Project title: IRN AP09058213 «Development of technology for meat products for child nutrition from non-traditional raw materials of the meat industry»

Relevance: The issue of rational nutrition of children is still extremely relevant and an effective factor that ensures the preservation of the life and health of children. Increasingly, there are pathological conditions associated with intolerance to certain components of food. An important role in the organization of rational nutrition of children is played by biologically complete products, which can be created only in the conditions of industrial production. With the annual increase in consumer demand for meat products, we still remain an import-dependent country. Given that camel and goat breeding are promising areas in animal husbandry, the industrial production of meat products from camel meat, goat meat is a new, previously unused direction in the industry. The trend to use low-fat hypoallergenic goat meat, camel meat, especially for baby food is growing all over the world. Therefore, the development of technology of meat products for baby food from camel and goat meat, of increased nutritional and biological value, with dietary properties is appropriate.

Purpose: development of technology for meat products of baby food from non-traditional raw materials of the meat industry, in particular, camel and goat meat

Expected results:

- the assessment of the state and prospects of using domestic non-traditional types of raw meat (camel meat, goat meat) will be given);
- a rational technological scheme for cutting camel and goat meat will be developed based on the study of the morphological and chemical composition of individual parts of the carcass;
- the nutritional and biological value, technological, microstructural indicators of camel and goat meat will be determined, depending on the age, breed and weight conditions of the animal;
- the technology of production of meat products for baby food from camel and goat meat, enriched with biologically active substances, as well as in the traditional way will be developed;
- the composition, properties of raw materials and patterns of formation of the specified quality indicators of meat products, their refrigeration processing and storage will be established;
- biochemical, microbiological and rheological changes in the production and storage of meat products will be established;
- a technological line for the production of products from camel and goat meat (dietary sausages, pates) will be developed);
- the economic efficiency of the technology of production and processing of camel and goat meat will be established and an application for obtaining security documents will be submitted;
- scientific publications will be published in the direction of the Project, including at least 2 (two) articles and (or) reviews in peer-reviewed scientific publications in the scientific direction of the project, indexed in the Science

Citation Index Expanded of the Web of Science database and (or) having a CiteScore percentile in the Scopus database of at least 35 (thirty-five), as well as at least 3 articles or reviews in a peer-reviewed foreign or domestic publication recommended by committee for quality assurance in the field of education and science, at least 2 publications in Russian scientific publications included in the RSCI database, reports will be published in at least 8 conference materials, including 4 international ones. Based on the results of the work, an Implementation Report will be received indicating the achieved economic effect.

Achieved results:

The use of an enzyme preparation in the technology of boiled sausage products from camel and goat meat is justified. The results of the camel protein study show that the control value remained unchanged. In experimental samples after treatment with an enzyme, a decrease in the amount of protein is observed over time. For example, a prototype of camel meat treated with 0.2% enzyme after 0 hours after treatment with the enzyme, the amount of protein varied 24.13; after 24 hours – 22.29; after 48 hours – 19.52. These results for goat meat and camel meat indicate the breakdown of protein by enzymes.

The results of the study of fat in experimental samples of camel and goat meat show a slight increase in the amount of fat. The indicators of the fat mass fraction of all samples differed slightly from each other and varied within 2-3%, which confirms the dietary peculiarity of the selected meat raw materials.

The results of the study of the mass fraction of goat and camel ash show that in both experimental and control samples, the amount of ash remains unchanged in the range of 0.98-1.01%. This suggests that the enzyme treatment does not affect the change in the mineral composition of goat and camel meat.

A comparative assessment of the physico-chemical characteristics showed that different concentrations of the enzyme preparation influenced the pH value. During the study of active acidity (pH), its decrease was observed. For example, in the study of goat meat from 5.94 (control) to 5.69 (experience); camel meat from 5.84 to 5.44.

As a result of a decrease in pH, the moisture content and, accordingly, the level of moisture binding ability changed. Of considerable interest were the changes in the moisture binding capacity (WCC) associated with the use of a proteolytic enzyme. During the experiment, the experimental samples contained less moisture compared to the control, of course, more moisture was released over time, but the enzyme treatment contributed to the retention of moisture in the tissues and the acquisition of juiciness and tenderness, as a result of which the BCC of the latter increased. In all the studied samples, at the concentration of the experimental drug, there was an increase in BCC: the concentration of the enzyme 0.05% - by 6 and 7.3%; 0.1% of the enzyme - by 7.7 and 12%; 0.2% of the enzyme - by 11 and 13% of camel and goat meat, respectively.

Based on the results of physico-chemical studies, the most optimal concentration of the enzyme preparation can be considered - 0.1% by weight of meat raw materials and the maturation time is 24 hours.

The technology of meat products of baby food has been developed and the formulation has been substantiated. The data of the analysis of the chemical composition of goat and camel meat after the use of the enzyme preparation confirm the positive effect of the enzyme on the quality of meat raw materials. Based on our research, we have proposed technologies and recipes for two types of baby sausages made of goat meat and camel meat. If in the first variant 100% goat meat is used as raw meat, then in the second variant, due to the specific taste and smell of camel meat, there is a partial replacement of camel meat with goat meat. To determine the percentage of camel meat/goat meat in this meat product, experimental samples No. 1, 2, 3 were studied with partial replacement of camel meat with goat meat 40%, 50%, 60%, respectively. To select the optimal ratio, experimental samples of camel/goat sausages were examined by chemical composition and organoleptic parameters.

According to organoleptic indicators, the optimal ratio of camel and goat meat is 50:50. So, experiment No. 2 has loaves with a clean, dry surface, without stains, slips, damage to the shell, influx of minced meat. The consistency is dense and elastic. Without an extraneous taste, with a pronounced aroma of smoking and spices. When adding camel meat in an amount of more than 50%, a specific taste characteristic of this type of meat raw material was present in the prototype. Based on the results of the sensory assessment, it was decided to continue the study of samples of sausages for baby food from camel meat in a ratio of 50:50 camel /goat meat, respectively. Thus, the technology has been developed and the formulation of sausages for baby food from: 1) goat meat; 2) camel and goat meat in the ratio of raw meat 50:50 has been substantiated. A technological instruction for the production of sausages for baby food has been developed.

Studies of the developed products have been carried out. The results of the study showed that the finished products from meet the organoleptic and physico-chemical parameters of the requirements for baby food.

For normal growth and development of children, a complete list of vitamins is necessary, the most important of which are vitamins of group B. Vitamins B1, B2 and B6 are very important for the harmonious development of the nervous system. They are indispensable for physical and mental stress. Thus, the amount of vitamins B1, B2 and B6 in goat sausages amounted to 0.325 mg/100g, 0.130 mg/100g, 0.065 mg/100g, respectively, which is 27%, 109% and 80% more compared to the control. A similar positive dynamics is observed in the experimental samples from camel/ goat meat, where vitamins B1, B2 and B6 were 0.310 mg/ 100g, 0.125 mg/100g, 0.055 mg/100g, which is 12%, 19%, 20%, respectively, more than in control samples.

For the harmonious development of children at any age, baby food products must contain sufficient amounts of macro- and microelements. Among the minerals contained in meat products, iron is of particular value for the child, the content of this trace element in the experimental samples from goat meat and camel meat / goat meat is 3.05 mg/ 100g and 4.01 mg/100g, respectively. The iron contained in meat products is in an easily digestible biologically active form and is absorbed by the child's body ten times better (by 20-30%) than from vegetable

products (1-3%). In addition, according to the results of the study of the mineral composition, experimental samples of goat sausages contain such important minerals as potassium – 383.71 mg/100g, phosphorus – 193.47 mg/100g, calcium – 14.72 mg/100g, which is 4.1%, 15.5%, 9.7%, respectively, higher than that of the control sample. The mineral composition of camel/ goat sausages showed the following potassium content – 325.61 mg /100g, phosphorus – 180.05 mg/100g, calcium – 11.83 mg/100g, which is 2.6%, 3.6%, 14.4%, respectively, higher than the control.

Research team:

Project Manager: Kadyrzhan Makangali, PhD. h-index – 3, Scopus Author ID 57203767726, Researcher ID AAR-1107-2020, ORCID https://orcid.org/0000-0003-4128-6482.

Members of the research team:

Gulzhan Tokysheva, PhD student, position in the project-senior researcher. h-index – 1; Scopus Author ID 57821670200, ORCID https://orcid.org/0000-0003-3818-7635;

Aknur Muldasheva, PhD student, position in the project-researcher. h-индекс – 1, Scopus Author ID 57212136590, ORCID https://orcid.org/0000-0003-0116-0260;

Kaldarbekova Madina, position in the project-researcher. h-index – 2, Scopus Author ID 57211610217;

Madina Begaly, Master's degree, position in the project-junior researcher. ORCID https://orcid.org/0000-0002-0196-0535;

Yeset Uzakov, production process engineer, position in the project-junior researcher.

Anel Kostanova, master's student, position in the project-laboratory assistant. ORCID 0000-0001-5682-2423

Information for potential users:

A technology for the production of meat products for baby food from camel and goat meat, enriched with biologically active substances, will be developed. When developing new types of meat products for baby food, the following indicators will be taken into account: the ratio of protein to fat, mineral composition, the presence of vitamins necessary during the development of the child's body.

Publications

1. Tokysheva G.M., Uzakov Y.M., Kakimov M.M., Abdilmanov A.A., Vostrikova N.L., Makangali K.K. Study of the physico-chemical properties of goat meat in order to justify the production of children's food products. The Journal of Almaty Technological University. 2022;(3):33-40. (In Kazakh) https://doi.org/10.48184/2304-568X-2022-3-33-40

2. Tokysheva, G., Makangali, K., Uzakov, Y., Kakimov, M., Vostrikova, N., Baiysbayeva, M., & Mashanova, N. (2022). The potential of goat meat as a

nutrition source for schoolchildren. Potravinarstvo Slovak Journal of Food Sciences, 16, 398–410. https://doi.org/10.5219/1763 (Скопус, процентиль 40)

3. Abdulmanov A.A. THE STUDY OF GOAT MEAT IN ORDER TO JUSTIFY THE PRODUCTION OF BABY FOOD PRODUCTS. "Seifullin okulary – 18: " Zhastar zhane gylym – bolashakka kozkaras" halykaralyk gylym - praktikalyk conference materialdary = Materials of the international scientific and practical conference "Seifullin readings – 18: "Youth and science – a look into the future" - 2022. - Vol.I, Part II. – pp. 150-152. (International Scientific and Practical Conference)