UDC 664.864
МРНТИ 65.59.29

DOI: https://doi.org/10.37788/2022-4/164-169

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Research and development of technology for homogenized meat and vegetable canned foods for baby food

Abstract

Main problem: obtaining high-quality products with traditional organoleptic characteristics and optimal structural and mechanical properties with the rational use of meat and vegetable raw materials, with the final product, balanced in protein-fat and amino acid composition, increased nutritional value, is a topical research topic.

The requirement for adequate nutrition is the basis for the development of recipes for meat products for baby food. When selecting recipes for baby food products, the age-related characteristics of the metabolic processes of the child's body should be taken into account, while the physiological needs of the child's body for nutrients and energy should be satisfied, and the biological and physiological laws that determine the assimilation of food in the body of children should be taken into account, while an important condition for assimilation food is to comply with the correspondence between the enzymes of the body and the chemical composition of food. This rule must be observed at all stages of the assimilation of food. This is achieved by targeted balancing of nutrients through the selection of raw materials and their technological processing to ensure a balanced ratio of proteins, fats, carbohydrates, vitamins, minerals.

Purpose: to develop a technology for children's homogenized canned food based on the rational use of meat and vegetable raw materials.

Methods: when conducting research, standard methods for assessing the physicochemical and organoleptic quality indicators of homogenized meat and vegetable canned food for baby food were used.

Results and their significance: the choice of meat and vegetable raw materials for the production of homogenized meat and vegetable canned food for baby food was substantiated. The physicochemical and organoleptic quality indicators of new canned food were studied. The influence of canning technological processes on the structural and mechanical properties of lentils, as well as on the change in its nutritional and biological value, has been established. The optimal mode of homogenization of meat and vegetable raw materials has been selected and substantiated. Mathematical modeling of the compositional formulation of homogenized meat and vegetable canned foods for baby food has been carried out. The modes of sterilization of new canned food are substantiated. The nutritional and biological value was calculated and the qualitative and quantitative indicators of ready-made meat and vegetable canned foods for baby food were determined. Normative documentation for the production of homogenized meat and vegetable canned food intended for baby food has been developed, and an assessment of their economic efficiency has been given.

Keywords: children's homogenized canned food, meat and vegetable raw materials, lentils, poultry meat, garden carrot.

Introduction

At present, based on the raw material base of the meat industry in our country, scientifically based recipes and technology for specialized canned food, sausages and culinary products, semi-finished products for children's nutrition have been developed.

For their manufacture, along with meat raw materials (beef pork, veal, horse meat, poultry meat), offal, blood, as well as skimmed milk, buttermilk, whey, or specially designed milk fortifiers, hydrolyzed vegetable, yeast, soy and other proteins are widely used. Products produced using simultaneously meat, dairy and vegetable raw materials have the most favorable and effective effect on a growing organism, are characterized by high biological value, increased digestibility, mutual enrichment with amino acids, fatty acids and vitamins.

To date, the issue of developing functional products for baby food, designed to prevent iron deficiency anemia, iodine deficiency, which in turn is one of the most widespread pathological conditions, has been sharply outlined. At the same time, a necessary condition is the scientific and practical search for ways to increase the content and bioavailability of iron in food products, good digestibility due to the high degree of dispersion of particles of a homogenized product, and the possibility of increasing the shelf life of canned meat and vegetables for baby food [1].

The range of children's homogenized meat and vegetable is extremely limited. Thus, taking into account the state of the canned food market and the raw material base, the most important goal facing the specialists of the canning industry is the development of technology for children's homogenized canned food based on the rational use of meat and vegetable raw materials.

In accordance with the goal, it was necessary to solve the following tasks:

– to study and systematize data from scientific and technical literature and patent information on the research topic;

– to substantiate the choice of meat and vegetable raw materials for the production of homogenized meat and vegetable canned food for baby food;

– to study the physicochemical and organoleptic quality indicators of homogenized meat and vegetable canned foods for baby food;

– to establish the influence of canning technological processes on the structural and mechanical properties of lentils, as well as on the change in its nutritional and biological value;

– select and justify the optimal modes of homogenization of meat and vegetable raw materials;

– to carry out mathematical modeling of the composition of homogenized meat and vegetable canned foods for baby food;

– to substantiate the sterilization regimes for homogenized meat and vegetable canned foods for baby food;

– calculate the nutritional and biological value, determine the qualitative and quantitative indicators of ready-made meat and vegetable canned foods for baby food;

– to develop regulatory documentation for the production of homogenized canned meat and vegetable intended for baby food, to assess their economic efficiency.

The use of vegetable raw materials in the technology makes it possible to enrich canned meat with functional ingredients and impart a characteristic jelly-like consistency to the meat filling.

Materials and methods

For the production of homogenized canned meat for baby food, the following raw materials were chosen: poultry meat (carcasses of broiler chickens), plate food lentils, corn flour, corn germ oil, iodized table salt, garden carrots.

Compared to the meat of slaughtered animals, poultry meat contains more complete proteins, extractives, fat has a low melting point (23-40 ºC). Poultry meat is easily digestible. There are few connective tissue proteins in chicken meat. According to the set and ratio of amino acids, they unconditionally belong to full-fledged ones. Poultry meat contains vitamins (B1, B2, PP, A), minerals (potassium, sodium, phosphorus, calcium, iron, copper), and other elements [2].

Enrichment of homogenized canned meat for baby food with plate lentils, corn flour, blanched carrots allows you to adjust the chemical composition of the main nutrients to the recommended ratio in baby food, i.e. the ratio of protein, fat, carbohydrates in meat and vegetable canned food for baby food is 2:1:1, and in the recommended ratio 1:1:3.

Lentil beans were chosen as a functional ingredient for the production of the product. Large-seed food lentils contain especially valuable proteins, fats, carbohydrates, dietary fiber, minerals (K, Ca, Na, F, P, Fe, Cu, Zn, Mg, J, S, Co, etc.) and vitamins: provitamin A, vitamins of group B, vitamin PP. According to nutritional, biological, dietary properties, lentils are closer to soybeans, beans than to peas. Lentil beans are rich in lipotropic substances and methionine, so dishes from it can be attributed to active means of diet therapy and atherosclerosis. In terms of the content of substances that promote hematopoiesis, lentils surpass many products of animal and vegetable origin. Due to the high content of phosphorus and considerable amounts of B vitamins, lentil beans are especially useful for people of mental labor.

The optimal dose of lentils was 10.0 %.

In order to ensure the integrity and elasticity of lentils in the final product, the selection of the coefficient of swelling of lentils during the blanching process was carried out. Determination of the swelling coefficient was carried out in the process of blanching lentils at a temperature of 70 ºC for 5, 10, 15, 20 and 25 minutes by dividing the mass of lentils after the blanching process by the mass of lentils before blanching. At the same time, the ratio of water and lentils was 2.5: 1. Then the lentils were packed in aluminum containers, filled with water and subjected to sterilization at a standard temperature for canned food sterilization - 20-50-20-120 ºC, p=2.2-2.5 atm . After sterilization, an organoleptic evaluation of the lentils was carried out.

Results

The analysis of the conducted studies made it possible to establish that the swelling coefficient equal to 1.5 is the most optimal in the production of functional meat and vegetable canned food based on lentils. The research results are presented in table 1.

Table 1 – The results of determining the coefficient of swelling of lentils in the process of blanching

experience number	Blanching Options		Swelling coefficient	Organoleptic evaluation of lentils after a sterilization process at 120 °C for 50 minutes
	t, °C	Holding time, minutes		
1	70	5	1,1	Grains are elastic, whole, change in the ratio of lentils: water
2	70	10	1,2	Grains are elastic, whole, change in the ratio of lentils: water
3	70	15	1,5	The grains are elastic, whole, no change in the ratio of lentils: water was observed
4	70	20	1,6	grains boiled
5	70	25	1,7	grains boiled

At the next stage, the influence of blanching and sterilization modes on changes in the nutritional and biological value of lentils was established using the example of changes in the content of protein, iron and folic acid.

Before blanching, the protein content in lentils was 30 g/100 g, the iron content was 12 mg/100 g, and the folic acid content was 405 μg/100 g. Table 2 presents data on the content of protein, iron, and folic acid in lentils after blanching. The data presented in Table 1 indicate that reducing the duration of blanching helps to reduce the loss of iron and folic acid in lentils. This is due to the fact that as a result of prolonged contact of lentils with water, the diffusion of vitamins and minerals from lentils into water occurs. Thus, the blanching mode at a temperature of 80°C is the most optimal and reduces the loss of vitamins and minerals.

The content of protein, iron, folic acid was used as the analyzed indicators of the nutritional and biological value of lentils.

Table 2 – The content of protein, iron, folic acid in lentils after blanching

The name of indicators	Content after blanching				
	Blanching modes				
	60 ℃ 50 minutes	65 ℃ 40 minutes	70 ℃ 35 minutes	75 ℃ 25 minutes	80 ℃ 15 minutes
Protein, g/100 g	20,0	20,0	20,0	20,0	20,0
Iron, mg/100 g	7,7	7,7	7,8	7,8	8,0
Folic acid, mcg/100 g	262	263	264	266	269

Table 3 presents data on the content of protein, iron, folic acid in lentils after the sterilization process, depending on the change in temperature and time of the actual sterilization.

Table 3 – The content of protein, iron, folic acid in lentils after sterilization

The name of indicators	Maintenance after sterilization		
	20-50-20-120 ℃, p = 2,2 атм	20-50-20-118 ℃, p = 2,2 атм	20-80-20-116 ℃, p = 2,2 атм
Protein, g/100 g	18,8	19,4	18,6
Iron, mg/100 g	7,3	7,6	7,2
Folic acid, mcg/100 g	355,0	360,0	357,0

The data given in Table 3 indicate that during the sterilization of lentils at a time of actual sterilization of 50 minutes at a temperature of 118 ℃, the smallest losses of protein, iron and folic acid occur.

The high value of corn germ oil lies in the high content of alpha-tocopherols (vitamin E). Alpha-tocopherols are natural antioxidants that prevent the aging of body cells, restoring beauty and youth [3].

The combination of essential fatty acids and biologically active substances allows the use of corn germ oil in diseases of the liver, biliary tract, and kidney stones.

Eating corn oil reduces the level of cholesterol in the blood, cleanses the walls of blood vessels and gives them elasticity.

The presence of unsaturated fatty acids in corn oil normalizes the fat balance in the human body. The optimal dose of germ oil is 0.5 %

To give the necessary consistency of meat filling for meat and vegetable canned food, corn flour was used, which is rich in such minerals as K, Ca, Na, P, Fe, etc. The optimal dose of corn flour is 5.0 %

Blanched carrots were used to improve the organoleptic properties of the product and adjust its chemical composition. It was introduced in an amount of 5.0 % of the total mass of the product.

Iodized salt was used to enrich canned meat with iodine and give a pleasant taste. It was introduced in the amount of -1.50 %.

Discussion

At the next stage of experimental studies, the structural and mechanical properties, nutritional and biological value of lentils were studied, depending on the impact of canning technological processes.

It was determined that the swelling coefficient equal to 1.5 is the most optimal and allows improving the consumer qualities of the finished product. The experimental studies of the influence of canning technological processes on the change in the nutritional and biological value of lentils showed that blanching of lentils at 80 ° C for 15 minutes and subsequent sterilization (20-50-20-118 °C, p = 2.2 atm.) allows significantly reduce the loss of vitamins and minerals.

It has been experimentally proven that the value of the actual lethality of the developed sterilization process is higher than the required lethality, which corresponds to the conditions for the development of sterilization modes for canned products and confirms the industrial safety of the finished product.

At the next stage, the regularities of the homogenization regime were studied. For homogenization of the meat-vegetable basis of canned food, a model 2096 homogenizer was used, designed for grinding and homogenizing samples with a high fat content or high moisture content.

The homogenization process was carried out using two operating modes of the homogenizer with a working knife speed of 1500 rpm and 3000 rpm.

The criterion for selecting the operating time of the homogenizer was to ensure the dispersion of the product (no more than 200 microns).

For the production of homogenized meat and vegetable canned food, a homogenization mode of 1500 rpm and a time of 20 seconds was chosen, which significantly reduces the energy intensity of production and reduces the cost of production.

At the next stage, mathematical modeling of the components in the recipe mixture was carried out.

At the fourth stage, sterilization regimes for homogenized meat and vegetable canned food for baby food were substantiated.

In homogenized meat and vegetable canned food for baby food, the thermal stability constants D and Z of the Cl.sporogenes test culture were determined, and the required and actual lethality of the Cl.sporogenes test culture was established to calculate the sterilizing effect.

Next, the calculation of the nutritional and biological value of meat and vegetable canned food for baby food was carried out.

The biological value of the product was assessed by comparing its amino acid composition with the amino acid composition of the "ideal" protein.

No limiting amino acid was found in the new homogenized meat and vegetable canned food, which indicates a high biological usefulness of the developed product.

It was found that the use of corn germ oil made it possible to enrich homogenized meat and vegetable canned PUFAs (classes W6/W3 linoleic and linolenic), which makes their use in the new product expedient.

The energy value of homogenized meat and vegetable canned food was 210.8 kcal

Conclusion

Analyzing the mineral and vitamin composition of homogenized meat and vegetable canned food for baby food, we can conclude that the use of plate lentils, corn flour, blanched garden carrots, corn germ oil will enrich the product with minerals such as Na, K, Ca, P, Fe, J and vitamins β-carotene, B1, B2, PP, C, E.

The practical result of the research was the recipe and technology for the production of canned meat and vegetables for baby food.

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Балалар тағамына арналған гомогенизацияланған ет және көкөніс консервілерінің технологиясын зерттеу және әзірлеу

Мақалада зерттелген ет және өсімдік шикізатын ұтымды пайдалана отырып, дәстүрлі органолептикалық сипаттамалары және оңтайлы құрылымдық-механикалық қасиеттері бар, ақуыз-май және аминқышқылдық құрамы бойынша теңдестірілген, тағамдық құндылығы жоғары соңғы өнімі бар жоғары сапалы өнімдер алу - өзекті тақырып болып табылады. .

Адекватты тамақтануға қойылатын талап балалар тағамына арналған ет өнімдерінің рецептурасын әзірлеудің негізі болып табылады. Балалар тағамы өнімдерінің рецептурасын таңдаған кезде бала ағзасындағы зат алмасу үрдістерінің жас ерекшеліктерін ескеру керек, бұл ретте бала ағзасының қоректік заттар мен энергияға физиологиялық қажеттіліктерін қанағаттандыру керек, сонымен қатар биологиялық және физиологиялық заңдылықтарды ескеру қажет. Балалардың ағзасындағы тағамның ассимиляциясын ескеру керек, тамақты ассимиляциялаудың маңызды шарты - ағзадағы ферменттер мен тағамның химиялық құрамы арасындағы сәйкестік. Бұл ереже тағамды ассимиляциялаудың барлық кезеңдерінде сақталуы керек. Бұған ақуыздардың, майлардың, көмірсулардың, витаминдердің, минералдардың теңгерімді қатынасын қамтамасыз ету үшін шикізатты іріктеу және оларды технологиялық өңдеу арқылы қоректік заттардың мақсатты теңдестірілуі арқылы қол жеткізіледі.

Мақаланың мақсаты – ет және өсімдік шикізатын ұтымды пайдалану негізінде балаларға арналған гомогенді консервілердің технологиясын жасау. Зерттеу жұмыстарын жүргізу кезінде балалар тағамына арналған гомогенизацияланған ет және көкөніс консервілерінің физикалық-химиялық және органолептикалық сапа көрсеткіштерін бағалаудың стандартты әдістері қолданылды.

Авторлар балалар тағамына арналған гомогенизацияланған ет және көкөніс консервілерін өндіру үшін ет және өсімдік шикізатын таңдау негіздемесін береді. Жаңа консервілердің физика-химиялық және органолептикалық сапа көрсеткіштері зерттелді. Жасымықтың құрылымдық-механикалық қасиеттеріне, сонымен қатар оның тағамдық және биологиялық құндылығының өзгеруіне консервілеудің технологиялық үрдістердің әсері анықталды. Ет және өсімдік шикізатын гомогенизациялаудың оңтайлы режимі таңдалды және негізделді. Балалар тағамына арналған гомогенизацияланған ет және көкөніс консервілерінің композициялық құрамын математикалық модельдеу жүргізілді. Жаңа консервілерді зарарсыздандыру режимдері негізделген. Балалар тағамына арналған дайын ет және көкөніс консервілерінің тағамдық және биологиялық құндылығы есептеліп, сапалық және сандық көрсеткіштері анықталды.

Түйін сөздер: балалар гомогенді консервілері, ет және өсімдік шикізаты, жасымық, құс еті, асханалық сәбіз.

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Исследование и разработка технологии гомогенизированных мясорастительных консервов для детского питания

Статья посвящена проблеме получения высококачественных продуктов с традиционными органолептическими показателями и оптимальными структурно-механическими свойствами при рациональном использовании мясного и растительного сырья. Актуальным является вопрос получения конечного продукта, сбалансированного по белково-жировому и аминокислотному составу, с повышенной пищевой ценностью.

В основу разработки рецептур мясных продуктов для детского питания заложено требование об адекватном питании. При подборе рецептур продуктов детского питания должны учитываться возрастные особенности обменных процессов детского организма, при этом должны удовлетворяться физиологические потребности детского организма в пищевых веществах и энергии, учитываться биологические и физиологические законы, определяющие усвоение пищи в организме детей. При этом важным условием усвоения пищи является соблюдение соответствия ферментов организма химическому составу пищи. Это достигается целенаправленным балансированием пищевых веществ за счёт подбора сырья и его технологической обработки, обеспечивающей правильное соотношение белков, жиров, углеводов, витаминов, минеральных веществ.

Цель статьи – разработать технологию детских гомогенизированных консервов на основе рационального использования мясного и растительного сырья. При проведении исследований

использовались стандартные методы оценки физико-химических и органолептических показателей качества гомогенизированных мясорастительных консервов для детского питания.

Авторы дают обоснование выбора мясного и растительного сырья для производства гомогенизированных мясорастительных консервов для детского питания; устанавливают влияние технологических процессов консервирования на структурно-механические свойства чечевицы, а также на изменение ее пищевой и биологической ценности; осуществляют математическое моделирование композиционного состава гомогенизированных мясорастительных консервов для детского питания. Кроме того, обосновываются режимы стерилизации новых консервов, рассчитывается пищевая и биологическая ценность, определяются качественные и количественные показатели готовых мясорастительных консервов для детского питания.

Ключевые слова: детские гомогенизированные консервы, мясное и растительное сырье, чечевица, мясо птицы, морковь столовая.

Date of receipt of the manuscript to the editor: 2022/12/10