

**PHYSICAL-CHEMICAL CHARACTERIZATION OF SOME DIETARY PRODUCTS
ENRICHED IN MINERAL SUBSTANCES AND VITAMINS**

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Abstract

The increased life expectancy a particular importance have energy restrictions, which were shown to have positive effects in many metabolic diseases that accompany the older people: obesity, diabetes, cardiovascular diseases.

In this study were obtained 2 diet products: flour, enriched with dried fruit and bread having as raw material the flour obtained. The products were tested regarding moisture content, minerals, fat, protein, macro and micronutrients and vitamins (B1, B2, B6). The experimental results obtained indicated that the products are proper regarding nutritional standards required by legislation. The addition of dried fruits (figs, pineapple and raisins) and integral wheat flour used increase the content in vitamins and minerals.

Key words: dietary products, wheat flour, vitamins, mineral substances.

1.INTRODUCTION

The current diet, even if it provides enough macronutrients (proteins, carbohydrates, lipids), in generally vitamins and minerals are deficient and therefore must be supplemented. The most important are: vitamins with antioxidant effect (A, C and E), minerals that affect the hormone system (zinc, chromium, boron) and electrolytes (calcium, magnesium, sodium, potassium) [1]. In general, are preferred supplements prepared with more vitamins and minerals, or those for certain diseases or periods of life: Calcium - magnesium, zinc and vitamin D, iron – with vitamin C and copper.

The third age-related diseases, such as: atherosclerosis, coronary thrombosis, cerebral haemorrhage, cancer, senility, cataracts, pancreas diseases, chronic arthritis are in correlation with the level of free radicals in the body. Free radicals are the first direct cause of some diseases, on the other hand, aggravates diseases already installed[2].

Our diets, therefore, not usually contain enough antioxidants to give an ideal protection. Vitamin C, natural, natural beta-carotene, selenium are considered primary antioxidants. After 1985, were published more than 5.000 scientific papers on free radicals, while about antioxidants, in the same period, it appeared no more than 1.000 articles[3].

The introduction of antioxidants, vitamins and mineral supplements in the diet contributes to elderly persons life expectancy of this population segment. Protein deficiency leads to severe forms of malnutrition, with disastrous human health issues from pregnancy stage, the birth of children to adulthood and during it. From studies of F.A.O – WHO, results that the overall contribution of the global availability of edible protein is composed of 70% vegetable origin protein, of which 50% provided by cereals[7].

2.MATERIAL AND METHODS

The 2 types of dietary products:

- premix based on whole wheat flour (70%), and fruit in equal proportion (dried figs, raisins, pineapple) obtained by softer processing technologies that allow retention of vitamins and mineral composition and of high biological value (*figure 1*)
- bread with this flour, yeast, margarine, fructose, milk (*figure 2*)

The products were done in the Bakery Laboratory of the Faculty of Alimentary Products Technology from Banat's University of Agricultural Science Timisoara.



Figure 1. Dietary flour enriched with fruits Figure 2. Dietary bread enriched with fruits

Moisture content, minerals, lipids, protein, macro and micronutrients and vitamins of those 2 products were determined according to ISO methodology (moisture, gravimetric SR ISO 6496, 13325-1995 SR protein Kjeldahl method, fat SR ISO 6492:2001. [5]. The macro and micro elements was determined with *SpectrAA 220 Spectrometer* (Na, K - SR ISO 7485:2000, Fe, Cu, STAS 9597/16-86, Mn, Zn STAS 9597/17-86) and vitamins B content (thiamine B1, Riboflavin B2, pyridoxine B6) with HPLC *Shimadzu - System Liquid Chromatograph*.

Chromatographic conditions: column C18, 150 X 4.6 mm.

Mobile phase: Mobile phase A: 5 g heptansulfonic acid, acetic acid 5 ml, 8 g NaH₂PO₄, 100 microliters triethylamine, brought to 2 liters of water.

Mobile phase B 1200 ml water, 5 g heptansulfonic acid, NaCl, 2.5 ml acetic acid, 50 microliters triethylamine, 800 ml acetonitrile.

Chromatograms obtained are given in *Figures 3-5*.

The values obtained represent the average of 3 successive determinations.

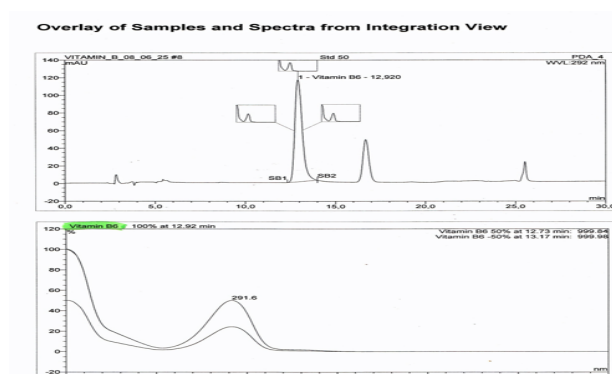


Figure 3. Standard chromatogram of B6 vitamins separated by HPLC

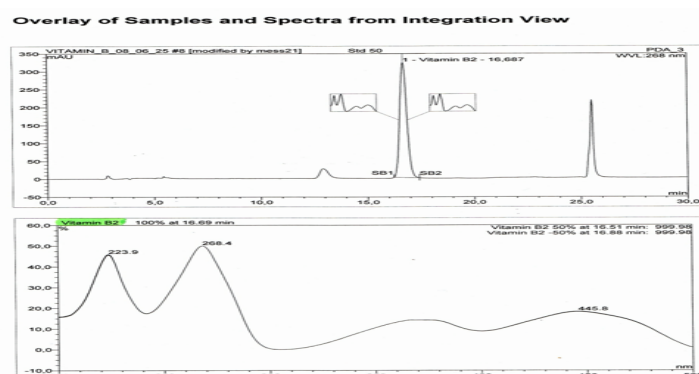


Figure 4. Standard chromatogram of vitamin B2 separated by HPLC

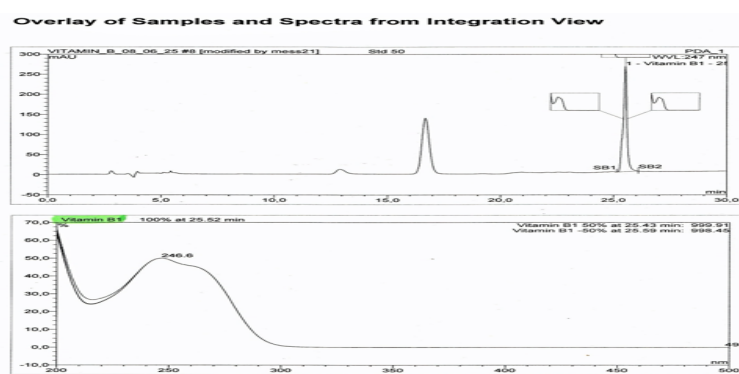


Figure 5. Standard chromatogram of vitamin B2 separated by HPLC

2. RESULTS AND DISSCUSIONS

The results obtained are shown in tables 1-3.

Tabel 1. Physical-chemical parameters

Products	Humidity %	Ash %	Protein %	Lipids %
Dietary flour enriched with fruit	8.91	1.49	11.13	1.10
Dietary bread enriched with fruit	28.78	2.03	12.42	4.47
Wheat flour for milling	13.23	0.69	13,5	0.86
White bread from wheat flour	36.4	1.89	7.23	3.47

The humidity content of dietary products is 28.78% (bread) and 8.91 (flour), which is according with ISO conditions.

The mineral substances constitute food components absolute necessary for life, which concure to normal development of human activity. The ash content of samples analyzed, which reflects the mineral content of the flours and bread and the values are higher in the case of dried fruits addition: 1.48 % (flour) and 1.51 % (bread).

The protein content of diet products obtained is comparatively equal to the whole wheat flour and is frame to recommended limits.

Lipid content in the analyzed bread in whose recipe has been used fat addition is the highest (4.47%), but frame in the range of levels in the literature data. Enriched flour show reduced lipid content (1.10%), appropriate to required conditions.

Table 2. Vitamins content of the products

Product	Vitamin B1 (mg/100g)	Vitamin B2 (mg/100g)	Vitamin B6 (mg/100g)
Dietary flour enriched with fruit	0,28	0,67	0,14
Dietary bread enriched with fruit	0,42	0,31	0,28
Wheat flour for milling	0,08	0,06	0,04
White bread from wheat flour	0,32	0,20	0,08

Vitamin B1 is also known as “intellectual performance vitamin”, because it provides the intellectual yield increase. Deficiencies of vitamin B1 train fatigue, loss of appetite and body weight, heart and digestive diseases. Absence of vitamin B2 disrupting the growth and development and favours the occurrence of dermatological diseases. Insufficient intake reduces protein biosynthesis. It has an important role in the smooth functioning of the nervous and immune system. Vitamin B6 is necessary for magnesium uptake in the internal process for the production of hydrochloric acid needed to digest. Interfere in amino acid metabolism [3].

Whole cereals are an important source of vitamin B. They are located in grain cereal shell, so that, in the technological milling process of obtaining flour, vitamins are dragged away once with the shells. Flour and flour products processed have a low content of vitamins. It can be increased by the addition of fruit. *Content in vitamins of dietary flour (mg/100 g produs) increased by the addition of fruit:*

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vitamin B1- 0.287 mg, vitamin B2 – 0.671 mg, vitamin B6- 0.145 mg, compared with wheat flour: vitamin B1- 0.8 mg, vitamin B2- 0.06 mg, vitamin B6-0.04 mg. Vitamin B complex content of diet bread is also superior to regular bread obtained from bakery white flour.

Table 3. Macro and microelements content of products.

Product	Cu (µg/g)	Fe (µg/g)	Zn (µg/g)	Mn (µg/g)	Se (µg/g)	Mg (mg/g)	K (mg/g)
Dietary flour enriched with fruit	3,22	37,16	13,87	20,22	<0,2	2,22	5,22
Dietary bread enriched with fruit	2,91	50,58	10,21	16,77	<0,2	3,96	6,52
Wheat flour for milling	1,81	9,21	8,40	7,90	<0,2	0,30	1,05
White bread from wheat flour	2,10	23,12	7,48	4,78		0,23	1,00

Micro and macro elements content is particularly important in ensuring balanced and good nutrition, it ensures proper functioning and development of the human body. Cu and Zn are elements with a role in ontogenesis processes in pigmentation and immune functions of the body.

The zinc content is involved in body growth, skeletal formation, nucleic acid metabolism, and protein and carbohydrates metabolism. Zinc deficiency affects growth. Iron is one of the most important and essential elements in nutrition. Iron deficiency of children and adolescents leads to feripriv anaemia (iron deficiency anaemia syndrome). Together with K, Mg is one of the basic intracellular cations

The experimental results indicated that dietary flours and bread flour obtained from it brings an additional contribution of Cu, Fe, Zn, Mg and K, compared with wheat flour for bread, respectively, obtained bread from non enriched flour.

CONCLUSIONS

- ❖ The ash content of analyzed samples, which reflects the mineral content of the flours and bread, are higher in the case of dried fruits addition.
- ❖ Dietary flours and the bread obtained from it brings an additional contribution of Cu, Fe, Zn, Mg and K, compared with wheat flour for bread, respectively bread obtained from flour non enriched.
- ❖ Vitamins content from B complex needed to dietary alimentation grow in flour and in fruit addition bread case.

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