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## NUTRITIONAL AND BIOLOGICAL VALUE AND QUALITY OF MULTICOMPONENT CANNED VEGETABLE SALADS

### Abstract.

*The creation of high-quality processing products from vegetable raw materials is urgent. The production of functional, dietary, preventive and therapeutic products is currently promising. Using the potential of biologically active substances of common vegetables is a strategically important task of the processing industry. The proposed recipes for preparing canned vegetable salads received high organoleptic indicators. The use of different recipes made it possible to increase the content of ascorbic acid by 2 times. Due to its low sugar content, this product is recommended for consumption by people who monitor their calorie and sugar intake, in particular, those prone to or suffering from diabetes. Further research will be aimed at the introduction of various spicy aromatic plants into the recipe and their effect on the quality and biological value of the finished products.*

**Keywords:** *овочі, салат, консерви, хімічний склад, якість.*

### Introduction.

The strategy for the development of the food and processing industry of Ukraine for the period 2020-2030 sets the goal of providing the population with high-quality food products necessary for the formation of a correct, comprehensively balanced diet only at the level of physiologically recommended consumption norms. Vegetable processing products contribute to the smoothing of seasonal fluctuations in vegetable consumption, provide the population with complete food products, increase or decrease the caloric content of food products, increase the nutritional and biological value and digestibility of valuable nutrients of processing products. In this regard, the development of scientifically based methods and technologies for the production of a wide range of food products from vegetable raw materials with a functional orientation to improve the nutrition structure of the population is relevant [1, 2].

Currently, national programs for improving the health of the population are being created and implemented all over the world, thorough research is being conducted on the creation of new functional products that have a curative and preventive spectrum of action. Annually, the production of functional products increases by 10-20%. A functional food product is a food product that is part of a regular diet and, in addition to its nutritional properties, positively affects certain body functions of all age groups of the population. Regular

use of such products reduces the risk of chronic diseases and improves health due to the presence of physiologically functional ingredients in its composition. It is possible to give functional properties to food products from vegetables by modifying the natural components of the product, biologically enriching it with biologically active substances (BAS) and removing unwanted components. Currently, new non-traditional sources of essential substances are being sought, methods of obtaining or isolating these substances from non-food raw materials are being sought, new directions in the technology of production of traditional products with functional properties are being developed. Special requirements are placed on functional ingredients: the absence of the ability to reduce the nutritional value of the food product, safety from the point of view of a balanced diet, and naturalness. True BAVs include only those capable of exhibiting pronounced biological and antioxidant effects in minimal quantities, directly participating in biochemical processes and reactions of the human body. Enrichment of food products with vitamins, deficient macro- and microelements is a serious intervention in the structure of the product, which has traditionally developed in the nutritional traditions of certain strata of society. This need is dictated by environmental factors associated with changes in the chemical composition, nutritional and biological value of food products, as well as with the reduction of energy consumption [3-7].

A systematic approach is necessary for the production of functional food products with the planned characteristics, including those with an increased BAS content. The technology of creating products with an increased content of BAV involves technological operations that maximally reduce oxidation and thermal decomposition of vitamins and other valuable natural components. It is necessary to correctly choose the temperature and time of heat treatment, taking into account the characteristics of the raw material, as well as biochemical indicators. Natural sources of nutrients that exhibit physiologically functional properties are the substances of plant raw materials, which include dietary fibers, proteins, lipids, oligosaccharides, antioxidants, vitamins and minerals. Vegetables are one of the main natural sources and the most common ingredients for creating functional products, and have a healing effect on the human body [8-14].

In the last 10-15 years, dietary fibers have been the object of special attention and serious study by physiologists, nutritionists and technologists. According to WHO recommendations, a product containing dietary fiber in the amount of 3 g/100 g of product is considered as a source of this functional component, and with a concentration of 6 g/100 g of product, it is considered enriched with dietary fiber. The physiological need for dietary fiber for an adult is 30-40 g/day, for children 15-20 g/day. The deficit of natural fibers in the diet of the majority of the population is 40-70%. Another aspect is the technological properties of fibers, their wide application as part of a group of food additives that change the structure and physical and chemical characteristics of food products [9].

Some vegetables have a relatively high content of flavonoids. The most complete information on the content of flavonoids (main 5 classes) in the most commonly used food products, including vegetables, is displayed in the Database of the US Department of Agriculture. The quantitative content of flavonols and flavones in products is expressed in terms of the main aglycones - quercetin, kaempferol, myricetin and isorhamnetin (flavonols), apigenin and luteolin (flavones). Each type of vegetable plant has its own flavonoid composition: flavonols (quercetin and kaempferol) predominate in broccoli; hot pepper fruits contain flavonols (quercetin) and flavones (luteolin); in red onion - flavonols (quercetin); parsley, celery - flavones (apigenin and luteolin); coriander - flavonols (quercetin); in eggplant fruits - anthocyanidins (flavonoid delphinidin); red lettuce leaves - flavonols (quercetin) [9, 15].

An important group of compounds with high antioxidant activity are carotenoids, which have anticarcinogenic, cardioprotective, and antiatherogenic properties, as well as immunomodulatory, radioprotective, and photoprotective effects. They are present in many food products, but the most valuable source for a person of the century are intensely colored vegetables: yellow-hot ones provide  $\beta$ - and  $\alpha$ -carotene, dark green ones - lutein. Spinach, rich in lutein and zeaxanthin, red pepper, which mainly contains capsanthin and capsorubin, and tomatoes - lycopene, are the leaders in the level of accumulation of carotenoids in vegetables. In carrots

and pumpkins, carotenoids are represented mainly by  $\beta$ -carotene, and their content ranges from 6 to 28 mg% and from 4 to 30 mg%, respectively. Vegetables contain vitamins (C, E, K, folic acid, as well as B1, B2, B3, B6, PP, biotin), vitamin-like substances (U, etc.) - the most important biologically active compounds that have antioxidant effects. Sweet pepper, parsley, dill, cauliflower, perennial onions are the undisputed leaders in terms of vitamin C. Vitamins of group B are found in significant quantities in representatives of the legume family and in yellow-green vegetables. Vitamin E (tocopherol) - in green peas, green parsley, spinach, lettuce, onions, carrots and cabbage [9].

#### **Materials and methods.**

Research conducted at NULES of Ukraine. The data of many years of research were used. Vegetables are grown in the research garden of the Faculty of Agrobiology, NULES of Ukraine. The salad preparation technology included all the main technological operations and regimes that ensured stability in the storage process. Sterilized products were stored at room temperature in the absence of light. The assessment of product quality has been carried out. Determination of the components of the chemical composition and statistical processing were carried out according to generally accepted methods. data was collected according to generally accepted methods [16-17].

#### **Results and discussion.**

Raw materials for salad preparation were selected at the technical stage of ripeness, healthy, well developed. Sweet and sour tomatoes with fleshy walls were taken, onions and turnips were of semi-hot or hot varieties. Vegetable products were washed, inspected, separated from inedible parts, ingredients of the recipe were chopped: eggplants: cut into thin plates; tomatoes - cut into pieces 1.5-2 cm in size; pepper - in plates with a side length of 1-1.5 cm; turnip onion - in pieces of 1-1.5 cm; garlic - in thin slices. Raw materials are transferred to a shallow enameled dish, mixed and vinegar, sugar, salt are added, mixed and placed in jars. The ratio of the components of the recipe: eggplant, tomatoes, garlic, pepper and onion was different. Before canning, the individual components of the recipe are analyzed according to the indicators of the content of the components of the biochemical composition, which ensure the nutritional and biological value of the finished product. Eggplants contain a small amount of ascorbic acid (up to 5 mg/100g) and organic acids (0.2%), B-carotene (0.02). But, like all vegetables, they contain a high amount of potassium (up to 238 mg/100g) and other trace elements (Table 1). Thus, on the one hand, eggplants have high taste properties, but they need to be enriched with biologically active substances at the expense of other components of salads, in particular, at the expense of introducing pepper, tomatoes, onions, etc. into the recipe. To improve taste and stability, it is necessary to add acetic acid in the range of 0.4-0.5%. Eggplants, as representatives of the solanaceae family, contain a small amount of solanine, but in canned food, the consumer wants to feel the usual taste and smell of traditional spices - onions and garlic, etc.

Table 1

**Technochemical assessment of the quality of raw materials for salad preparation**

Name of raw material	Content, %				
	dry soluble substances	dry substances	titrated acids	sugar-acid index	ascorbic acid, mg/100g
Tomatoes	5,60	7,39	0,50	3,70	15,23
Sweet pepper	7,00	8,32	0,10	4,80	78,00
Eggplants	4,40	9,96	0,30	6,80	2,61
Onion-turnip	7,10	14,76	0,10	9,10	13,00
Garlic	3,70	29,00	0,10	3,50	13,20

The raw materials differ in the content of the main nutrients. Garlic and onions contain a higher content of dry soluble substances, and tomatoes and peppers contain more ascorbic acid. The content of titrated acids in vegetables is insignificant, so acetic acid was used. The fiber content is 1.8-2.9%.

Salad recipes with different ratios of components were created (Table 2).

Table 2

**Salad recipes**

Name of raw material	%, in recipe 1	%, in recipe 2
Eggplants	40,0	33,0
Tomatoes	25,0	16,0
Sweet pepper	15,0	30,0
Onion-turnip	5,5	6,0
Garlic	8,3	11,0
Onion	3,2	1,5
Sugar	2,0	1,0
Salt	1,0	1,5

During storage (3 months), there was a redistribution of the components of the biochemical composition in the entire mass of the salad (Table 3). An important indicator is the preservation of the valuable components of the salad during the storage period. The results of the tasting evaluation revealed that the appearance and taste properties of the salad were quite high (Table 3). The consistency in the 2nd formulation was denser,

which had a positive effect on the evaluation. Technochemical assessment showed that high taste properties are provided by a small amount of sugar (3-4%), optimal acidity (about 1%). At the same time, it should be noted that the content of ascorbic acid in the 2nd recipe is almost 2 times higher compared to the vitamin content of eggplant. This is due to the greater use of sweet pepper.

Table 3

**Chemical and technological characteristics of canned vegetable salad**

Index	Recipe	
	1	2
Organoleptic indicators, points		
appearance	4,80	4,90
taste	4,90	4,80
consistence	4,70	4,90
Total score	4,80	4,87
Content, %		
dry soluble substances	11,6	12,5
simple sugars	3,14	3,54
titrated acids	1,06	0,91
ascorbic acid, mg/100g	8,6	16,0

**Conclusions and suggestions.**

The proposed recipes for preparing canned vegetable salads received high organoleptic indicators. The use of different recipes made it possible to increase the content of ascorbic acid by 2 times. Due to the low level of sugar, this product is recommended for consumption by people who monitor their consumed calories and sugar, in particular, those prone to or suffering from diabetes. Further research will be aimed at the introduction of various spicy aromatic plants into the recipe and

their effect on the quality and biological value of the finished products.

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