

THE PROSPECT OF USING THE CARROT OF INCREASED CAROTENE CONTENT IN FUNCTIONAL FOODS

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Abstract

Carrots are a high value raw material, that has nutritional, as well as biological value. It also provides a way to correct human nutritional state and to improve one's immunity to disease. Lately, Vitamin A deficiency has been considered World-wide problem number 3, right after the lack of energy and proteins in dietary intake. Taking into account the high biological activity of vitamin A, carrot selection based on a high carotene value remains a highly relevant problem. The consumption of products with health-improving natural ingredients is constantly rising in the world of healthy diets, and natural products from carrots can contribute to this. The purpose of this study was to evaluate the amount carotene in the root of the orange carrot plant sort, and to determine an assortment of canned carrot goods with high biological value based on carotene content. Presented are the results of the study of carrots cultivated in Moldova in 2013. An assortment of carotene containing canned goods, which can satisfy the daily need in β -carotene, has been identified.

Key words: carrots, hybrid, processing, selection β -caroten

The modern policy of creating new products (especially healthy products), optimization of the products' quality along other methods implies the use of sorted raw materials with a high biological value. One of the study's problems is the use of vegetal resources in human diet to fulfill their biotic needs.

Among vegetable cultures carrots have a relatively small specific weight, but because of nutritional and dietary qualities carrots are a valuable component in human diet. Scientists are beginning to pay additional attention to the use of vitamins, antioxidants and other dietary supplements in human immunity modulation.

Orange colored Carrot root-crops contain carotene (provitamin A) once eaten by humans and animals transforms into vitamin A – a substance vital to humans, which natively exists only in products of animal origin. Inside the human organism vitamin can be formed from carotenes, found in many vegetables in the form of carotene isomers - α , β , γ . Among the three isomers in the process of forming vitamin A β -carotene displays the best biological activity. Thanks to carrot's unique composition, modern medicine strongly advises adding it to the diets of children, the elderly and people who are recovering from serious disease.

The goal of this study is the creation of products for healthy eating, which are based on vegetal raw material with high biological value.

The problem was to find the most valuable sorts of carrot for use in industrial processing of different kinds of products, and to give practical recommendations on using vegetal ingredients to expand the assortment and increase the dietary and biological value of conserved foods.

One of the current problems of the production carrot-based food products with high biological value is the selection of carrot sorts with the highest possible amount of carotenes. Primary importance is given to the selection of sorts and hybrids of carrot with the high values of antioxidants.

MATERIALS AND METHOD

Research materials include fresh carrots and products of carrot processing.

The following hybrids of foreign selected food carrot, grown on sort plots of the State Commission for testing of agricultural plant sorts of Moldova in the southern and northern areas in the year 2013: carrot type „Nantes”- *Bolero F₁*, *marior* (France), *Narbonne F₁* (Netherlands) *Samson F₁* (Netherlands), *Bangor F₁* (Netherlands), *Baltimore F₁* (Netherlands), *Olimpo F₁* (France), *Saturno F₁*, *Maestro F₁* carrot type „Chantenay”- *Santa Cruz F₁*, *marior* (Olandcarrot typea), *Cupar F₁* (Netherlands), *Cordoba F₁*

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(Netherlands), *Carini F₁* (Netherlands), *Chamare* (Czech Republic). Research was conducted on 13 northern grown and 5 southern grown hybrids and sorts of carrot.

The process of the determining the physico-chemical indexes (the fraction of dry substance, general and reducing sugars, carotenes, dimensions, pH) of fresh carrot and the products of its processing were conducted with the use of standardized methods of determination.

RESULTS AND DISCUSSIONS

Carrots are different from other vegetables in that they contain high amounts of carotenoids. It is the richest source of vitamin A (carotene) in nature. To maintain a normal physiologically healthy human organism, the recommended daily norm of β -carotene consumption is 5-6mg (M.B. Кравцова, В.К. Андрищенко, Т.П. Стрельникова, 1991), which equates to 0.8-1.0mg of vitamin A (the daily requirement for humans). Because of the low consumption of fruits and vegetables the inflow of β -carotene does not exceed 1.8-5mg/day (Нормы физиологических потребностей в энергии и пищевых веществах для различных групп населения РФ, 2008). The inclusion of carrots into the everyday diet based on the daily needed amounts of vitamin A can help in warding off many diseases. Taking into account the high biological activity of vitamin A, selection of carrots based on the amount of carotenes and evaluation of the researched samples of food carrot grown in different soils and climates of the Republic of Moldova remain a point of interest. In accordance to the existing classification of raw material based on the amount of carotenes it contains, the

researched carrot sorts and hybrids, grown in the 2013 season, can be classified as containing very high amounts of carotene (20 mg/100g of carrot) (Калачева А.В. 2005). An exception is the *Chamare* sort, which exhibited a relatively low carotene accumulation, but it can still be grouped as containing medium amounts of carotene (10-15mg/100g). High carotene content determines its use in medical, dietary, prophylactic nutrition as a source of natural carotenes. The researched sorts and hybrids can be viewed as raw material with high carotene content to be consumed raw or to be used in food producing processing industries.

For this reason, the creation of a new generation of products, particularly drinks made from ecologically safe grown raw materials, became an important trend in the food industry. Taking into account the importance of the food carrot as a complex source of vitamins and antioxidants for the population, its consumption volume must increase and rise to new a level.

Carrots are eaten raw, and are also used in canning and cooking. In the canning industry carrots are a basic part of mince for an assortment of canned goods, especially in vegetable preserves. It is also used to make juice, puree, jams, citron and can be frozen. The objective of the researched sorts of carrots is the creation of a wide assortment of products with a high biological value, which requires further development for use in medical, dietary and prophylactic eating. Below is the factual data on the amounts of carotenes in the researched samples, which is the range of 5.01-28.88 mg/100g depending on the product's recipe, production technology and the amount of carotene in the carrots themselves.

Table 1

Physico-chemical indicates carrots, tested in year 2013

| Sample name | Carotene content mg/100g | | Ascorbic acid content, mg/100g |
|--|-----------------------------|--------|-----------------------------------|
| | in fresh carrots | canned | canned |
| Carrot for garnish | 28,35 | 28.88 | = |
| Marinated carrot | 49,27 | 27,02 | - |
| Carrot sauce | - | 8,78 | - |
| Carrot Puree | 34,72 | 9,52 | - |
| Puree carrot-apple | 34,72 | 9,92 | - |
| Mashed carrots and jujube | 34,72 | 9.54 | 52, 27 |
| Mashed carrots and sea buckthorn | 34,72 | 11,84 | 37,95 |
| Carrot nectar | 30,53 | 8.21 | - |
| Carrot nectar and plums | 30,53 | 5.01 | - |
| Mashed carrots and jujube, sea buckthorn | 35,43 | 5.28 | 91,01 |
| Carrot dessert | 30,53 | 9.52 | - |

The given amounts of carotene are enough to meet and exceed the daily requirements for it, considering the daily norm needed to sustain a healthy physiological condition of the body, which is the criteria for evaluating factual nutrition and is the base for the construction of a rational diet (**Коростылева Д.А., Парфенова Т.В., - 2013**). The amount of vitamins in juices, drinks and nectars is an important mark of their biological usefulness (**Щеглов Н.Г. 2013**). The inclusion of vitamin-rich purees made from ziziphus and hippophae (sea buckthorn) into the recipes results in carrot-based purees and nectars that contain 37, 95-91, 1 mg/100g of vitamin C, which makes up 42,2-100% of the daily requirement for it. The obtained results are the precondition for the creation of an assortment of healthy food products with high amounts of carotenes and vitamin C in a single product.

CONCLUSIONS

The nutritional value of products can be increased significantly by using sorted raw materials with high amounts of biologically active elements. Carrot, pumpkin, jujube, sea buckthorn are the perspective sources of biologically-active natural carotenes and vitamin C.

The consumption of products with health-improving natural ingredients is on the rise in the world of healthy diets, and natural products made from carrots can contribute to this trend.

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