Traditional Bulgarian food – source of antioxidant vitamins

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Many studies have shown that traditional foods are related to good health and longevity of population. The aim of the current study was to provide data on the content and biological importance of antioxidant vitamins: vitamin A (as beta-carotene), vitamin E and vitamin C in some traditional Bulgarian foods. 15 traditional Bulgarian foods from plant origin are included in the present study. The antioxidant vitamins were determined using HPLC methods. A comparative analysis of the obtained results with information from European and American databases was carried out. The highest values of the studied vitamins were determined in vegetables - red peppers and tomatoes, and in fruits - cherries and peaches, which are traditional for Bulgarian diet. Enhancement of antioxidant defenses through dietary antioxidant vitamins would seem to provide a more reasonable and practical approach for reducing the level of oxidative stress. The data provided on antioxidant vitamins levels in the studied products are a scientific evidence that traditional foods are sources of antioxidants, which through the diet contribute to Bulgarians health and longevity, by enhancing the body antioxidant defenses.

Keywords: Antioxidant; Traditional foods; Provitamin A; Vitamin E; Vitamin C.

INTRODUCTION

In recent decades science has provided a wide range of data concerning the role and importance of traditional foods for human health [1-4]. One of the main reasons for this attention to traditional foods is the powerful invasion of foreign cuisines today and new non-recognisable for the general population foods, which are available by the free movement of goods in the open global food market. We are witnessing a time when the every day nutrition list of Bulgarians is full of snacks, pizza, hamburgers and many others, but rarely includes traditional Bulgarian foods. This fact is a challenge for science of providing new data on the nutritional, historical and cultural significance of traditional nutrition and preserving their key position in the diet of Bulgarians.

Traditional foods are related to good health and longevity of population. These types of foods were the cause for the discovery of vitamin deficiencies in the early 20th century, and the pathogenesis of many diseases related to the diet of local populations from different regions of the world. In this aspect we are facing again a problem related to vitamin deficiencies, having a new form of impact on human health. There are numerous examples of vitamin D and vitamin B12 deficiencies which are considered as risk factors for the initiation of various diseases [5-8].

The scientific exploration of the link between food and health has led to the development of the *Antioxidant hypothesis* clarifying the importance of antioxidant ingredients in the diet for augmenting cellular defenses, and protecting components of the cell against oxidative damage. With regard to this concept, antioxidant vitamins have an important position in the defence mechanisms of the human body [9]. However, much more information about foods is needed including dietary antioxidants and other bioactive compounds. Initially, it may be necessary to study the food's antioxidants composition.

The aim of the current study was to provide data on the content and biological importance of antioxidant vitamins: vitamin A (as beta carotene), vitamin E (as alpha-tocopherol) and vitamin C in some traditional Bulgarian foods.

EXPERIMENTAL

15 traditional Bulgarian foods from plant origin are included in the present study. The food sample collection was performed on a randomized basis. The analytical samples were prepared by mixing three individual samples for each product. All requirements related to food sampling were covered. The antioxidant vitamins were determined using HPLC methods with a Perkin Elmer chromatographic system - Series 4. In the examined foods, vitamin A is mainly present as beta-carotene (provitamin A), determined under the following chromatographic conditions: reverse-phase C18 column; mobile phase - acetone:water (100:5, v/v); flow rate - 0.8 ml/min; temperature - 35 °C; UV/VIS detection at 450 nm. The parameters of the method are: detection limit (LOD): 0.6 µg/100g; limit of quantification (LOQ): 1.8 µg/g; analytical

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yield - 96%; relative standard deviation (RSD) - 3.2%.

Vitamin E was determined using a method for determination of both vitamins A (retinol) and E (alpha-tocopherol) under the following chromatographic conditions: reverse phase C18 column; mobile phase – 97 % methanol; flow rate – 1 ml/min; detection - fluorimetric: Ex = 285 nm, Em = 345 nm. The characteristics of the method are: detection limit (LOD) - 0.2 µg/100 g; limit of determination (LOQ) - 0.6 µg/100 g; analytical yield 98%; relative standard deviation (RSD) - 3.9%.

The following chromatographic conditions were used in the vitamin C determination: reverse phase C18 column; mobile phase - methanol/buffer (pH = 5.5) (35:65, v/v); flow rate - 0.8 ml/min; temperature - 35 °C; detection - UV-254 nm. The parameters of the method are: detection limit (LOD) - 0.02 mg/100 g; limit of determination (LOQ) - 0.05 mg/100 g; analytical yield – 92%; RSD - 1.9%.

A comparative analysis of the obtained results with information from European and American databases for food composition was carried out [10,11].

Table 1. Antioxidant vitamins in traditional Bulgarian foods and in different databases

Foods	Provitamin A, RE µg			Vitamin E (alpha-tocopherol), mg			Vitamin C, mg		
	BG	USA	Danish	BG	USA	Danish	BG	USA	Danish
Onions	0	0	30	0.43	0.02	0.07	11.7	7.4	8.19
Garlic	0	0	0	0.01	0.08	0.01	29.3	31.2	8.21
Tomato, red, ripe, raw	114	42	992	0.34	0.5	1.1	17.8	13	15
Pepper, sweet, green, raw	41	18	167	0.7	0.37	0.55	102	80.4	104
Pepper, sweet, red, raw	297	157	1270	2.94	1.58	2.9	143	127.7	191
Cabbage, white, raw	13,1	5	35	1,69	0,15	0.02	47.8	36.6	45.8
Beans, white	3.6	0	13	-	0	0.34	0	0	2.04
Lentils	10.3	2	60	-	0,49	0	0	4.5	0
Apple	5.05	2	25	0.61	0.18	0.55	5.8	4.6	7.7
Pears	2.03	1	65	0.71	0.12	0.7	4.1	4.3	4.9
Plums	45.3	17	80	0.55	0.26	0.4	13.4	9.5	5
Cherries, sour	142	64	69	0.14	0.07	0.2	11.1	10	10
Peaches, yellow	57.5	16	70	1.82	0	1.8	7.1	6.6	6.6
Grapes	6.3	3	33	0.4	0.19	0.4	9.7	3.2	10.8
Quince	4.4	2	24	0	0	0	16.5	15	15

RESULTS AND DISCUSSION

Table 1 presents the results from the analysis of the three antioxidant vitamins (vitamins A, E and C) in the tested Bulgarian traditional foods. Vitamin A is presented as provitamin A (beta-carotene). Corresponding data from Danish and USA databases are also presented [10,11]. The assessment of our results showed higher levels of beta-carotene in vegetables traditional for Bulgarian diet - red peppers and tomatoes, followed by green

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peppers and cabbage. Fruits with higher levels of beta-carotene are cherries and peaches, followed by prunes. The results for both groups of fruits and vegetables show closer values to the USA database, but they are significantly different from the Danish data. Beta-carotene can directly scavenge free radicals, which determines its antioxidant activity. It is recommendable to take beta-carotene in its natural form with foods and not as a synthetic product, since the *cis*-form contained in natural foods acts as an antioxidant, while the *trans*-form

has a prooxidant activity. Another important biological activity of beta-carotene is its role as a precursor to vitamin A [9].

Numerous studies have demonstrated the antioxidant activity of vitamin E in foods from plant origin. In the present study, higher levels of vitamin E in red peppers were found. This result shows that red peppers are a great source for vitamin E not only for the traditional Bulgarian diet, but also for Europeans and Americans. Antioxidant activity of vitamin E is related to its ability to quench free radicals and break oxidation chains, which determines its important role in the body's antioxidant protection.

Similar data for vitamin C are shown in the three groups according to the type of products. Traditional Bulgarian products - peppers and cabbage are with the highest level of vitamin C. Its primary role in antioxidant protection is the recovery of the activity of oxidized forms of vitamin E in the process of lipid peroxidation.

Enhancement of antioxidant defense through dietary antioxidant vitamins would seem to provide a more reasonable and practical approach for reducing the level of oxidative stress.

A number of factors, including genetics, and growing conditions can affect the spectrum and quantity of antioxidant vitamins in plant foods. These differences need to be considered in developing a database of food antioxidants. Due to the lack of a standard assay, it is difficult to compare our results with the data from different studies. However, it is of great interest to the food science experts and medical researchers to know the antioxidant composition and capacity of the local or national foods.

CONCLUSION

The established differences between our data and the data in both databases on the one hand and the differences between the two foreign databases on the other, show the necessity to build national food composition tables as they depend on the geographical origin, the impact of specific environmental conditions, harvesting and preservation of the crop, as well as on the way of production and analysis of the food products.

The data provided on antioxidant vitamins levels in the studied products are a scientific evidence that traditional foods are sources of antioxidants, which through the diet contribute to Bulgarians health and longevity, by enhancing the body antioxidant defense. The data can be used for building preventive and healthy nutrition.

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ТРАДИЦИОННИ БЪЛГАРСКИ ХРАНИ – ИЗТОЧНИЦИ НА АНТИОКСИДАНТНИ ВИТАМИНИ

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(Резюме)

Много проучвания показаха значението на традиционните храни за доброто здраве и дълголетието на популацията. Целта на настоящото проучване бе да предостави данни за съдържанието и биологичната значимост на антиоксидантните витамини: витамин А (като бета-каротен), витамин Е и витамин С в някои традиционни български храни. В настоящото проучване са включени 15 традиционни български храни с растителен произход. Количествата на антиоксидантните витамини са определени чрез използване на HPLC-методи. Получените резултати са сравнени с данните в Европейска и Американска база данни. Най-високи нива на изследваните витамини са установени при зеленчуците за червени чушки и домати, а при плодовете – за череши и праскови, които са типични традиционни храни в диетата на българина. Повишаването на антиоксидантната защита на организма чрез антиоксидантните витамини в храната е подходящ практичен подход за редукция на оксидативния стрес. Предоставените данни за антиоксидантните витамини в изследваните продукти са научно доказателство, че традиционните храни са източници на антиоксиданти, които чрез диетата на българина, допринасят за неговото здраве и дълголетие, повишавайки антиоксидантната защита на организма.