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COMPREHENSIVE ASSESSMENT OF QUALITY AND SAFETY INDICATORS OF MINCED MEAT SEMI-FINISHED PRODUCTS

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Abstract: This article studies the issues of determining the quality and safety indicators of semi-finished products based on minced meat. During the study, the composition and quality parameters of the products were evaluated based on organoleptic, physicochemical, microbiological and toxicological methods. The moisture, protein, fat, salt content, pH, water activity and water retention capacity of the obtained samples were determined, and the dynamics of their changes during storage were analyzed. In addition, the degree of lipid oxidation, antioxidant activity and the amount of toxic elements were determined, and the safety of the products was assessed based on sanitary and hygienic requirements. The results obtained were shown to be of great importance in improving the quality of semi-finished meat products and extending their shelf life.

Keywords: minced meat, semi-finished products, quality indicators, organoleptic analysis, physicochemical indicators, microbiological safety, toxic elements, antioxidant activity, lipid oxidation, shelf life.

Introduction. In the current conditions of increasing demand for fast food, the production of semi-finished products based on minced meat is gaining importance. Such products are characterized by convenience, quick preparation and nutritional value. At the same time, ensuring their quality and controlling their safety is one of the urgent issues of the food industry.

Minced meat products are microbiologically perishable, and various physicochemical and biological changes occur during their production, storage and sale. In particular, lipid oxidation, moisture changes and the development of microorganisms have a negative impact on product quality.

Therefore, a comprehensive assessment of the quality indicators of semi-finished meat products, a deep study of their composition, and determination of their safety level are of great scientific and practical importance. In this study, organoleptic, physicochemical, microbiological, and toxicological indicators of minced meat products are analyzed based on modern standard methods.

Determination of quality indicators of minced meat semi-finished products.

Object and methods of the research: Standard and generally accepted organoleptic, physicochemical, microbiological and toxicological research methods were used in the research. Sample selection and preparation for analysis were carried out on the basis of GOST R 51447 “Meat and meat products. Sampling methods” [1; 2-b.].

The chemical composition of meat raw materials, semi-finished products and antioxidant extracts during storage was determined by the following standard methods.

- mass fraction of moisture - according to GOST R 51479 "Meat and meat products. Method for determining the mass fraction of moisture" [2; 1-4-p.];

- mass fraction of protein - according to GOST 25011 "Meat and meat products. Methods for determining protein" [3; 1-7-p.];

- mass fraction of fat - according to GOST 23042 “Meat and meat products. Methods for determining fat” [4; p. 1-9];

- mass fraction of sodium chloride - according to GOST 9957 “Meat products. Methods for the determination of sodium chloride” [5; 1-4-b];

- by the mass fraction of mineral substances;

- the composition of carbohydrates was determined by calculation by difference;

- the fatty acid composition of lipids was analyzed by gas chromatography on the “Chromatec - Crystal 8000” device (Russia);

- the determination of ammonia-ammonia nitrogen was carried out by titration according to Sofronov;

- the pH indicator was aqueous in solution was determined using a Mettler Toledo “S400-Basic” pH meter;

- the composition of macro and microelements was determined according to GOST 30178 “Food raw materials and products. Atomic adsorption method for the determination of toxic elements” (copper, zinc, iron) [6; 1-17-p.], GOST 26570 “Feed, compound feed, compound feed materials. Methods for the determination of calcium” (calcium) [7; 1-13-p.], GOST R 51309 “Drinking water. "Determination of elemental composition using atomic spectrometry methods" (sodium, potassium, manganese) [8, 1-17-b.];

- acidity - GOST 4288 "Culinary products and semi-finished products from minced meat. Acceptance rules and test methods" [9; p. 1-14];

- water retention capacity - was carried out by pressing, which is based on the removal of free moisture from the sample under the influence of pressure applied to it by the Grau and Gamma method. Pressing does not remove water, but tissue juice, which contains protein substances, protein-lipid complexes and other substances dissolved in water;

- water activity was determined after thawing of frozen samples using the HQS-2 "Nagy-ness system" in accordance with ISO 21807:2004 "Microbiology of food and animal feeding stuffs. Determination of water activity";

- Determination of antiradical activity was carried out by antiradical activity (ARF) of the extracts against the stable free radical DFPG (2,2-diphenyl-1-picrylhydrazyl).

DFPG method. In this work, to assess the ARF, we used a method for spectrophotometric measurement of the kinetics of the reduction of the stable radical 2,2-diphenyl-1-picrylhydrazyl (DFPG) molecules by antioxidants [10, p. 123]. The method is based on the interaction of antioxidants with the stable chromogenic radical 2,2-diphenyl-1-picrylhydrazyl (DFPG). A standard solution of DPPH (5x10-4 M) in ethanol with acetic acid was diluted 1:10 with ethanol to obtain a working solution. The resulting solution should have an optical density of not more than 0.9 at 517 nm. 50 μl of the studied extracts were added to 5 ml of the working solution of DPPH, mixed, and the kinetics of the decrease in the optical density of the solution at a wavelength of 517 nm was recorded for 30 minutes. A working solution of DFPG was used as a control sample.

The antiradical activity was determined by the following formula:

$$\% \text{ ingibirlanish} = \frac{A_{kontr} - A_x}{A_{kontr}} \text{ x } 100\%,$$

where A_x is the optical density of the test solution, A_{kontr} is the optical density of the test sample.

Toxic elements in products:

- the amount of lead and cadmium elements is based on the requirements of GOST 31262;
- the amount of mercury elements is based on the requirements of GOST 26927-86;
- the amount of manganese elements is based on the requirements of GOST 26930-86;
- the amount of copper and zinc elements is based on the requirements of GOST 26931-86;
- the amount of elemental iron is based on the requirements of GOST 26928-86;
- The amount of a,b,y-GHTSG substance is determined in accordance with the Methodological Manual No. 012-3/0010 of the State Statistics Committee of the Republic of Uzbekistan,
- The amount of DDT and its metabolites is determined in accordance with the requirements of the Methodological Manual No. 012-3/0010 of the State Statistics Committee of the Republic of Uzbekistan. Frozen “Totli” cutlets and “Erman”, “Karag’ayinabargi” dumplings, which were subjected to laboratory testing and submitted for laboratory testing, were tested. It was determined that the composition of the products complies with the requirements set out in the current “Rules of the Sanitary and Hygienic Standards for the Safety of Food Raw Materials and Products” of the Republic of Uzbekistan in terms of safety indicators for human life and health.

Results and discussion: Assessment of the biological safety of processed products GOST 26669-85 “Food and flavor products, GOST 26670-85 “Food and flavor products. Based on the requirements of the "Method of Cultivation" standard, samples for microbiological analysis were taken and a sanitary-bacteriological examination was carried out. Identification of Stylonychia aureus according to GOST 10444.2-94, identification of mesophilic aerobic and facultative microorganisms according to GOST 10444.15-95, identification of Escherichia coli groups and coliforms according to GOST 50474-93, in the manner prescribed by GOST 10444.12.-88 Analyses were conducted to identify pathogenic microflora (Bacillus cereus), fungi, and mold indicators.

The Litchfield and Wilcoxon methods were used to determine the acute toxicity parameters of the extracts. This was applied to the following: Preparations:

Aqueous extract of the Erman plant, in the form of a dark brown resin with a slight characteristic odor. 1 ml of the extract contains 93% active organic substances.

Alcoholic (ethanol) liquid extract of pine needles. A characteristic odor, light yellow extract. 1 ml of the extract contains 88% active organic substances. The acute toxicity of the preparations was studied in white mice of both sexes, weighing 20±2.0 g, 5 animals per group, a total of 45 mice. The experiments were conducted on healthy, adult animals kept in quarantine for 10-14 days. The studied preparations: erman extract and pine

needle extract were administered to mice via gavage, and to the control group - using the same volume of distilled water. The erman extract (18.6% aqueous solution) was administered to mice at doses of 1860, 2790, 3720 and 4650 mg/kg or 0.2, 0.3, 0.4 and 0.5 ml per mouse. Pine bark extract was administered in liquid form to mice once at doses of 1260, 1580, 2000, and 2200 mg/kg or 0.28, 0.36, 0.45, and 0.5 ml.

The animals were observed in the laboratory every hour on the first day of the experiment, and the functional status of the animals, including general condition, anxiety, survival, and mortality, were monitored. Then, for 2 weeks, the general condition and activity of animals in all groups in vivarium conditions, behavior, respiratory rate and depth, condition of hair and skin, condition of the tail, amount and condition of fecal masses, frequency of urination, changes in body weight, and other indicators were monitored every day. All experimental animals were kept under the same conditions, with free access to water and food. [11; 33-b.].

At the end of the experiment, the median lethal dose (LD50) was calculated and the toxicity class was determined. [12; 16-b. 13; 21-b. 14; 248-b].

Organoleptic analysis of minced semi-finished products after heat treatment was carried out on the following indicators: appearance, color, smell, texture, taste and juiciness [15; 10-b]. The indicators were evaluated on a five-point scale according to GOST 9959 "Meat products. General conditions for organoleptic evaluation": 5 - excellent quality; 4 - good; 3 - satisfactory; 2 - bad; 1 - very bad.

Before heat treatment, the samples were evaluated for their appearance. The quality of the finished product was assessed by an overall score for all indicators. Products with a score of 5.0-4.5 fully correspond to an excellent rating; 4.4-4.0 corresponds to a good rating; 4.3-3.0 corresponds to a satisfactory rating. A product with a tasting score of less than 3.0 is considered to be of unsatisfactory quality.

CONCLUSION: A comprehensive assessment of the quality and safety indicators of minced meat-based semi-finished products is important in ensuring their nutritional value and safety.

The results showed that a comprehensive assessment of the quality and safety indicators of minced meat-based semi-finished products is of significant scientific and practical importance in determining their nutritional value and ensuring their safety for consumption.

Based on the conducted organoleptic, physicochemical, microbiological and toxicological analyses, the main quality indicators of the products were determined and the dynamics of their changes during storage were assessed. During the study, it was found that lipid oxidation, changes in moisture content and the development of microorganisms have a significant impact on product quality.

It was also proven that the studied samples comply with current sanitary and hygienic standards, that is, they are safe in terms of toxic elements and microbiological indicators. The results of determining antioxidant activity may have a positive impact on extending the shelf life of products by optimizing their composition.

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