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Prospects for Using Tomato Processing Products in the Production of Rye Bread

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ABSTRACT. One of the directions of the implementation of the production of products from rye and a mixture of rye and wheat flour in the conditions of small enterprises with an intermittent cycle of work is the use of one-stage (without fermentation) technologies due to a variety of acidifying additives, in particular from fruit, berry and vegetable raw materials, especially secondary ones. The problem of finding the integrated use of raw materials and the rational processing of food waste is still relevant. Among the promising types of raw materials for use in the production of rye breads, the secondary raw materials of the canning industry are of practical interest, at the enterprises of which tens of thousands of tons of fruits and vegetables are processed annually, which leads to a large amount of waste, mainly in the form of pomace. When processing tomatoes for juice and paste, up to 20.0% of the total mass of raw materials falls on the share of waste (culled tomatoes, seeds, peels), therefore, studies on the rational use of these raw materials are relevant. The aim of the presented work is to study the nutritional value and safety of processed tomato products for use in the production of rye breads. The chemical composition and food safety of tomato pomace products have been investigated. Comparative analysis of this raw material with peeled rye flour showed that the mass fraction of protein in tomato powder exceeds the same value in flour by 2.3, fats - by 2, mono- and disaccharides - by 18.5, dietary fiber - by 2.7. mineral substances - 1.9 times. The energy value of 100 g of powder is 89 kcal less than that of the reference sample, and the rank is 1.7 times less. The data obtained convincingly prove the advisability of using processed tomato pomace in the production of rye bread. The experimental part of the work was carried out in the laboratories of the Department of Food Technology of the Bukhara Engineering and Technological Institute and the accredited complex of the testing laboratory of the Bukhara Center for Sanitary and Epidemiological Well-being (accreditation certificate UZ.AMT.07.MAI.493). The research methods were used traditional for the laboratories of food production enterprises. The authors consider it possible to use tomato processing products in the production of rye breads to increase their nutritional value while maintaining satisfactory organoleptic and physicochemical characteristics.

KEYWORDS: pomace, dry pomace powder, puree, peeled rye flour, nutritional value, safety.

INTRODUCTION. Bread made from rye flour has a high nutritional value due to the content of essential amino acids, vitamins E and B group, iron, magnesium and potassium, high molecular weight pentosans - mucus in the flour. Due to their high hydrophilicity, pentosans participate in the formation of the structural and mechanical properties of rye dough and, along with the increased content of dietary fiber, adsorb and remove the end products of metabolism from the body. The characteristic taste and smell of rye breads

increases their physiological value, influencing the degree of digestibility of the product. In a number of European countries, this type of product belongs to the group of "healthy" food products.

However, despite the high nutritional value, due to the change in the structure of the population's nutrition, there is currently a tendency to reduce the consumption and production of rye bread. This is largely due to the fact that the technological process of its production is distinguished by its complexity, duration and can be fully implemented only with a continuous production cycle. However, the implementation of the technology of rye bread in the conditions of low-capacity bakery enterprises, which currently dominate as producers of bread and bakery products, in a full cycle, involving the use of renewable starter cultures, presents certain difficulties due to the discrete modes of their operation. An important factor is the hot climate in Uzbekistan, as a result, the starter cultures are acidified, acquire an unpleasant smell and taste, which negatively affects the consumer benefits of this product.

One of the directions of the implementation of the production of products from rye and a mixture of rye and wheat flour in the conditions of small enterprises with an intermittent cycle of work is the use of one-stage (without ferments) technologies by using a variety of acidifying additives, in particular from fruit, berry and vegetable raw materials, especially secondary ones.

The problem of finding the integrated use of raw materials and the rational processing of food waste is still relevant. Among the promising types of raw materials for use in the production of rye breads, the secondary raw materials of the canning industry are of practical interest, at the enterprises of which tens of thousands of tons of fruits and vegetables are processed annually, which leads to a large amount of waste, mainly in the form of pomace.

MATERIALS AND METHODS. The aim of the presented work is to study the nutritional value and safety of processed tomato products for use in the production of rye breads.

Research objectives:

- to study the nutritional value and safety of tomato processing products (pomace, dry pomace powder, mashed potatoes);
- to substantiate the expediency of using these additives in the production of rye breads.

Research objects: pomace, dry pomace powder, puree, peeled rye flour.

The experimental part of the work was carried out in the laboratories of the Department of Food Technology of the Bukhara Engineering and Technological Institute and the accredited complex of the testing laboratory of the Bukhara Center for Sanitary and Epidemiological Well-being (accreditation certificate UZ.AMT.07.MAI.493).

The mass fraction of moisture was determined according to O'zDSt ISO 751: 2011 and O'zDSt ISO 2173: 2011, protein - according to Lowry's method [1], starch - according to GOST 10845-98, sugars - according to GOST 8756.13, pectin substances - according to GOST 29059 -91, fat - according to GOST 31902-2012, organic acids - by potentiometric method, dietary fiber (cellulose) - according to the Kurschner and Haneck method [2], total ash - according to O'zDSt ISO 763: 2011. mineral substances were determined by the ICP-MS method according to MUK 4.1.1483-03; vitamins - by the method of high-performance liquid chromatography on the spectrophotometer SF-46 according to the instructions for the device. The energy value was calculated according to the method described in the manual [3].

The indicators of the level of toxicological safety of raw materials were determined in accordance with generally accepted research methods for compliance with the requirements of SanPiN No. 0366-19. The determination of the content of toxic elements was carried out by standard methods according to MU 5178-90, GOSTs: 26933-86, 26932-86, 26934-86, 26931-86, 31660-2012 and O'z DSt ISO 6634: 2013. The mass fraction of ions - nitrates -

according to GOST 29270-95. Pesticides were determined according to the guidelines of the Ministry of Health of the Republic of Uzbekistan 012-3 / 0010 dated December 30, 2003, radionucleides - according to GOST 32164-2013, aflatoxin B - according to GOST 31748-2012. Microbiological studies of KMAFAnM were carried out in accordance with the requirements of GOSTs: 10444.15-94, 30518-97, 30519-97, 10444.12-88, 32031-2012
The quality of the tomato pomace powder was checked for compliance with the requirements of TU 10.61.23-843-37676459-2018 Fruit and vegetable powder, puree - TU 10.39.22-506-37676459-2020 Fruit and berry puree.

DISCUSSION. More than 300 types of raw materials of plant origin are processed by the canning industry into juices, purees, pastes, etc. This generates up to 70.0% of waste or so-called secondary raw materials, which is used mainly for feed for farm animals and poultry, and about 30.0 % - processed to obtain industrial products. Recycling of waste contributes to the expansion of the raw material base for various sectors of the food industry, increasing production efficiency and maintaining the ecological balance of nature. The priority condition for the use of secondary raw materials (hereinafter HRV) in the industrial production of food products is the improvement of technologies for their processing and, as a consequence, the expansion of the scope [4, 5].
In the process of processing fruit and berry and vegetable raw materials, pomace, wipes, seeds, fruit seeds, peeling of potatoes, carrots, beets, zucchini, eggplant, green pea flaps, cabbage cover leaves, etc. are formed. Pectin, fruit and vegetable powders are obtained from this raw material. , mashed potatoes, dry pomace, aromatic substances, dyes, ethyl alcohol, biochemical vinegar, feed briquettes, starch, therapeutic and prophylactic drugs, etc. [6-8].
First of all, pomace was considered as a source of pectin-containing raw materials for confectionery production, as well as a renewable cellulosic substrate for enzymatic conversion of cellulose and hemicellulose [9, 10]
So, there are known methods of obtaining pectin extracts (hydratopectins) using reagents - food acids, followed by purification of the hydrolyzate using ion-exchange resins for use in bakery and confectionery industries [11, 12]. N.V. Sokol et al. [13] propose to use a pectin extract from hawthorn fruits for the production of functional bread, thereby increasing the nutritional value of bread made from first grade wheat flour, improving its quality and increasing shelf life.
The expediency of using dietary fiber from sugar beet for enriching bread and giving it prophylactic properties has been established. To obtain dietary fiber, beet sugar production wastes are used: sugar beet crumbs and tails, with a dietary fiber content of 78.0 ... 87.0% [14, 15]. It should be noted that indigestible polysaccharides are non-toxic, do not contribute to allergies, at the same time, they have a detoxifying effect, normalize the intestinal microflora [16].
The production of extruded products is also promising, in particular, from fresh pumpkin seeds not peeled from the shell, the chemical composition and pharmacological properties of which characterize the resulting product as a complete additive for the production of bread and flour confectionery [17, 18].
Vegetables, fruits and berries contain substances that have pronounced phytoncidal and bactericidal effects on a number of microorganisms (many types of fungi, Staphylococcus aureus, tubercle bacillus, Proteus, etc.), due to the content of organic acids (coffee, chlorogenic, benzoic, quinic, sorbic) and other antimicrobial substances that determine the phytoimmunity of vegetables [19].

In the assortment of raw fruit consumed by the industry, the leading place belongs to apples. So, apple products: natural and concentrated juice, puree, powder, fiber are used to activate yeast, prepare bakery products [20-22].
A.I. Alekseev et al. Patented a method [23] for preparing a liquid sourdough with the addition of apple juice (10.0… 15.0%) and whey (15… 20.0%) for rye-wheat bread varieties.
Powder from apple pomace in an amount of not more than 10.0% by weight of flour is recommended to be used in the production of wheat and rye breads [24, 25].
For the preparation of wheat breads, powder (no more than 3.0%) and protein concentrate from grape pomace (2.0 ... 3.0%) have been used. Grape processing products (powder, syrup, meal) have found application for the activation of pressed and liquid yeast [26].
J.M. Magazhanov et al. [27] developed a technology for obtaining a liquid concentrate of total polyphenols from grape pomace for use, including in bakery production.
A patented method for making bread from wheat and rye flour with the addition of pomegranate pomace powder containing tanning, coloring and pectin substances, sugars, organic acids and other nutrients. The recommended dose of powder for bread made from wheat flour of the highest and first grade is 0.1%, the second - 0.2%, and rye-wheat - 0.5 ... 1.0% by weight of flour [28].
A number of works [29-31] are devoted to the study of the possibilities of using tropical and subtropical fruits in baking. There is information about the use of date syrups and almond powder in the preparation of wheat bread.
It is recommended to use tangerine pomace in bakery production, which is characterized by a high content of crude protein (15.8% on dry matter), pectin substances (9.8%), cellulose and hemicellulose (16.5%), and P-vitamin activity [30].
BUT. Dubrovskaya et al. [32] recommended the use of gluten-free flour mixture of citrus fruits, pectin, powder from the fruits of red-fruited mountain ash for the production of gluten-free bakery products.
One of the promising directions for expanding the range of functional food products is the use of wild and cultivated berries: lingonberry, red currant, cranberry, sea buckthorn, bird cherry, etc. [33-35].
For example, a group of scientists [36] studied the features of the influence of powders from lingonberry and cranberry on the baking properties of wheat flour. The use of these additives increases the water absorption capacity of flour, improves the organoleptic characteristics of the finished product and decreases its calorie content.
I.B. Avramenko et al. [33, 37] proved the effectiveness of the use of meal, syrup and extract from sea buckthorn pomace for the preparation of wheat and rye breads.
S.Ya. Koryachkina et al. [38] studied the effect of sea buckthorn, viburnum and mountain ash puree on bread quality.
For the prevention of mold formation in rye-wheat bread varieties, an acidifying mixture "Citrasol" is used with the addition of powder from pomace or rowan fruits in an amount of 3.0% to the flour mass [39].
The inclusion of berries and products of their processing in the formulation of bakery products enriches them with biologically active substances, gives a specific aroma, color and taste, and reduces sugar consumption. However, due to the high cost and shortage of raw materials, its use is constrained.
Technologies for the production of bread and bakery products based on vegetable processing products have been developed. Thus, the possibility of replacing sugar in the bread recipe of second-grade wheat flour with beet powder (up to 4.5% by weight of flour) has been established if it contains at least 70% sugar. It is also recommended to use beetroot powder to activate yeast and make custard breads [21].

O. Vershina et al. [40] used pumpkin pulp obtained by extrusion treatment of pumpkin seeds of the Muskatnaya variety, Vitaminnaya subspecies, as a source of non-traditional plant raw materials for enriching bakery products from wheat flour. On the basis of the research carried out, the authors have developed recipes for new varieties of bread - "Fantasy" and "Bogatyr".
T.I. Atamuratova [41] established the possibility of using pumpkin juice, mashed potatoes and pomace powder in the preparation of bread from wheat and rye varieties in an amount of 20, 30 and 5%, respectively, to the flour mass. The effectiveness of the use of these additives in the processing of flour "weak" in strength and with increased autolytic activity has also been proven.
Particular attention is paid to the use of potato products in the production of bread: grains, granules, flakes or protein concentrate. Potato proteins contain more lysine than flour proteins, as a result of which the use of potato products will increase, according to the authors, the efficiency factor of flour products proteins [42, 43].
A.P. Zhuravlev et al. [44] developed a method for making bread from wheat flour with the addition of Jerusalem artichoke products. It was found that this additive should be added in an amount of not more than 3.0% to the flour mass at the stage of yeast dilution.
Tomato processing products (seeds, cake and oil) were used to enrich bread with lysine and lipids. Replacing from 25.0 to 50.0% of flour with ground tomato seeds or cake in flour infusions in the preparation of liquid yeast leads to a reduction in the technological cycle by 1.5… 2.0 times [21].
A biologically active additive "Yantarnaya" has been developed from tomato pomace to improve the functional properties of bakery products from wheat and rye-wheat flour [45].
A.F. Zagibalov et al. [46] proposed to use meal and protein concentrate from tomato seeds to increase the protein value of bread.
At the Kuban State Technological University, studies were carried out on the use of products of processing seeds from pumpkin, watermelon, melon, and flax for the production of bakery products for prophylactic purposes in diseases of the liver and kidneys, disruption of the prostate gland [47].
Dry multicomponent mixes designed to produce a wide range of bakery products in an accelerated way are of particular interest for modern bakery. The composition of ready-made mixtures also includes processed products of fruits and vegetables: potato flakes and grains, powders of tomatoes, carrots, onions; medicinal plants: milk thistle seeds, amaranth flour; malt processing products and improvers [48].
In this regard, the creation of domestic multicomponent mixtures and additives that improve their quality characteristics, manufacturability and reduce the cost of the final product is an urgent task, a solution that is achieved by involving in the production of secondary raw materials [49].
Thus, a functional nutritional mixture has been developed, which includes the following ingredients: powders from pumpkin seeds, calamus rhizomes, milk thistle meal, spirulina and buckwheat flour, which will increase the biological and physiological value of finished products [50].
V.S. Agibalova et al. [61] developed a bread recipe for prophylactic purposes using flour from whole-grain sorghum and carrot powder. S.Ya. Koryachkina et al. [52] proposed the use of a vegetable mixture of cabbage, carrot and pumpkin powders taken in equal proportions for the production of crackers.
Thus, it has been established that the use of natural herbal additives in the production of flour products, including bakery products, in order to increase the content of physiologically valuable ingredients and increase consumer value, is scientifically and practically justified. The problems associated with the use of plant materials, including secondary ones, have been

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sufficiently studied. However, these data do not reveal all the potential possibilities of using this raw material, in particular, in the processing of flour with reduced baking properties and the production of extruded flour products.

Result. Cultivated tomato (tomato) -Solanum lycoflgrsicum L, family - Solanaceae (Solanaceae).

Tomato fruits are distinguished by high nutritional, taste and dietary qualities. The calorie content of ripe fruits (energy value) is about 19.0 kcal. They contain 4.0 ... 8.0% of dry matter, in which sugars dominate (1.5 ... 6.0% of the total mass of fruits, represented mainly by glucose and fructose), proteins have also been found (0.6 ... 1, 1%), organic acids (0.5%), fiber (0.84%), pectin substances (up to 0.3%), starch (0.07 ... 0.30%), minerals (0.6%). Noteworthy is the high content of carotenoids (0.8 ... 1.2 mg per 100 g of wet weight), vitamins (B1, B2, B3, B5), folic and ascorbic acids (15 ... 45 mg per 100 g of wet weight), organic (citric, malic, oxalic, tartaric, succinic, glycolic), high-molecular fatty (palmitic, stearic, linoleic) and phenolcarboxylic (n-coumaric, caffeic, ferulic) acids. Fresh tomatoes and their processed products are recommended for the prevention of atherosclerosis, diseases of the cardiovascular system, stimulate diuresis and intestinal motility. Recommended in the diet of people with kidney and joint diseases associated with metabolic disorders, as well as hypertension, glaucoma and overweight [53].

When processing tomatoes for juice and paste, up to 20.0% of the total mass of raw materials falls on the share of waste (culled tomatoes, seeds, peels), therefore, in order to save resources, it is advisable to research on the rational use of these raw materials.

Investigated indicators of the chemical composition and food safety of processed tomato products. The results of the study are presented in tables 1-4.

Fresh tomato pomace was characterized by the following indicators: mass fraction of moisture - 69.0 ± 1.0%, bulk density - 370 ± 5 kg / m3, density - 1.31 ± 0.50 kg / m3.

Since tomatoes are a seasonal product and their processing takes place mainly in the period from July to October, when the average air temperature in Uzbekistan is 30 ± 5 ° C, it is very important to determine the maximum shelf life of raw pomace before processing. For this purpose, we studied the change in the microbiological parameters of fresh tomato pomace during storage under natural conditions (table 1).

Table 1. Changes in microbiological parameters of fresh tomato pomace during storage

Indicators	The value of indicators			
	ND *, no more	Storage duration, hour		
		0	*24*	*48*
QMAFAnM, CFU / g, no more	1×10^4	$2,4\times10^3$	$6,9\times10^3$	$1,2\times10^4$
BGKP (coliforms), in 1 g	Not allowed	Not detected	Not detected	Not detected
Salmonella in 25 g	Not allowed	Not detected	Not detected	Not detected
Yeast, CFU / g, no more	1×10^2	Not detected	Not detected	Not detected
Molds, CFU / g, no more	1×10^2	$0,5\times10^2$	$0,6\times10^3$	$1,3\times10^3$
Listeria monocytogenes in 25 g	Not add.	Not detected	Not detected	Not detected

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* ND - normative document - SanPiN 03366-19 (6.1.1. Fresh, frozen vegetables and potatoes and their processed products).

From the data in Table 1, it follows that after 24 and 48 hours of storage, the number of mesophilic aerobic and facultative anaerobic microorganisms (KMAFAnM) increased by 2.9 and 5.0 times, respectively, and the number of molds by 12 and 26 times. Bacteria of the Escherichia coli (BGKP) group, Salmonella and Listeria monocytogenes were not found in the raw materials under study.

Fresh tomato pomace is a perishable product due to high humidity, which is confirmed by the results of the analysis of the dynamics of microflora development. In addition, they are prone to clumping and sticking, which creates certain difficulties in their further processing. The data obtained made it possible to establish the permissible shelf life of fresh tomato pomace before disposal or processing, no more than 48 hours.

There are various ways of storing similar products, such as chemical preservation, freezing or heat treatment. However, the use of chemical preservation is limited due to the high medical and biological requirements for the final product. The solution to the problem can be canning the pomace and packing them in plastic bags under vacuum. However, this method has not found wide application and is not in demand by manufacturers of bakery products. Freezing pomace is also not a solution to the problem because of the high cost of energy carriers, the complexity of the process of storing and transporting raw materials to the place of their processing [54].

One of the safest ways to extend the shelf life of tomato pomace is to dry it for the purpose of further grinding and obtaining a powder. The choice of powdery products is due to the convenience of transportation, storage and dosing.

To obtain the powder, fresh tomato pomace was dried in a Hohenheim helium dryer (Germany) to a moisture content of 7.0 ± 1.0%. Then they were crushed (dispersed) in a laboratory micro-mill LZM-1 to the size of dietary flour (the exit from the sieve No. 27 is not more than 2.0%, the passage of the sieve No. 38 is not less than 60.0%) according to the requirements of GOST 28561-90.

Puree was prepared from powder at a ratio with water of 1: 3, the mixture was boiled to a moisture content of 18.0 ± 0.5. This method is much more convenient and economical than buying canned puree, since it allows you to prepare the required amount of puree even for the production of a certain type of bakery products in a small volume.

In the obtained semi-finished products, the chemical composition was determined and a comparative analysis was made with the chemical composition of peeled rye flour, since this additive is positioned as a substitute for a certain part of the recipe amount of the latter.

The research results are presented in tables 2, 3.

Table 2. Chemical composition and energy value of processed tomato pomace

Nutrients	Mass fraction of nutrients, g / 100 g of product	
	powder	*puree*
Water	7,00	18,50
Proteins (vegetable)	22,14	19,40
Vegetable fats	3,54	3,10
Carbohydrates: starch	25,70 7,60	22,48 6,67

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mono- and disaccharides	18,10	15,81
Dietary fiber, g: cellulose pectin	35,44 26,74 8,70	31,20 23,42 7,78
Organic acids	2,30	2,00
Ash	2,40	2,10
Minerals, mg, including: calcium Ca magnesium Mg sodium Na potassium K phosphorus P iron Fe	 138 62 - 524 314 510	 120 54 - 462 275 447
Vitamins, in mg, including: riboflavin B2 pyridoxine B6 tocopherols E	 0,17 0,48 5,72	 0,15 0,40 5,01
Other substances	1,48	1,22

From the data in Table 2, it follows that the samples of the studied additives contain all the basic nutrients necessary for use in baking. The difference in their value is due to different humidity.

In addition to this standard set of nutrients, anthocyanins (petunidin glycosides), stearins (stigmasterol, betasitosterol), triterpene saponins (α- and β-amirins), and abscisinic acid were found in tomatoes. The choline present in tomatoes lowers blood cholesterol, prevents fatty degeneration of the liver, increases the body's immune properties, and promotes the formation of hemoglobin. A feature of the chemical composition of tomato pomace is the presence of glucosides in them: naringin and α-tomato. It should be noted that the amount of glucosides in tomato pomace is low and cannot have a negative effect on finished products - the bitterness threshold for naringin is 2 · 10-3%, and for α-tomato - 5 · 10-3% [55].

Further, a comparative analysis of the chemical composition and energy value of the studied additives, namely, tomato powder, with peeled rye flour was carried out. To obtain more visual information, we used the method of ranking the main nutrients, that is, the lower the rank, the higher the value of this nutrient. For a more objective assessment of the nutritional

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value of the raw materials under study, we recalculated the mass fraction of nutrients per dry matter (DM) due to the difference in their moisture content (Table 3).

Table 3. Chemical composition and energy value of the investigated raw materials

Nutrients	Mass fraction of nutrients, in g / 100 g DM / rank	
	peeled rye flour	*tomato powder*
Proteins (vegetable)	10,35 / 2	23,81 / 1
Vegetable fats	1,86 / 1	3,81 / 2
Carbohydrates: starch mono- and disaccharides	71,28 70,23 1,05 / 2	27,63 8,17 19,46 / 1
Dietary fiber, g: cellulose pectin	14,02 / 2 9,30 -	38,11 / 1 28,75 9,36
Organic acids	- / 2	2,47 / 1
Ash	1,37 / 2	2,57 / 1
Minerals, in mg, including: calcium Ca magnesium Mg sodium Na potassium K phosphorus P iron Fe	 15,12 / 2 37,21 / 2 2,33 / 1 260,46 / 2 151,16 / 2 1,05 / 2	 148,40 / 1 66,67 / 1 - / 2 563,00 / 1 338,00 / 1 548,00 / 1
Vitamins, in mg, including: riboflavin B2 pyridoxine B6 tocopherols E	 0,15 / 2 0,29 / 2 4,26/ 2	 0,18 / 1 0,52 / 1 6,15 / 1
Other substances	1,12	1,60
Energy value, kcal	322 / 2	233 / 1
Total rank, score	30	18

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As follows from the data in Table 3, in terms of the content of the main nutrients, the studied tomato powder is in many ways superior to peeled rye flour, that is, it has a higher nutritional value. So, the mass fraction of protein in powder exceeds the same value in flour by 2.3, fats - by 2, mono- and disaccharides - by 18.5, dietary fiber - by 2.7, minerals - by 1.9 times. The energy value of 100 g of powder is 89 kcal less than that of the reference sample, and the rank is 1.7 times less. The data obtained convincingly prove the advisability of using processed tomato pomace in the production of rye bread.
However, for a more complete picture of the prospects of these additives for bakery production, studies are needed to determine the presence of toxic elements in them in accordance with the requirements of SanPiN 0366-19 of the Republic of Uzbekistan.
The results of the study are presented in table 4.

Table 4. Indicators of the level of environmental safety of the studied additives

Indicator	The value of indicators, in mg / kg	
	According to ND, no more	*tomato pomace*
Mercury	0,02	Не обнаружено
Cadmium	0,03	0,00
Lead	0,50	Not detected
Zinc	10,0	3,75
Copper	5,00	2,52
Iodine	1,00	0,00
Arsenic	0,20	0,00
Ion - nitrates, mg / kg	150,0	283,9
Pesticides:		
Hexachlorocyclohexane (α-, β- and γ- isomers)	0,50	0,12
DDT and its metabolites	0,10	Not detected
Radionucleides, Bq / kg:		
- cesium - 137	120,0	Not detected
- strontium - 90	40,00	Not detected
Aflatoxin B, mg / kg	0,05	0,009

It was found that the mass fraction of toxic metals, non-metals and nitrates did not exceed the MPC, pesticides and radionucleides were not found in the raw materials under study. The obtained data testify to the compliance of the quality of the studied raw materials with the requirements of SanPiN No. 0366-19 of the Republic of Uzbekistan (Appendix 2).

CONCLUSION. Thus, the complex of theoretical and experimental studies carried out confirms the expediency of using tomato processing products to increase the nutritional value

of rye breads and reduce the duration of the technological process. The potential of this raw material has not yet been sufficiently studied, especially in the production of rye breads.
The advantage of using processed tomato products in bread production is also that they are a natural source of especially valuable nutrients, the use of which does not require significant changes in the technological process of producing new products, creates preconditions for diversification of processing and bakery industries. The use of this raw material and products of its processing in the production of flour products is cost-effective, and research in this direction is relevant and timely.

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