição, Instituto Nacional de Saúde Doutor Ricardo Jorge, I.P., Av. Padre Cruz, 1649-016 Lisboa, Portugal

[2]Institute of Food Research, Norwich Research Park, Colney, Norwich NR4 7UA, United Kingdom

[3]Campus of Food Science, Cesena, University of Bologna, Italy

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

INTRODUCTION

Nowadays, consumers are much more aware of nutritional composition and show especially interest in compounds with putative health benefits. Therefore, in the last few years, great attention has been devoted to the study of bioactive compounds in order to promote the consumption of traditional foods.

The European project BaSeFood (Sustainable Exploitation of Bioactive Components Black Sea Area Traditional Foods) aims to study traditional foods from Black Sea Area countries (BSAC), namely their nutritional and bioactive composition [1]. In the frame of this project, the present work has analysed carotenoids, vitamins and folates in 33 traditional foods.

MATERIALS AND METHODS

Carotenoids, retinol and α-tocopherol	L-ascorbic acid	Riboflavin	Total folates
Sample extraction: Homogenized samples → $MgCO_3$ → Hexane/Ethanol 4:3 (v/v) → 6 min in an Ultra Turrax® and centrifugation (5 min at 1500 rpm, 4 °C) (Figure 1 A) → Re-extraction → Pool organic phases and evaporate to dryness at 28 °C → Filtration (0.22 µm PTFE filter)	Homogenized samples → Stabilization solution (10% (v/v) perchloric acid + 1% (w/v) metaphosphoric acid in ultrapure water) → Vortex and dilution with mobile phase → Filtration (filter paper and 0.45 µm PVDF filter)	Homogenized samples → HCl 0.1 M for 30 min in an autoclave at 121 °C → pH was adjusted to 4.5 with sodium acetate 2.5 M → Overnight enzymatic treatment at 37 °C with takadiastase and β-amylase (Figure 2A) → After cooling at room temperature, dilution with ultrapure water and filtration (filter paper and 0.45 µm PET filter)	The determination of the total folate content in Traditional foods was carried out by a microbiological assay (EN 14131:2003) with turbidimetric detection of the growth of the microorganism Lactobacillus casei, subspecies rhamnosus (ATCC 7469). The analyses were performed in an accredited laboratory according to ISO/IEC17025.
Chromatographic separation: Ultra-high Pressure Liquid Chromatography- Photodiode Array Detector (PDA) (Figure 1 B) → Guard-Column: ACQUITY UPLC® BEH, C18 guard column (2.1 x 5 mm I.D., 1.7 µm particle size) → Column: ACQUITY UPLC® BEH C18 reverse phase column (2.1 x 50 mm I.D., 1.7 µm particle size) → Column temperature: 20°C → Injection volume: 10 µL → Flow rate: 0.6 mL/min → Detection: λ =295 nm (α-tocopherol); λ = 325 nm (retinol), λ = 450 nm (carotenoids) → Gradient mobile phase: (A) ultrapure water; (B) acetonitrile/methanol (with 0.05 M ammonium acetate)/dichloromethane (75:20:5)	HPLC- Photodiode Array Detector (PDA) → Guard-Column: SecurityGuard Cartridge AQ C18 (4Ø 2.0 mm I.D., 5 µm particle size) → Column: Phenomenex, Synergi™ Hydro-RP (150 4.6 mm I.D., 4.0 µm particle size) → Column temperature: 30 °C → Injection volume: 20 µL → Flow rate: 0.6 mL/min → Detection: λ = 454 nm → Mobile phase: 20 mM ammonium dihydrogen phosphate, pH 3.5 (adjusted with orthophosphoric acid 85%), containing 0.015% (w/v) of metaphosphoric acid	HPLC-Fluorescence Detector (Figure 2 B) → Column: Phenomenex Luna C18 (250 x 4.6 mm I.D., 5 µm particle size) → Column temperature: 37 °C → Injection volume: 50 µL → Flow rate: 1 mL/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 – (A) Homogenization with an Ultra Turrax®, (B) Ultra Performance Liquid Chromatograph. Figure 2 – (A) Overnight incubation, (B) HPLC equipment with fluorescence detector.

* Samples were also saponified with 10 % (w/v) methanolic KOH during 4h at room temperature.

RESULTS

Carotenoids, retinol and α-tocopherol

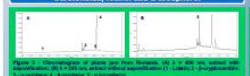

Figure 3 – Chromatogram of plasma spiked with Standards. UV: λ = 450 nm, extract with saponification; (B) λ = 295 nm, extract without saponification (1- Lutein; 2- β-cryptoxanthin; 3 – α-carotene; 4 – β-carotene; 5 – α-tocopherol.

Depending on the sample and on the studied compound, saponification might be needed. Therefore, both extraction procedures (with and without saponification) where carried out for all matrices. Most of the samples contain α-tocopherol (Figure 3) and do not present retinol. Great variability was found in carotenoids content of BSAC samples.

L-ascorbic acid

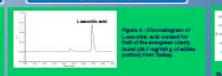

Figure 4 – Chromatogram of standard mix of L-ascorbic acid (1) and of the analysed sample (2) (1 mg/100 g of edible portion) from Turkey.

One of the samples with highest L-ascorbic acid content was the fruit of the evergreen cherry laurel (Figure 4). However, most of the samples did not contain L-ascorbic acid (limit of quantification =0.34 mg/100 g of edible portion).

Riboflavin/Total folates

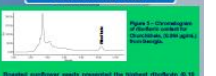

Figure 5 – Chromatogram of standard mixture for riboflavin (1) and of sample from Slovakia (2) (0.066 µg/mL).

Roasted sunflower seeds presented the highest riboflavin (0.10 mg/100 g of edible portion) and total folates (113 µg/100 g of edible portion) content. About 85% of the foods analysed had contents below the quantification limit (<0.02 mg/100 g of edible portion). Figure 5 shows a chromatogram of riboflavin content found in Charcharias (0.066 µg/mL).

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[1] D'Antuono L.F., Sanches Costa, H., Sanches-Silva A. (2012). BaSeFood: Sustainable exploitation of bioactive components from the Black Sea Area traditional foods. Nutrition Bulletin, 37: 272-276.

CONCLUSIONS

The analysed traditional foods from BSAC can be considered good sources of bioactive compounds, although it was found a great variability on the content of carotenoids, vitamins and total folates. Due to the putative health benefits of these compounds, the consumption of those with higher content of bioactive compounds should be encouraged/promoted.

ACKNOWLEDGEMENTS

The research leading to these results has received funding from the European Community's Seventh Framework Programme (FP7/2007-2013) under grant agreement nº 227115. The authors are also grateful for the Postdoctoral contract awarded to Ana Sanches-Silva financed by the FCT under the frame of the Program "Science 2007".

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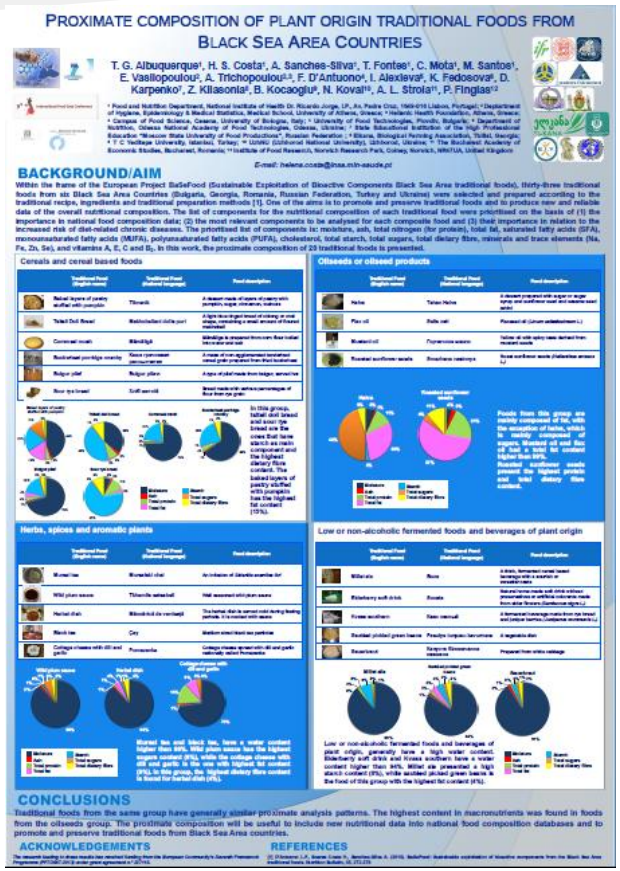
12th to 14th October 2011, Istanbul, Turkey

Dissemination

9th International Food Data Conference



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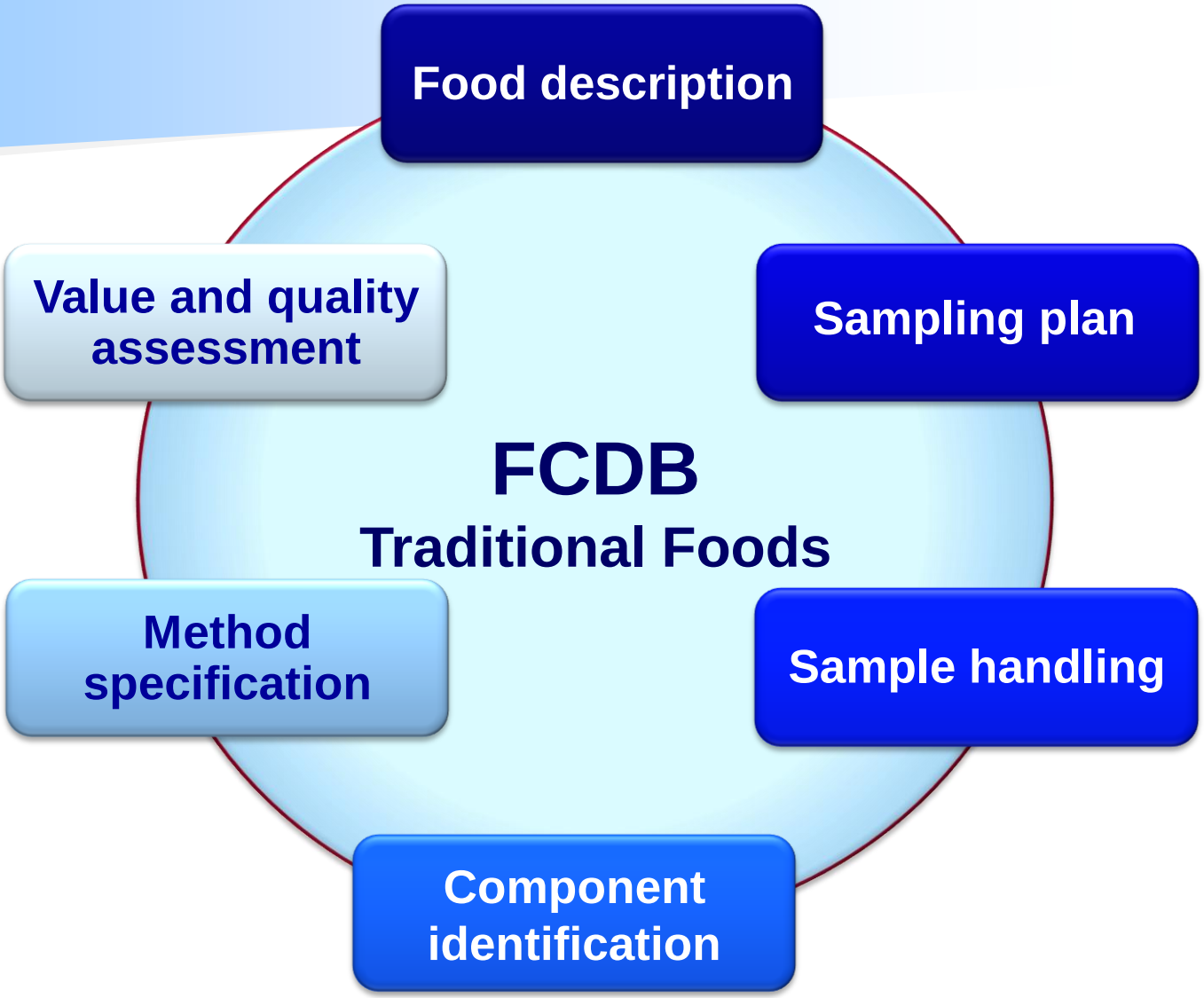

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Output and benefits

EuroFIR and BaSeFood Traditional Foods WP

- Enhanced knowledge of traditional foods composition
- Harmonized procedures to continue to update national food composition databases
- Nutritional composition data for successful promotion of traditional foods
- Development and economic sustainability of rural areas
- To promote local biodiversity and sustainable diets by maintaining healthy dietary patterns

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Helena Soares Costa

National Institute of Health Dr. Ricardo Jorge (INSA),

Food and Nutrition Department

helena.costa@insa.min-saude.pt