THE CORRELATION BETWEEN THE EFFECT OF FRESH BERRY CONSUMPTION AND THE CONSUMPTION OF FOOD SUPPLEMENTS MADE FROM FRESH BERRIES

Bei Mariana[*], Popovici Raluca[*], Domocoș Daniela[**], Ciavoi Gabriela[**], Cuc Albinița[**]

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048, Oradea, Romania, e-mail: marianaf.bei@gmail.com
**University of Oradea, Faculty of Dental Medicine, P-ta 1 Decembrie 5, Oradea, Romania, e-mail: cuc.albinita@yahoo.com

Abstract

Although the correlation between the effect of fresh berry consumption and the consumption of dietary supplements obtained from berries has been researched and analysed by similar studies (Blomhoff 2005), our analysis aims to consciously and wisely revive the genuine and non-commercial interest in these species of great importance in the improvement or even in the treatment of certain diseases, thus avoiding the use of synthetic food products or supplements (Benzie and Strain 1996). In this respect, scientific studies are required to restore some order in what is known or should be known about these plants and especially about these fruit (Halvorsen et al., 2002, Halvorsen et al., 2006, Carlsen et al. et al., 2010).

This approach regarding the analysis of the active principles as real medicinal valences is absolutely motivated given that modern means of harvesting, generally conventional, would use in the cultivation of these plants phytosanitary and fertilizing substances that are as harmful as those of synthesis or even worse. Qualitative analyses of berries have highlighted the important content of nutritional principles based on which to make recommendations on the impact of these products on the reduction or improvement of vitamin and mineral deficiencies, elements which the body benefits from following food intake. The analysis of the nutritional impact of berries on the carential status as presented by food frequency questionnaires and complemented by paraclinical studies show that a quantity of 450g of berries such as raspberries, blueberries, blackberries and rosehips for a period of 6 weeks reduced the carential status by approximately 16% compared to 5% for the syrup based diet supplements.

Key words: healthy eating, berries, carential status, vitamin C,

INTRODUCTION

All nutritional studies of all foods start from the understanding and the analysis of the nutritional quality of the food. Based on these, specialists set up “the health and/or nutrition terms” that are written on food labels. The qualitative analysis of nutrition is an intrinsic complex process and gives each food the opportunity to find itself in a balanced diet. However, defining the place that food should occupy in the diet is an extremely delicate and, at the same time, difficult task since several factors are to be taken into account.

Berries occupy the most important place among the forest by-products thanks to certain real medicinal valences which made their role more important in the ancient times when they were consumed fresh as

synthesis drugs were not available. Used as raw material for the food industry, they undergo several transformation processes resulting in finished products with properties that are different from those of the fresh fruit (Halvorsen et al., 2002, Halvorsen et al., 2006, Carlsen et al. al., 2010). Nutrients in fruit are easily assimilated and help increase the immunity of the body. Thanks to their healing properties, some nutrients are used in the pharmaceutical industry or empirically by people. These products represent a true "horn of plenty" and a real source of health thanks to their rich content in minerals, some of which with alkaline properties, as well as to their content in vitamins, other phytochemicals and enzymes (Halliwell 1996; Lindsay and Astley 2002).

By means of scientific nutrition programmes, people should be taught to consume more fresh fruit and vegetables and less canned fruit and vegetables as canned fruit present a high sugar content that has a devastating role on people's health, along with salt, alcohol and smoking. In traditional medicine, raspberry vinegar or juice are used in case of fever or diseases such as measles, scarlet fever, laryngitis and can successfully replace some synthesis products thanks to their very beneficial effects.
Blackberries are very tasty fruit that contain malic acid, succinic acid, lactic and oxalic acid, citric acid, salicylic acid, tannins, pectin, mucilage. From blackberries, one can make a lot of preparations such as syrup, wine, jam, jelly. When consumed fresh, they represent an important source of vitamins. Blackberry juice is also used to colour the pale rosé wine. (Connor et al., 2005a, b).

Rosehips contain pectin, sugar tannins, malic acid, citric acid, oils, dextrin, vanilla, resin, several mineral salts and are very rich in vitamin C. (Roman et al., 2013). Levorotatory vitamin C, as opposed to vitamin C of chemical synthesis, plays a special role in many antioxidant biological processes that regenerate oxidoreductases from ascorbic acid and dehydroascorbic acid. Vitamin C in rosehips is more efficient thanks to the complex of numerous organic acids, pectin, polyphenols, carotenoids and minerals that are presented in significant amounts. Natural vitamin C plays an important role in helping the immune system respond to stress and to bacterial and viral infections.

From a medical point of view, rosehip tea presents diuretic properties with the advantage that its effect lasts longer without affecting the kidneys. Rosehip tea is also used as fluid extract in renal lithiasis reducing the amount of renal and urinary calcium, the size and number of calcium oxalate kidney stones and the lipid peroxide in the liver (Tayefi-Nasrabadi et al., 2012). The rosehip decoct used against stomach cramps is red and has a pleasant vanilla scent. In certain areas, it is used as a black tea substitute, being considered anti-thermic. If eaten fresh, rosehips are

effective in eliminating tapeworm. The data suggest that the rosehip extract used in traditional medicine may have immunomodulatory effects such as vitaminization, arterial vasodilator, antilithiasic, intestinal anti-inflammatory, anthelmintic. The rosehip extract is also recommended in peripheral vascular disorders (Sadigh-Eteghad, 2011).

Blueberries are important for their biological action on the body as well as for their high content of vitamins and minerals, especially antioxidants. Consequently, blueberries should not miss from our daily diet, especially from May to September, the harvest period, whether consumed fresh, frozen or as tea or syrup. Blueberries have a rich content of tannins, pectin, myrtilin, sugars, provitamin A, vitamin C, organic acids (citric, malic, oxalic, succinic, lactic) because they have not undergone special cultivation programmes (Laura Zoratti, 2016). Leaf and fruit extracts have astringent properties thanks to the tannin. Blueberries have antibacterial properties, favourably modifying the intestinal pathogenic flora, antidiarrheal and anti-inflammatory properties because of the flavonoids. Blueberries are recommended in diabetes thanks to their effect of reducing glucose levels. They are also recommended in gout, enterocolitis, colitis, intestinal parasites, urinary tract infections or uraemia. As minor antiseptic, blueberries have bacteriostatic and diuretic properties. They also have beneficial effects in rheumatism, dermatological disorders, peripheral vascular disorders, urethritis, stomatitis, eczema, chronic bleeding ulcer.

When establishing the nutritional and the functional food capacity profile (Mencinicopschi et al., 2010), besides the known indexes of nutritional quality (VE, the percentage content of the main nutrients and the ratio between them in order to find out the positive and negative interferences among the constituents) we must consider the following:

- the role and the importance of food and its contribution to the population's diet, taking into account several risk groups
- the overall nutritional composition of the food and the presence in its food matrix of those nutrients that are scientifically recognized as having at least one effect upon health
- the nutritional profile should allow the innovation of new products and, at the same time, take account of food habits and traditions in such a way that a single product can play an important part in a diet.

These aspects have been clarified so those interested in this field of great importance for the food industry understand and become familiar with the essential and basic rules of nutrition studies without which, as mentioned above, one cannot talk about innovating, designing and approving new products.

Berries contribute to diet improvement and diversification, pleasing the eye and the taste buds with their special qualities, revitalizing the human body and strengthening the human immune system so exposed to the daily stress factors.

These fruit are considered medicinal products because they can help strengthen the immune system, stimulate the regeneration of the degraded liver tissues, improve night vision, fight dietary diseases (diabetes, gout, obesity), block free radicals by maintaining the cell's antioxidant system, ameliorate chemotherapy-induced side effects, fight the diseases of all the systems in the body (respiratory, cardiovascular, digestive, endocrine, nervous, excretory). The anthocyanosides in rosehips and other berries have a significant preventive and curative property for antiulcer by influencing the biosynthesis of the mucopolysaccharides, thus improving the efficacy of the mucus barrier at the gastric level (Cristoni and Magistretti, 1987; Magistretti et al., 1988).

Unfortunately, the production activity of any industrial unit is motivated by the need to meet consumers' growing food demands and is meant to create a diversity of foods with no functional properties on the body, a preoccupation that should represent people's conscious activity to meet certain functional needs.

MATERIAL AND METHOD

The present study on the importance of active principles as real medicinal valences focuses on the technical progress and scientific development by means of which the natural processes of obtaining products for special purposes can be reduced in duration and, in some cases, can be completely replaced, but with a significant reduction in functional value. The reductions are motivated by the physical and chemical transformations that take place during the process of obtaining the finished products.

These aspects led to the comparative study on the analysis of the quality of the berries consumed as such, in their natural state, in the amount of 450 g/day for 6 weeks - a period completed with a set of paraclinical laboratory analyses meant to evaluate the improvement and even the reduction in the carential status of certain vitamins and minerals.

A comparative analysis was also carried out over a 6-week period in order to assess the carential status of vitamins and minerals following the consumption of syrups based on fruit extracts (synthesis products) administered at doses of 2x5ml/day, except for rosehips that were consumed as a powder obtained from the natural drying of the fruit without achene and stings in a quantity of 2x3g powder/day. Finally, paraclinical

analyses were carried out to evaluate the carential status of vitamins and minerals.

The return to nature, which has become more and more justified thanks to medical use, has made consumers use and recommend a "higher" consumption of berries for the relief of several diseases. Unfortunately, these fruit are imported, both as fresh products and in the food industry (Banu, 2010).

The analysed biological material was represented by 4 species of berries: blackberries, blueberries, raspberries and rosehips, well represented in the forests of northern Romania and which represent, both quantitatively and qualitatively, important sources of raw and auxiliary materials for a series of food products.

RESULTS AND DISCUSSION

The results of the qualitative analysis of berries (Table 1) reveal an important content in soluble matter, ranging from 7 to 17%, higher values being obtained in raspberries 9-16%, followed by blueberries 8-14% and blackberries with the smallest amount of soluble dry matter 7-15%.

Table 1.

The harvest period and the characteristics of the main species of berries

Name of the species	Period of ripening and harvesting	Fruit colour at ripeness	Soluble dry matter %
Blackcurrant – Vaccinium myrtillus	July - October	Blue black	8 - 14
Raspberry – Rubus idaeus	July - September	Red	9 - 16
Blackberry – Rubus hirtus	August - October	Blue black Dark bluish-grey	7 - 15
Rosehip– Rosa canina	August - November	Orange-red Bright red	8 - 17

In terms of soluble dry matter, all four berry species meet the quality standards, representing a quality raw material for the food industry. These values of the dry matter are influenced by the yearly climatic conditions and have to be presented in an analysis report in order draw up the quality certificate on quality classes.

The results of the research on the content of sugars, organic acids and vitamin C presented in table 2 show values that confirm once again the superior quality of these species of berries for human nutrition in improving the immune parameters or when used as auxiliary materials for certain dairy products.

Table 2.

Chemical composition at some berries

Name of the fruit	Water %	Sugars mg %				Organic acids %	Vitamin C mg/100 g fruit
		Total	G	F	Z		
Blueberry	85-88	7-13	3.32	5.28	1-2	1.3-1.6	20-35
Raspberry	86-92	3-7	2.05	2.89	0.89	0.8-1.6	45-85
Blackberry	80-88	5-9	2.69	3.57	1.73	1-2.2	25-40
Rosehip	30-35	6-10	4.41	2.91	0.75	8-11	150-350

The highest sugar content was determined in rosehips, 6-10 mg% fresh product, followed by blackberries 5-9 mg%, blueberries 4-8 mg% and raspberries 3-7 mg%, the lowest sugar content of the analysed species. All these values meet the quality standards specific to quality class I for each species.

The content in organic acids also belongs to quality class I. The highest content of organic acids was recorded in rosehips, 8-11%, which gives them the first place in improving health by treatments with natural extracts. The content of vitamin C in rosehips can be beneficial in treating influenza, in increasing the body's immunity and in recovering faster thanks to its antioxidant properties.

The comparative results on the carential status in vitamins and minerals are of great importance in the studies of carential nutrition. It is worth mentioning that in this study rosehips were consumed as powder obtained from dry fruit without achene and stings in the amount of 2x3 g/day.

In the case of syrup-type supplements, the main nutritional criteria studied relate to nutrients and ingredients, knowing their impact on health and distinguishing between components with positive connotations (dietary fiber, vitamins, minerals, fatty acids ω3) and components with negative connotations sugar, salt, and hydrogenated .fats).

The values of the paraclinical analyses (Table 3) at the beginning of the study in parallel with the paraclinical values obtained after a 6-week period of consumption of fresh berries, except for the rosehips that were consumed as powder in the amount of 6 g/day, improved significantly in both studies.

The values of the paraclinical analyses (Table 4) after a 6-week period of consumption of 2x5 ml/day of natural fruit extracts of each species, i.e. blueberries, blackberries, raspberries and rosehips, were slightly increased.

Table 3.

Values of the paraclinical analyses at the beginning and at the end of the study

Paraclinical analyses	Markers				
	Vitamin C mg	Serum Mg mg/dL	Serum P mg/dL	Serum K mmol/L	Serum Ca mg/dL
Reference values	50-60	1.6-2.6	2.5-4.5	3.3-5.1	8.6-10
Values obtained at the beginning of the study	51	1.9	2.6	3.1	8.7
Values obtained after 6 weeks	59.16	2.2	3.01	3.59	10.09

Table 4.

Values of the paraclinical analyses at the beginning and at the end of the study

Paraclinical analyses	Markers				
	Vitamin C	Mg	P	K	Ca
Reference values	50-60	1.6-2.6	2.5-4.5	3.3-5.1	8.6-10
Values obtained at the beginning of the study	54	1.8	2.8	3.6	8.5
Values obtained after 6 weeks	56.7	1.89	2.94	3.78	8.93

The comparative analysis of the paraclinical investigation results revealed that in the case of synthetic syrup consumption the nutritional profile of the consumption of unprocessed natural products improved by about 16% compared to 5% for the syrup based diet supplements.

CONCLUSIONS

The study of the effect of fresh berry consumption compared to the consumption of syrups obtained from these fruit in order to evaluate the efficiency of improving the carential status in vitamins and minerals revealed a significant difference of 11%. The advantage of improved carential status is related to the fairly high seasonality of these berries which are on the market from the third decade of May to the second decade of September.

Fruit in the forest area can be certified as “BIO” products. So, by means of modern processing and latest technology, high-quality products can be obtained which actually improve the body’s carential status.

The experiment control in the nutritional studies on the ingestion of berries is represented by the fruit obtained from spontaneous flora or grown without fertilizers, fungicides and pesticides because these substances interfere with the nutritional constituents.

The amount of vitamin C is strongly influenced by fertilizing substances, resulting in false positives. This requires paraclinical analysis and interpretation of the body's status before and after the study.

The pertinent recommendation of this study is to consume as many indigenous berries and berries from spontaneous flora, purchased locally as much as possible, neither imported nor obtained from crops, all the more as the carential status is known.

REFERENCES

1. Denke M.A., 2001, Metabolic effects of high-protein, low-carbohydrate diets. The American Journal of Cardiology Volume 88, Issue 1, 1 July Pages 59-61.
2. Gromiha, M.M., 2010, Protein Bioinformatics: From Sequence to Function. Academic Press is an imprint of Elsevier. eBook ISBN: 9780123884244
3. Karin R.Sargrad, Carol Homko, Maria Mozzoli, Guenther Boden, 2005, Effect of high protein vs high carbohydrate intake on insulin sensitivity, body weight, hemoglobin A1c, and blood pressure in patients with type 2 diabetes mellitus. Journal of the American Dietetic Association Volume 105, Issue 4, April, Pages 573-580.
4. G. A. Kaysen, W. G. Kirkpatrick, W. G. Couser, 1984, Albumin homeostasis in the nephrotic rat: nutritional considerations. American Journal of Physiology - Renal Physiology Published 1 July Vol. 247 no. 1, F192-F202 Doi.
5. George A. Kaysen, John Gambertoglio, Irma Jimenez, Hardin Jones, and Florence N. Hutchison, 1986, Effect of dietary protein intake on albumin homeo stasis in nephrotic patients. Kidney International, Vol. 29, pp. 572—577.
6. Liu X, Blouin JM, Santacruz A, Lan A, Andriamihaja M, Wilkanowicz S, Benetti PH, Tomé D, Sanz Y, Blachier F, Davila AM., 2014, High-protein diet modifies colonic microbiota and luminal environment but not colonocyte metabolism in the rat model: the increased luminal bulk connection. Am J Physiol Gastrointest Liver Physiol. Aug 15;307(4):G459-70. doi: 10.1152/ajpgi.00400.2013. Epub 2014 Jun 26.
7. Memcinicopschi, Gh., et. al., 2010, Compendiu de terapie naturală, Editura Medicală, Bucureşti.
8. Newsholme EA,Parry-Billings M, McAndrew M et al., 1991, Biochemical mechanism toexplain some characteristics of overtraining. In Brouns F (editor): Medical Sports Science, Vol. 32, Advances in Nutrition and Top Sport (pages 79-93). Basel, Germany: Karger.
9. P.M. Piatti, L.D. Monti, Fulvio Magni, Isabella Fermo, L. Baruffaldi, R. Nasser, G. Santambrogio, M.C. Librenti, M. Galli-Kienle, A.E. Pontiroli, G. Pozza, 1994 Hypocaloric High-Protein diet improves glucose oxidation and spares lean Body Mass: Comparison to hypocaloric High-Carbohydrate diet metabolism Volume 43, Issue 12, December 1994, Pages 1481-1487.
10. Reed JC, et al., 1994, Cloning and disruption of CKB2, the gene encoding the 32-kDa regulatory beta'-subunit of Saccharomyces cerevisiae casein kinase II. *J Biol Chem* 269(27):18192-200.