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THE IMPACT OF CRANBERRY (*VACCINIUM OXYCOCCOS*) BIOACTIVE COMPOUNDS ON CONTEMPORARY DIET

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Abstract: *The current trend in creating diets is strongly influenced by the high rate of development of the society and the lack of time for food preparation, leisurely dining and basic food preparation from direct producer. Thus, the current target of science is moving towards developing new food products capable of correcting in terms of nutrition and sanogenous contemporary diet.*

*The chemical composition of *Vaccinium Oxycoccus* is extremely rich in essential compounds for the proper functioning of the human body, with a high antioxidant capacity, containing fibers and vitamins that come in support.*

*This study is intended to focus on the nutritional benefits and physicochemical properties of *Vaccinium Oxycoccus* - cranberry, towards human body and to highlight the simplest methods of introduction to contemporary diet.*

Keywords: *cranberry, diet, sanogenous.*

1. INTRODUCTION

The technological and scientific progress has generated significant changes in terms of lifestyle and food preferences regarding the contemporaries. Nowadays, the nutritional products are given a set of procedures and treatments to be easily prepared and consumed and to provide pleasant sensations for consumer, decreasing hunger, without taking into account, however, the energy needs of the body and the adverse repercussions for health. [1]

Scientific progress and facilitation of consumer access to various information, led to the recovery of interest in the connection between diet and health, which forced the scientific world in the field to create foods with the ability to influence decisively health.

Because the body needs are becoming more pronounced, involving high level of energy consumption, solutions were sought in order to develop new products. Their evolution has experienced various stages of development, reaching today an increasing diversity.

The current trend is to use various food ingredients in products, with active principles that will bring immediate benefits from consumption. A remarkable ingredient in terms of the content of bioactive compounds is *Vaccinium Oxycoccus*.

It is found in a number of food products in various forms, but most often as raw fruit or as an extract, tincture, macerated and prepared. Different constituent parts of cranberry bush - fruit pulp, exocarp and leaves have been used in traditional medicine in order to assert their curative properties. The high proportion of antioxidant activity of cranberry is supported by its biologically active potential. The edible part of the fruit contains considerable quantities of acids, sugars, vitamins, proteins, minerals and polyphenols. [2]



Figure 1. Cranberry
harvest

The present study aims to analyse the physicochemical properties of *Vaccinium Oxycoccus* as biologically active ingredient intake, used in various forms - unprocessed, raw and processed condition - juices, prepared extracts.

Cranberry is part of a small evergreen shrub belonging to the genus *Vaccinium*, subgenus of *Oxycoccus*. It is a herb belonging to the family *Ericaceae*. It is known by many popular names as: lingonberry, bilberry, red cranberry, peony, boxwood, currant, blueberry mountain, con-temporary, rhododendron, periwinkle, garland.

Taking into account certain classifications, subgenus *Oxycoccus* is appointed as a genre itself. Cranberries can be found in acidic bogs in cold regions of the northern hemisphere, and in the Eastern Europe, in Romania can be found in the higher regions of the mountains.

Boxwood shrubs are small form of climbing bushes or shrubs that can reach 2 m wide and between 5 to 20 centimeters high. They have thin stems, poorly developed that are covered by thin layers of wood that grow small leaves, evergreen. The flowers are dark pink, with petals of different shapes. The fruit is round shaped bigger than plant leaves, initially white, but then acquiring a dark red at full maturity stage. It is edible, with an acidic taste that can overwhelm its sweetness.

Cranberry fruit is preferred by a wide range of consumers due to its sweet-sour taste, slightly astringent. Its beneficial effects are due to the intense antioxidant activity possessed by the variety of biologically active compounds.

2. MATERIALS AND METHOD

The plant material used is represented by the fresh fruit of *Vaccinium Oxycoccus*. It must provide adequate sensory characteristics.

2.1. Physical properties

Physical properties. During experimental research, there were evaluated a number of fresh fruits, which were examined visually, taking into account the physical layout for the whole fruit and appearance of the fruit section. Fruits were checked by the research team to establish the integrity and the most appropriate evaluation, a number of 10, were classified according to the scale of hedonic evaluation score (1 = worst, 10 = best). [4]

Chemical properties. A large number of recent studies has shown that cranberries eaten as raw food - compared to purified extracts of cranberry consumed either in liquid or dry form of supplements - are more effective in protecting the cardiovascular system and liver.

The chemical composition of cranberry is given by its nutritional content (fiber, manganese, vitamin C, vitamin E, copper, pantothenic acid, vitamin K), phytonutrients (phenolic acid, proanthocyanidins, anthocyanins, flavonoids, triterpenoid), acids (citric acid, malic acid, quinone), sugar, water and trace metals such as found in its structure.

In the following table, it is highlighted the content of nutrients per 100 g of cranberry fruit. [5]

Table 1. The nutrient content in 100 g cranberry expressed as a percentage

Nutrients	Fiber	Manganate	Vitamin C	Vitamin E	Copper	Pantothenic acid	Vitamin K
%	18,4	18	17,7	8	6,6	5,7	5,6

While ordinary nutrients such as vitamin C and fiber, plays a very important role regarding health benefits of cranberry is interesting the grouping of phytonutrients which plays an important role in researchers attention. There are a number of five categories of phytonutrients with an important role in supporting health, summarized in Table 2.

Table 2. Phytonutrients in composition of cranberry fruit

No.	Phytonutrients	Specific molecules
1.	Phenolic acid	Caffeine acid and ferulic acid
2.	Proanthocyanidins	Epicatechin
3.	Antocyanins	Malvidin
4.	Flavonoids	Myricetin
5.	Triterpenoid	Ursolic acid

Most phytonutrients present in the table above have been studied due to its antioxidant, anticancer and antiinflammatory potential and in many cases the results were impressive. Of particular importance concerning the research of cranberry properties was the discovery related to the isolated phytonutrients which do not contribute equally as phytonutrients taken as a whole, as a synergistic group (stepping action of both substances in the same direction). [1]

Table 3. The water content and constituents of cranberry fruit

No.	Compound	Percent (%)
Acids		
1.	Citric	1,0
2.	Quinone	1,0
3.	Malic	0,7
4.	Benzoic	0,01
Sugars		
1.	Glucose	2,9
2.	Fructose	1,0
Another compounds		
1.	Tannin	0,3
2.	Pectin	0,1
3.	Antocians (mg/100 ml)	40,0
4.	Flavones (mg/100 ml)	17,75

Table 4. Metal traces contained by cranberry fruit

No.	Metals	Quantity (mg)	Percent (%)
1.	Iron	0,25	2
2.	Magnesium	6	2
3.	Manganese	0,36	17
4.	Phosphor	13	2
5.	Potassium	85	2
6.	Sodium	2	0
7.	Zinc	0,1	1

The values shown in table 4 varies from year to year, depending on the existing weather conditions. These are the most common values considered reference values for studies.

Cranberries have a unique chemical composition, which distinguishes them from other fruit. The combination of strong acids (approx. 2%) and low Brix degrees (approx. 7.5 ° Brix) gives the pure cranberry juice a ratio Brix/ acidity of almost 3.75, which makes it extremely pleasant due to its unique form acidity. In contrast, apple or orange juice having a Brix value of the ratio acid / about 10. Another unique feature of cranberries is created by the significant amount of astringent tannins. Cranberries also contain a unique blend of organic acids. Citric and malic acids predominate, followed by quinone (approx. 1.0%) and benzoic acid (approx. 0.01%), typical for a large variety of fruits. [2]

The second approach performed in this study is represented by the chemical analysis of different products performed in cranberry - extracts, prepared juices. These products have been performed by various methods – concentration, sweetening/ drying, flavouring.

The results were expressed taking into account the levels of calories, fat, cholesterol, sodium, potassium, carbohydrates, fiber, sugars, proteins, vitamin A, vitamin C, calcium and iron.

Table 5. Cranberry products - Nutritional value of cranberries (measured per 100 g)

Nutrients	Frozen	Concentrated	Sweetened/ dry	Concentrate for fine flavored drinks	Powder
Calories (kcal)	48	198	298-367	337-342	360
Calories from fat (%)	0	0	11-12	5	2
Total fat content (g)	0,5	0	1,2-1,4	0,5	0,2
Saturated fat (g)	0	0	0	0	0
Cholesterol (mg)	0	0	0	0	0
Sodium (mg)	3	14	3-4	2-3	29
Potassium (mg)	73	500	40-90	11	734
Total carbohydrates (g)	10	49	82-88	83-84	89
Diet fiber (g)	4	<0,5	6-9	5-6	6
Sugars (g)	4	22	64-69	67-68	37
Proteins (g)	0,6	<0,5	<0,5	<0,5	<0,5
Vitamin A (g)	0	0	70	16,200	0
Vitamin C (mg)	18	58	0	1	5
Calcium (mg)	10	39	10-18	4	184
Iron (mg)	0,6	1,7	0,5	0	4

3. RESULTS AND DISCUSSIONS

Alternating daily diet and a healthy lifestyle are the defining elements to maintain health and prevent establishment of chronic diseases. In the current context, a large number of people suffering from diseases of the most diverse, but the highest incidence is the feeding disorders, cardiovascular system and the nervous system.

The multitude of biomolecules present in the composition of fruit and vegetables plays an important role in monitoring and preserving health limits.

Food styles had a considerably evolution, focusing on the benefits brought by essential nutrients in order to prevent nutritional deficiencies. According to this direction, there were studied and introduced into the diet a number of ingredients that bring multiple benefits from eating. One such ingredient is considered to be the cranberry, appreciated for its multivalent feature.

Due to its unique chemical composition, cranberries bring many health benefits and thus for the health of the consumer. The high content of bioactive compounds, such as fat-soluble vitamins - A, E, K and water soluble - C, malic acid, pantothenic minerals support their beneficial activity.

Remarkable in terms of the benefits from the consumption of cranberry is protection against urinary tract infections - UTI. Initially, it was believed that this protection is due to the increased acidity of the cranberry, but with the evolution of the studies carried out have shown that this protection is conferred by the content of proanthocyanidins. They have a special structure, the dominant type links A, create a

barrier against bacteria entering the urinary tract ascendancy. This discovery created the basis of research in the field, creating new perspectives and directions for research on central element benefits for the body due to cranberry consumption. [1]

Multivalent character of cranberry is reflected in the anti-inflammatory manifested in the body after consumption. The content of phytonutrients has an important role in protection against a broad spectrum of harmful factors. Among them there are: germs, bacteria, fungi and other microorganisms. At the cardiovascular system level, and in the case of certain parts of the digestive tract, cranberries had a promising anti-inflammatory effect. Phytonutrients contained in cranberry include chemical structure of compounds as: proanthocyanidins (PAC), anthocyanins - which gives cranberry fruit their interesting color and phenolic acids. The combination with the unique character of these compounds reduces the risk of inflammation.

An interesting anti-inflammatory effect after cranberry consumption was observed in improving gingival problems, due to the fact that it contributes to reducing the risk of periodontitis.

Due to the high antioxidant potential, cranberries bring numerous benefits to consumer health. Antioxidants contained in their structure helps to neutralize free radicals, considered by professionals responsible for distortions links of DNA and genes, interference with normal lipid metabolism and the production of inflammation, thus increasing the risk of developing certain forms of cancer and chronic diseases. Most notable are compounds with antioxidant capacity like flavonoids. Flavonoids contained by cranberry fall into three categories: anthocyanins, flavonoids and proanthocyanidins. Due to outstanding antioxidant capacity, cranberries and cranberry products obtained are representative in terms of high antioxidant capacity. [2]

4. CONCLUSIONS

Due to the interesting chemical composition of cranberries, extremely rich in essential compounds that brings important benefits for human health, it was observed that they can contribute to the proper functioning of the human body. The high antioxidant capacity, alongside with fiber content and vitamin complex contributes to the proper functioning of the human body, having an important impact concerning multiple diseases such as: protection against urinary and digestive tract infections – UTI, antioxidant and anticancer effects and boosting the cardiovascular system.

The multivalent character is sustained by the unique combination of bioactive compounds concentrated in cranberry fruits – vitamins A, E, K, malic acid, citric acid, phenolic acid and the last but not the least the high content of anthocyanin that has an extremely important role as an anti-inflammatory agent.

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