

Выводы. Ионизирующая радиация является мощным фактором, влияющим на жизнедеятельность живых организмов, не только непосредственно после облучения, но и в отдаленный период и является дополнительным фактором риска развития злокачественных новообразований. Показатели выживаемости животных в течение 30 суток после облучения на гамма-установке «ИГУР» и рентгеновской установке X-Rad 320 значимо не различались. Рентгеновское и гамма-облучение были эквивалентны по влиянию на уровень спонтанного образования опухолей в легких мышей линии Af.

Данное исследование подтверждает возможность замены гамма-установок рентгеновскими установками биологического назначения.

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THE RESEARCH OF INDIVIDUAL PREFERENCES FOR THE CONSUMPTION OF EDIBLE SALT BY THE POPULATION OF BELARUS AND WAYS TO ENRICH IT WITH FOOD INGREDIENTS IMPORTANT FOR HUMAN HEALTH

ИССЛЕДОВАНИЕ ИНДИВИДУАЛЬНЫХ ПРЕДПОЧТЕНИЙ ПОТРЕБЛЕНИЯ ПИЩЕВОЙ СОЛИ НАСЕЛЕНИЕМ БЕЛАРУСИ И СПОСОБЫ ЕЁ ОБОГАЩЕНИЯ ВАЖНЫМИ ДЛЯ ЗДОРОВЬЯ ЧЕЛОВЕКА ПИЩЕВЫМИ ИНГРЕДИЕНТАМИ

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A survey of 123 respondents living in the Republic of Belarus was conducted on the characteristics of individual consumption of edible salt. It was found that 60.9% of respondents believe that vitamins should be a functional ingredient; 72% of respondents said they would be willing to buy salt with various additives. A method is proposed for enriching edible salt with ingredients important for human health with the possibility of regulating its mineral status due to extruded biologically active components from plant materials and, as a result, obtaining a wide range of salt with increased nutritional value.

Проведено анкетирование 123 респондентов, проживающих в РБ, по особенностям индивидуального потребления пищевой соли. Установлено, что 60,9 % опрошенных считают, что функциональным ингредиентом должны выступать витамины; 72 % опрошенных ответили, что готовы покупать соль с различными добавками. Предложен способ обогащения пищевой соли важными для здоровья человека ингредиентами с возможностью регулирования её минерального статуса за счет экструдированных биологически активных компонентов из растительного сырья и, как следствие получение широкого ассортимента соли, отличающейся повышенной пищевой ценностью.

Keywords: salt, edible salt, salt substitutes, dietary supplements.

The largest salt producers in the Republic of Belarus are: JSC «MozyrSalt», where boiling salt is produced; LLC «Belaruskali», where rock salt is produced [1].

In Belarus, consumption of edible salt is much lower than production, so the Republic (fig. 1) has a large export potential.

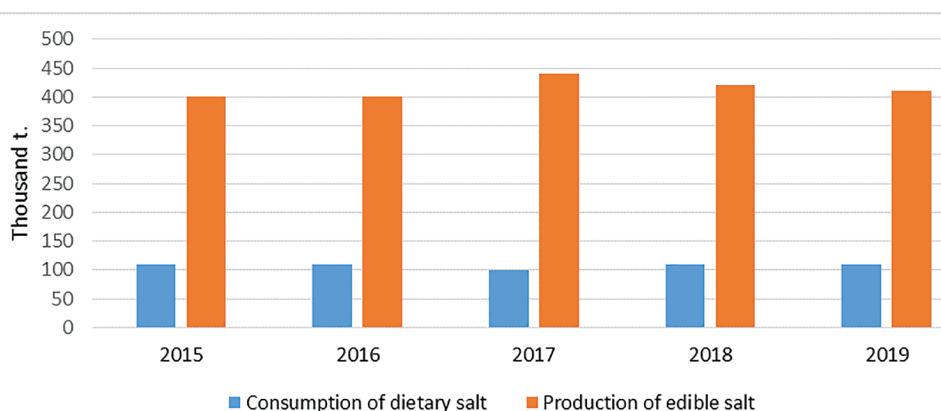


Fig. 1 – Balance of food salt production and consumption in the Republic of Belarus

The dynamics of the volume of food salt production in recent years remains almost at the same level and exceeds 400 thousand tons per year, while consumption fluctuates around 100 thousand tons per year.

Salt is a food product that improves the taste of food when used rationally. At the same time, the use of salt is strictly regulated (up to 5-6 g/day). The level of sodium, as well as other important elements (Mg²⁺, K⁺, Cl⁻, Ca²⁺) in the blood is a strictly maintained constant. And excessive salt intake is nothing but the most important modifiable risk factor for a large number of diseases, from hypertension, kidney disease to diabetes and atherosclerosis [2].

Recently, people have been trying to reduce salt intake in food, and in order to preserve the usual taste, they are looking for its replacement. For primary and secondary prevention of electrolyte disturbances in nutrition and diseases provoked by them, two approaches have been formed in medical science: restriction of intake of table salt and the use of special substitutes for it.

Salt is colorless crystals that contain 39.4% sodium and 60.6% chlorine. Salt of natural (marine) origin almost always has impurities of other mineral salts that can give it different colors (usually gray, brown, and pink).

It is produced in different types: coarse and fine grinding, pure, iodized, nitrite and so on. Depending on the purity is divided into grades: extra, highest, first and second [1].

Salt is vital to human life, as well as to that of all other living things. The chlorine ion in salt is the basic material for the production of hydrochloric acid, an important component of gastric juice.

Sodium ions, along with ions of other elements, are involved in the transmission of nerve impulses, contraction of muscle fibers, so their insufficient concentration in the body leads to general weakness, increased fatigue and other neuromuscular disorders. At the same time, excessive sodium causes fluid retention and an increase in blood pressure.

Salt intake affects different people, their blood pressure and heart health in different ways. Studies have found that salt sensitivity varies from person to person and depends on a variety of factors - nationality, age, body mass index, general health and heredity for hypertension.

Strict restrictions are due to the fact that the content of Na in the diet more than 2 g/day is associated with an increase in blood pressure, acute cerebrovascular accident, fatal myocardial infarction and stroke. The pronounced damaging effect of NaCl upon excessive intake into the body is associated not only with the fact that salt contributes to the development of blood pressure.

A questionnaire survey of 123 respondents living in the Republic of Bashkortostan was conducted on the specifics of individual consumption of dietary salt. The analysis of answers led to the following results: 97.5 % of respondents believe that salt is necessary to enhance taste, 49% are convinced that salt is necessary for the proper functioning of the body, which is true in terms of the need to balance the salt exchange; 73 % of respondents do not think about the salt content when choosing foods, which can be explained by poor awareness of its content in various products; 88.6 % of respondents know about functional foods, only 27 % buy them on a regular basis; 60.9 % of respondents believe that the functional ingredient should be vitamins; 72 % of respondents said that they are willing to buy salt with various additives, and 89% believe that the variety of salt in the trade network is sufficient; 76.4 % of respondents were of the opinion that it is necessary to organize social advertising of salt and 96 % indicated that they are willing to buy salt of domestic production.

The majority of respondents believe that a healthy lifestyle and proper nutrition are the most important for maintaining health (fig. 2).

Note that only 1.6 % of respondents said that they had not thought about this issue.

Analyzing patents on improving salt or searching for its analogues, we can distinguish two directions: the creation of salt condiments and the creation of salt substitutes [3].

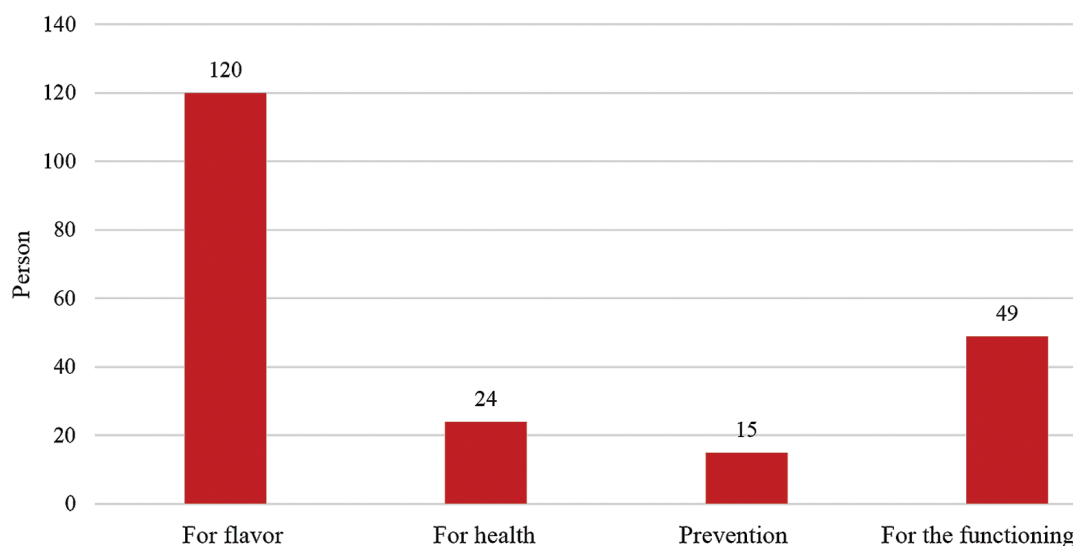


Figure 2 – Distribution of respondents' answers to the question «Why do people need salt?»

We propose the following ways of enriching food salt with ingredients important for human health.

Method 1: Enrichment with immune-boosting ingredients.

Starch-containing raw materials (native potato starch) are ground on a hammer crusher to particle size of 0.5–2.0 mm.

Enriching ingredient (blend of green tea, black tea, ground coffee, asafetida, badiana, vanilla, cloves, ginger, calgan, cardamom, cinnamon, turmeric, laurel, nutmeg, black pepper, white pepper, Cuba pepper, long pepper, African pepper, chilli pepper, cayenne pepper, bird pepper, kumba, Jamaican pepper, Japanese pepper, malaguetta, rosemary, saffron, onions, multilocular onions, shallots, leeks, baton onions, chives, mangir, Altaic onions, Pskem onions, garlic, ramson, bulb, garlic mushroom, parsley, parsnip, celery, fennel, horseradish, ajwain, ayre, anise, basil, black mustard, sarepta mustard, white mustard, gravilatae, blue clover, oregano, angelica, ispop, calofer, chervil Spanish chervil, kermen, coli, coriander, watercress, bittercress, meadow cress, garden cress, capuchin cress, lavender, lovage, marjoram, melissa, Moldavian snakehead, juniper, peppermint, curly mint, spearmint, apple mint, common wormwood, Roman wormwood, mugwort, lemon wormwood, alpine wormwood, oregano ruta, thyme, cumin dill, fennel, fenugreek, savory, winter tea, thyme, sage, tarragon, ginseng, orange peel, mandarin peel, pomorantse, lemon peel, orange peel, mandarin peel, grapefruit peel, taken in equal quantities) are dried to a moisture content of 7-8%, crushed to a particle size of 0.3–1.9 mm, sieved through a sieve of 0.8–2.0 mm and subjected to visual control.

Salt is crushed to particle size of not more than 1.0 mm, sieved and subjected to inspection (visual inspection). To obtain enriched salt is carried out by mixing starch-containing raw materials, enriching ingredient and salt at the following ratio, wt%: starch-containing raw material -30, enriching ingredient – 20, sea salt – 50.

Mixing of the components is carried out in a mixer for 2–4 minutes. Mixture of components is passed through a magnetic column with permanent magnets (layer thickness 6–8 mm, speed not more than 0,5 m/s).

The mixture is subjected to a single extrusion process at an operating temperature of 100°C, a working screw speed of 70 min⁻¹, a die diameter of 1 mm, without additional water supply, and a metering screw speed of 90 min⁻¹ and a cutting device speed of 80 min⁻¹.

The extrudate is crushed on a hammer crusher and metal-magnetic separation is performed, as a result of which it is passed through a magnetic column with permanent magnets (layer thickness 6-8 mm, speed not exceeding 0.5 m/s) and fed for packing and packaging.

Method 2. Enrichment with ingredients that stimulate the digestive process.

Starch-containing raw materials (native (potato, corn, tapioca, wheat, rice, pea, chickpea, rye, triticale, barley, oat, buckwheat, amaranth) starch taken in equal quantities) are ground on a hammer crusher to particle size 0,5-2,0 mm.

Salt (table salt) is crushed to a particle size of no more than 1.0 mm sifted and inspected (visual inspection).

Enriching ingredient (a mixture of common wormwood, Roman wormwood, mugwort, citron wormwood, alpine wormwood in a ratio of 4:1:1:1:1) dried to 7–8 % moisture content, ground to particle size 0.3-1.9 mm, sieved through a sieve with a size of 0.8-2.0 mm and subjected to visual control.

To obtain the final product is carried out mixing of starch-containing raw materials, enriching ingredient and salt at the following ratio, mass %: starch-containing raw material – 30, enriching ingredient – 15, sea salt – 55.

Mixing of the components is carried out in a mixer for 2–4 minutes. The mixture of components is passed through a magnetic column with permanent magnets (layer thickness 6-8 mm, speed less than 0,5 m/s).

The mixture is subjected to single extrusion processing at an operating temperature of 140°C, a working screw speed of 70-95 min⁻¹, the diameter of the used die – 3 mm, with additional water supply, and the frequency of rotation of the dosing auger 93 min⁻¹ and the frequency of rotation of the cutting device 83 min⁻¹.

Method 3. Enrichment, with ingredients with anticancer anti-inflammatory and antimicrobial properties.

Starch-containing raw materials (chemically modified (oxidized, acid-hydrolyzed, phosphate, acetate, cross-linked) starch, dextrin, taken in equal quantities) are ground on hammer crusher to particle size 0.5-2.0 mm.

Lake salt (table salt, sea salt and lake salt: salt “Caspian Sea” in a ratio of 1:2:1) is ground to particle sizes no larger than 1.0 mm is sieved and subjected to inspection (visual control).

Enriching ingredient (juniper) dried to a moisture content of 7-8%, shredded to a particle size of 0.3–1.9 mm, sifted through a sieve with a size of 0.8-2.0 mm and subjected to visual control.

To obtain biologically active salt they mix starch-containing raw materials, enriching ingredient and salt at the following ratio, mass %: starch-containing raw material -30, enriching ingredient - 15, sea salt -55.

Mixing of the components is carried out in a mixer for 2–4 minutes. Mixture of components is passed through a magnetic column with permanent magnets (layer thickness 6-8 mm, speed not more than 0,5 m/s).

The mixture is subjected to single extrusion processing at an operating temperature of 170°C, a working screw rotation speed of 87 min⁻¹, a die diameter of 5 mm, with/without additional water supply, and a metering screw rotation speed of 93 min⁻¹ and a cutting device rotation speed of 80 min⁻¹.

Extrudate is crushed on a hammer crusher and metal-magnetic separation is carried out by passing through a magnetic column with permanent magnets (layer thickness 6-8 mm, speed less than 0.5 m/s).

The finished product - obtained biologically active salt is packaged, packed and transported to a warehouse or sold to the consumer.

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АНТАГОНИСТИЧЕСКАЯ АКТИВНОСТЬ БАКТЕРИЙ РОДА *BACILLUS*, ВЫДЕЛЕННЫХ ИЗ ПОЧВ, НАХОДИВШИХСЯ В УСЛОВИЯХ ДЛИТЕЛЬНОГО ВОЗДЕЙСТВИЯ ИОНИЗИРУЮЩЕГО ИЗЛУЧЕНИЯ, ПО ОТНОШЕНИЮ К БАКТЕРИЯМ ГРУППЫ КИШЕЧНОЙ ПАЛОЧКИ

ANTAGONISTIC ACTIVITY OF BACTERIA OF THE GENUS *BACILLUS* ISOLATED FROM SOILS UNDER PROLONGED EXPOSURE TO IONIZING RADIATION IN RELATION TO COLIMORPHOUS BACTERIA

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В данной работе представлены результаты исследований антагонистической активности бактерий рода *Bacillus* (*Bacillus subtilis*, *Bacillus thuringiensis*, *Bacillus mycoides* и *Bacillus cereus*), находящихся под