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**NITRATE CONTENT OF TOMATOES, SWEET PEPPERS AND EGGPLANTS  
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**Abstract.** *A comparative study of the content of nitrates in some vegetable products in the winter-spring period, sold in supermarkets in Kyiv, was carried out. During the study, it was found that the concentration of nitrates in the studied vegetables is different. In all samples, the content of nitrates does not exceed the maximum permissible norm and they can be considered safe for consumption.*

**Key words:** *nitrates, vegetables, tomato, eggplant, sweet pepper, monitoring.*

**Introduction.**

Vegetable growing in Ukraine is developing rapidly. In 2021, according to the MinAPF, ukrainian greenhouse products provide up to 15-20% of the domestic market, and from February to May it reaches 50%, the rest of the vegetables on the market are imported, mainly tomatoes, peppers and eggplants. According to forecasts, the consumption of greenhouse vegetables in our country in the next 5-10 years may be angry 3-6 times, and the export potential of 4-8, according to forecasts Pro-Consulting [4].

The maximum yield cannot be obtained without fertilizers. Nitrogen in various forms is a natural and necessary component of physiological and biochemical processes of all plants. They ensure normal growth and development. However, excessive application of nitrogen fertilizers causes excessive accumulation of nitrate forms in the commodity parts of vegetables [6].

According to the Ministry of health of Ukraine, the content of nitrates in 11-15% of vegetable products constantly exceeds the maximum allowable levels, so their content is normalized. When eating vegetables high in nitrates, they are reduced to



nitrites in the intestinal tract, and the latter get into the bloodstream and cause diseases - methemoglobinemia. Nitrites interact with hemoglobin (oxidize ferric iron), resulting in the formation of nitrosohemoglobin, which is transformed into methemoglobin and partially into sulfhemoglobin. Methemoglobin inhibits the feedback of oxygen, there is a clinical picture of hypoxia (1 mg of sodium nitrite can convert to methemoglobin about 2000 mg of hemoglobin). A single injection of 100-150 mg of nitrite causes a person redness of the skin, lower blood pressure, faster heart rate, noise in the head; 300 mg - severe sweating, cyanosis of the skin, shortness of breath, impaired vision. Under the action of large doses of nitrates, the development of hemic and tissue hypoxia occurs, the process of oxidative phosphorylation is inhibited. Hypoxia caused by methemoglobinemia has a greater impact on patients with anemia or circulatory pathology. There is an embryotoxic effect of nitrates - abnormalities in fetal development (hematomas, skeletal disorders). The target of high doses of nitrates is the nucleus of hepatocytes and nucleic metabolism. As a result, metabolism is disrupted, the nervous system and all the protective functions of the body suffer. If nitrates enter the body in small doses, but regularly, it is fraught with the emergence of cardiovascular disease, nervous disorders and even stomach cancer. Elderly people, patients (diabetes, cardiovascular, liver and kidney diseases) and children who may consume untested and potentially dangerous products are especially at risk. Therefore, the quantitative determination of nitrates in vegetable products is currently relevant [1,2,3,5,7,8,10,11,12,13].

The aim of the study was to determine the content of nitrates in fruit vegetables (tomatoes, peppers and eggplants) in the winter-spring period, which are sold in retail chains in the city of Kiev and comparative characteristics of the results with the MAC.

#### **Research materials and methods.**

The research was conducted at the department of technology of storage and processing of crop products named after prof. B.V. Lesyka NULESU in 2021. Samples were taken from Silpo, Velyka Kyshenya, ATB, Novus and Lukyanovsky market. Determination of nitrate content in vegetables was carried out using a personal electronic nitrate tester H-405. Statistical data processing was performed using Excel [9].

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

For an adult, the maximum allowable level of nitrates is 5 mg per 1 kg of body weight, which is 300 mg per person weighing 60 kg. For the child the admissible norm is no more than 50 mg. The bulk of nitrates enters the human body with canned food and fresh vegetables (40-80% of the daily amount of nitrates). According to some scientists, the content of nitrates in early vegetables and indoors can be 2-3 times higher than in vegetables grown in their usual period. No wonder nutritionists advise to avoid greenhouse vegetables, especially for people with compromised health, and especially for children. After all, a product that can harm them can be legally sold in our retail network and considered safe and usable [10, 11,12].

Products selected from different retail chains were of different varieties (shape, size, color). The maximum allowable concentration (MAC) of nitrates in tomatoes from closed soil is up to 300 mg / kg (Table 1). The average content of nitrates in January was 139, and in April - 99 mg / kg. The content of nitrates in winter was 1.4 times higher on average, but did not slightly exceed the MAC.

**Table 1. Nitrate content in tomatoes**

Trade establishment	Nitrate content, mg / kg		MAC, mg/kg	Origin	
	january (2021)	april (2021)			
Velyka Kyshenya	152	95	300	Turkey	
	124	92		Ukraine	
Silpo	147	105		Turkey	
	134	100		Ukraine	
ATB	157	108		Turkey	
	152	107		Ukraine	
EKO-market	137	92		Turkey	
	112	86		Ukraine	
Novus	148	112		Turkey	
	122	87		Ukraine	
Lukyanovsky market	154	122		Turkey	
	127	87		Ukraine	
Average	139	99		-	-

Sweet pepper is represented only by imported samples. The fruits were large, bright - good looking (table 2). Exceedance of the MPC was not detected.

**Table 2. Nitrate content in sweet pepper**

Trade establishment	Nitrate content, mg / kg		MAC, mg/kg	Origin
	january (2021)	april (2021)		
Velyka Kyshenya	156	99	400	EC
Silpo	135	75		EC
ATB	166	111		EC
EKO-market	174	127		EC
Novus	142	78		EC
Lukyanovsky market	186	135		EC
Average	159	104	-	-

Eggplant fruits are presented only in imported samples. Due to the high price and low demand, this vegetable was not available in all retail chains (table 3). Exceedance of the MAC was not detected.

**Table 3. Nitrate content in eggplant**

Trade establishment	Nitrate content, mg / kg		MAC, mg/kg	Origin
	january (2021)	april (2021)		
«Велика Кишеня»	79	59	300	EC
«Сільпо»	95	45		EC
«Новус»	111	66		EC

All products of tomatoes, peppers and eggplants, which were sold in all retail chains and the market "Lukyanovsky" in appearance, shape and texture met the requirements of the standard, but the organoleptic characteristics were different. Tomatoes (Turkey) were light red in color and completely tasteless (critically low concentrations of sugars and acids), ie they were plucked to milk ripeness and turned red during transportation. Cocktail tomatoes (cherry) (Ukraine) had a characteristic appearance and had a very harmonious taste in the direction of sweet. Sweet pepper



had a characteristic taste, slightly watery but inherent. Eggplants in texture were characteristic and without seeds.

### Conclusions and suggestions.

The conducted researches allow to draw the following conclusions. The studied types of vegetables do not have the biological ability to accumulate high concentrations of nitrates. The level of nitrates in all studied vegetables did not exceed the MPC for greenhouses. The obtained data should be taken into account when compiling the menu for patients, children and the elderly.

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