potravinárstvo®
Slovak Journal of Food Sciences

Potravinarstvo Slovak Journal of Food Sciences
vol. 12, 2018, no. 1, p. 806-814
doi: https://doi.org/10.5219/982
Received: 13 October 2018. Accepted: 27 November 2018.
Available online: 14 December 2018 at www.potravinarstvo.com

ISSN 1337-0960 (online)

STUDYING THE IMPACT OF NON-TRADITINAL SUPPLEMENTS ON THE QUALITY OF THE MINCED RABBIT MEAT PRODUCTS

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ABSTRACT

The topical challenge of our era is the development of such compositions of innovative polyfunctional products, which take into account, to the maximum degree, the effect of mutual enrichment of animal and vegetable products, physiological substances, the capacity of dietary fibers to remove harmful substances from the body and the capacity of probiotics to maintain micro-ecological balance in the gastro-intestinal tract. One of the priority areas of the implementation of these issues the development of technologies of rabbit meat products fortified with plant raw materials and prebiotic ingredients. The purpose of the work is to study the impact of vegetable supplements and lactulose on the quality of the minced meat products. When performing this work, there were used the modern, standard, commonly accepted methods of research, which are in compliance with solving the set objectives. Statistical processing of the results obtained and the evaluation of the reliability of data were carried out by the mathematical statistics methods using the IBM SPSS Statistics for Windows. There have been studied the chemical compositions of the brush rabbit meat bred in Georgia, as well as of haricot bean, pea and amaranth. It is reasonable to use the above-mentioned plant raw material and lactulose use as bioactive supplemented in the production of animal products. There has been justified the appropriateness of mentioned plant raw materials and lactulose as the bio-correcting supplements in the technology for producing animal food products. In order to control and identify the functionality of products, there have been identified the critical control points, such as: preparing and dosing functional raw materials, the introduction stages and an equal distribution of formula components. There have been established the hydration conditions and modes of haricot bean, pea and amaranth flours. There are shown the advantages of their hydration in mineral water, the optimal irrigation modulus has been determined. Also, there have been determined the maximum permissible levels of vegetable supplements and lactulose to be added into the minced rabbit meat, which have a positive impact on the functional-technological properties of semi-finished and finished products, in particular, improve the water binding and water holding capacities of the minced meat, increase the yield of product, as well as improve organoleptic indices of its quality, in comparison with a reference sample. Based on the study of the microbiological characteristics of developed products, it has been demonstrated that the number of mesophilic-aerobic and facultative-anaerobic microorganisms does not exceed the sanitary norms and standards, no *E. coli* group bacteria and pathogenic microorganisms were detected, including *Salmonella* that is in line with the microbiological safety hygienic requirements and norms. The obtained data set indicates the appropriateness of using a new type of product in a functional, dietetic and preventive nutrition.

Keywords: minced rabbit meat; plant raw materials; lactulose; semi-finished product; functional-technological properties

INTRODUCTION

Nutrition makes part of the factors determining health, potential and the development perspectives of the nation. Against the background of the less mobile modern lifestyle and related low energy cost, there is an acute lack of proteins, especially of animal origin in the population's diet. The consumption of animal fats and easily digested carbohydrates rose, and there were discovered high share of saturated fatty acids and cholesterol and a lack of unsaturated fatty acids. At the same time, the deficiency of vitamins, micro-and macro-elements was revealed. These deviations cause the abnormality of the immune status, reducing resistance of human body to infections and other negative environmental factors.

The most realistic way to solve this problem is to develop such compositions of innovative functional products, which take into account, to the maximum degree, the effect of mutual enrichment of animal and vegetable proteins, vitamin provision and optimal ratio, the range of actions of mineral and other physiological substances, the capacity of

dietary fibers to remove harmful substances from the body and the capacity of probiotics to maintain micro-ecological balance in the gastro-intestinal tract **(Arihara, 2006; Dalle Zotte and Szendrő, 2011; Decker and Park, 2010; Cavani et al., 2009; Shenderov, 2001; Tutelyan, 2003; Wambui et al., 2016; Weiss et al., 2010)**.

One of the priority areas of the implementation of these issues is the management of the process of delivering biologically active substances to the human body through the enrichment of meat products. In particular, the inclusion of such bio-correcting plant raw materials or preparations in stuffed semi-finished meat product formulas, which have a certain physiological effect **(Gorodok, 2009; Fomenko, 2011; Kidyaev, Litvinova and Jamalov, 2017; Kolenik et al., 2014; Maksimov et al., 2013; Okara et al. 2008; Samchenko and Mishina, 2013; Sharipova, 2014; Shtakhova, 2008; Vaytanis, 2012; Yartseva and Dolganova, 2010; Zinina, 2016)**.

Accordingly, the development of technologies of rabbit meat products fortified with plant raw materials and prebiotic ingredients is of practical interest.

Rabbit meat is distinguished by a high content of complete animal proteins and a moderate content of fats, and its morphological characteristics, technological properties, nutritional and biological value are much higher compared to beef, pork and poultry, the percentage of flesh is quite higher, the percentage of connective tissue is significantly lower, and the level of cholesterol, purine compounds and sodium is lower, and the meat consistency itself is fine-fibred and tender. Due to these qualities, rabbit meat is considered to be a dietetic food intended for a functional nutrition, which has no contraindications towards various diseases **(Antipova and Vasilenko, 2003; Dalle Zotte, 2004; Hernández and Gondret, 2006; Nistor et al., 2013; Pla, Pascual and Ariño, 2004; Tavdidishvili, Khutsidze and Tsagareishvili, 2018; Volkova et al, 2009)**.

Of plant raw materials, special mention should be made of leguminous crops and amaranth **(Erashova, Pavlova and Kashkarova, 2010; Sharipova, 2014; Shelepina, 2016; Shtakhova, 2008; Tavdidisvili and Lipatova, 2018; Vasneva and Bakumenko. 2010; Zharkova and Miroshnichenko, 2012)**.

Leguminous crops are distinguished by a high content of vegetable proteins, which, on account of their content, are close to animal proteins, and are characterized by substantial content of B-group vitamins, mineral substances and dietary fibers having preventive and nutritional properties.

As a functional supplement, greater attention should be given to the amaranth. It contains a significant amount of proteins and other biologically active substances. Along with high nutritional value, the amaranth has the antioxidant properties and a hypoallergenic potential. Special mention should be made of the fact that it contains substance called squalene, which has antimicrobial, anti-carcinogenic, fungicidal activity and the toxin absorbing capacity.

One of the ways to create food supplements having the prebiotic properties, is the introduction of lactulose into the minced meat, which can ensure high bifidogenic activity under conditions of a lower dosage. Along with the bifidogenic properties, it also has a salutary and curative effect: stimulates the growth of useful microflora and the intestinal peristalsis, suppresses the vitality of pathogenic microflora, lowers blood cholesterol level, reduces the risk of atherosclerosis development, protects from diarrhea, and increases the calcium absorbing capacity **(Dolgova, Khramova and Proskurina, 2013; Grigoriev and Yakovenko, 2000; Khramova, 2011; Leonidov, 2013; Zinina, 2013; Hernández and Gondret, 2006)**.

Thus, the studies aimed at producing high-quality food products having a positive impact on the human body are of great relevance and social importance. The purpose of the work is to study the impact of vegetable supplements and lactulose on the quality of the minced meat products.

Scientific hypothesis

Addition of non-traditional bio-correcting ingredients to the minced rabbit meat improves water binding capacity and water-holding capacity, as well as its qualitative and organoleptic indices.

MATERIAL AND METHODOLOGY

The studies were carried out in the laboratories of the Department of Food Technologies of Akaki Tsereteli State University. As targets for the studies, there have been selected: the brush rabbit meat haricot bean, pea, amaranth and flour produced from them; lactulose syrup; mineral water “Lugela”, model meat and vegetable semi-finished and finished products.

The chemical composition of plant raw materials was determined in accordance with the following indicators in mean sample of raw materials: moisture, protein, fat, and ash contents. Moisture content was determined at a temperature of 105 °C by method of drying weight sample to constant weight **(GOST ISO 24557-2015)**; total nitrogen was determined by modified Kjeldahl method **(GOST 25011-81)**; protein content was determined in accordance with the amount of nitrogen considering the conversion coefficient (6.25); fat content was determined Soxhlet method **(GOST 23042-86)**; ash content was determined by method of ashing through pre drying **(ISO 2171:2007)**. The functional-technological properties of the minced meat, such as: water binding capacity - by pressing with method of Grau and Hamm, the water holding capacity - by the difference between the moisture content existing in stuffing and the amount of moisture released during the thermal treatment **(Antipova, Glotova and Rogov, 2001)**.

Organoleptic indices were determined on a scale of 1 to 9 according to the following characteristics: appearance, color, smell, taste, consistency and succulence.

During the microbiological analysis, the number of the mesophilic-aerobic and the facultative-anaerobic microorganisms in samples were determined by **State Standard GOST 10444.15-94** "Food products. Methods for determining the amounts of the mesophilic aerobic the facultative anaerobic microorganisms"; the number of the *E. coli* group bacteria was determined by **State Standard GOST 50454-92** "Meat and meat products. Detection and registration of possible coliform bacteria and *Escherichia coli*", and the amount of *Salmonella* - by **State Standard GOST P 50455-92** "Meat and meat products. *Salmonella* detection".

Producers of chemicals and instruments used for analyses are: Stavropol plant of chemicals (Russia), Chemical reagent (Tbilisi, Georgia); Alphalab (Tbilisi, Georgia), Oxjen import (Tbilisi, Georgia).

Table 1 The brush rabbit meat's chemical composition and energy cost.

Indicator	Content	Indicator	Content
Moisture, %	71.2	Ratio of fat: protein	0.34
Protein, %	21.1	Energy value, kJ	538.4
Fat, %	7.1	Water binding capacity, %	65.09
Ash, %	1.22	pH	5.71

Table 2 Chemical compositions of haricot bean, pea and amaranth.

Indicator	Haricot bean	Pea	Amaranth
		content in 100 g grain	
Moisture, %	13.7 ±0.32	14.1 ±0.27	12.6 ±0.30
Protein, %	28.5 ±0.36	29.2 ±0.25	18.1 ±0.28
Fat , %	1.8 ±0.26	2.1 ±0.30	3.6 ±0.26
Ash, %	3.6 ±0.28	3.9 ±0.27	0.8 ±0.18
Carbohydrates, g	57.3 ±0.34	55.8 ±0.31	61.3 ±0.32
Starch, g	47.3 ±0.38	63.1 ±0.18	53.2 ±0.32
Food fibers, g	10.2 ±0.34	10.6 ±0.29	0.9 ±0.27

Table 3 Quality indicators of the haricot bean, pea and amaranth flours.

Flour samples	Flour color	Crushing thickness – the mass remained on a 35 sieve, %	Taste	Aroma
Red haricot bean	Gray, with red layer particles	1.3	Specific, characteristic of leguminous crops	Normal, characteristic of leguminous crops
Yellow pea	Yellow	1.3	Specific, characteristic of leguminous crops	Normal, characteristic of leguminous crops
Amaranth	Dark gray	1.2	Characteristic pleasant taste of peanut	Characteristic pleasant aroma of peanut

Statistic analysis

To analyse the functional-technological and quality indicators of minced rabbit meat product is conducted a statistical analysis of the obtained data, the reliability of the obtained data was evaluated by the mathematical statistics methods using the Windows IBM SPSS Statistics software program (version 20.0). We calculated the arithmetic average of the measured value. Then, we computed the error of each measurement and calculated the squared errors in order to compute the absolute measurement error. We selected the value of reliability P = 0.95. Based on the number of measurements and the value of reliability, Student's coefficient equals t = 3.77 (Figures 2 and Figure 3) **(Romanov and Komarov, 2002).** Graphical interpretation of the results was made by using Microsoft Excel. In Tables and Figure, there are presented the data of typical tests, and each value is an average of at least ten determinations

RESULTS AND DISCUSSION

In conformity with the goal to be reached, using the principles of healthy eating theory, at the first stage of the work we chose the main formula ingredients of new types of pro haricot bean, pea and amaranth flour, as well as mineral water and lactulose.

The brush rabbit meat was selected for a study. Its chemical composition and some physical-chemical characteristics are presented in Table 1. The Table shows that rabbit meat contains a substantial amount of proteins, but the fat content is quite low, indicating that rabbit meat as healthy low-calorie.

The Table 2 shows that haricot bean, pea and amaranth are distinguished by a high content of proteins, carbohydrates and dietary fibers. In addition, the contents of proteins are almost the same in haricot bean and pea, and relatively lower in amaranth (by 36%). As for dietary fibers, their largest amounts are contained in haricot bean and pea, and their content is by 28 - 29% lower in amaranth.

The content of proteins and dietary fibers in studied plant raw materials justified expediency of using the functional bio-correcting supplements in the technologies for producing animal food products, raw material can be used in dietetic and preventive nutrition.

The obtained data on the chemical composition of rabbit meat are in conformity with available in the literature and the similar data that we obtained. For example, according to data of **Volkova (2009)**, the protein content in rabbit meat is 22.06%, and according to data of **Nistor et al. (2013)** - 21.2%, according to data of **Zhidik (2017)** - 18.97%, according to data of **Sautkin (2010)** - 22.3%, according to **Tavdidishvili, Khutsidze and Tsagareishvili (2018)** -

20%. According to data of these authors, the fat content is 4.85%, 9.2%, 4.69% and 3.9%, respectively, and the ash content - 1.29%, 1.1%, 1.68% and 1.06%, respectively as well.

Thus, the nutritional value of rabbit meat confirms the relevance of its in the production of functional-purpose meat-plant stuffed semi-finished products.

We have also studied the chemical compositions of haricot bean, pea and amaranth (Table 2). We took haricot bean, pea and amaranth as follows: the grains were cleared of the grain and rubbish impurities, we removed the damaged ones, washed and dried up to no more than 14% of moisture content. The dried grains were crushed to obtain particles, which pass through the hole with a diameter of 2.5 - 3 mm. Then, on a laboratory mill, we crushed it the powdery state and sifted through the #35 sieve. Qualitative indicators of the obtained haricot bean, pea and amaranth flour samples are shown in Table 3.

At the next stage of research, in order to develop the scientifically justified technologies, as well as to control and identify the functionality of products, there have been identified the critical control points, such as: preparing and dosing functional raw materials, the introduction stages, and an equal distribution of formula components.

It has been revealed that the flour in the dry form was unevenly distributed in the minced meat, while the supplementation in the hydrated form had a positive effect on the organoleptic indices of the minced meat - it was distributed equally in the entire mass.

For the hydration, we used tap water and mineral water "Lugela". The use of the latter is justified by the fact that "Lugela" water is a natural 9.5 percent concentration of $CaCl_2$, in which $CaCl_2$ is represented in the ionized form (Ca^{2+}, Cl^-), which facilitates its bioavailability **(Ardia and Janelidze, 1999; Georgian Soviet Encyclopedia, 1983)**.

We have determined that the hydration is 20 - 30 minutes for haricot bean and pea flours, for amaranth 40 - 45 minutes. The hydration was carried out at a temperature of 18 - 200 °C. The obtained results are shown in Figure 1.

Figure 1 illustrates that the process of hydration is more intensive in mineral water than in usual water, and besides, the haricot bean and pea flours have higher hydration capacities (133 and 120%, respectively), and the amaranth flour has lower hydration capacity (96%). Therefore, we have considered it worthwhile to use mineral water for the hydration of haricot bean, pea and amaranth flours.

We have also determined the time of swelling of flour samples, for which we have studied the process of their swelling. The most intensive swelling occurred in the case of the haricot bean and pea flours during the first 20 minutes, and then the intensity of water absorption was reduced, but in the case with the amaranth flour - during the 40 minutes, so the duration of swelling was determined at 30 minutes for the haricot bean and pea flours, and at 40 minutes - for the amaranth flour.

At the next stage of the study, we determined the optimal number of supplements to be added into the minced rabbit meat - the hydrated flours and lactulose. It was understood that by these supplements we replaced the same amount of the minced meat.

As a reference sample, we have taken a natural stuffing cooked through the traditional technology. On its basis, we prepared 3 types of semi-finished products with the following main ingredients: 1 - rabbit meat, haricot bean flour, lactulose, Georgian spices; 2 - rabbit meat, pea flour, lactulose, Georgian spices; 3 - rabbit meat, amaranth flour, lactulose, Georgian spices.

The amount of flours of the hydrated be haricot bean, pea and amaranth to be added into the minced meat varied from 15 to 30% with the irrigation modulus ratios of 1:2; 13 and 1:4.

As a result of organoleptic estimation of semi-finished products, we have chosen the optimal irrigation modulus ratio for haricot bean or pea flour is 1:3, for amaranth flour 1:2, because with the higher irrigation modulus ratio, the minced meat was significantly fluidized.

We have studied the impact of the hydrated supplements on the functional-technological properties of the minced meat - the water binding capacity and water-holding capacity. As is known, the higher these indicators, the less moisture is lost during heat treatment, the higher the quality, the yield of finished products and their organoleptic characteristics: tenderness, juiciness and taste properties.

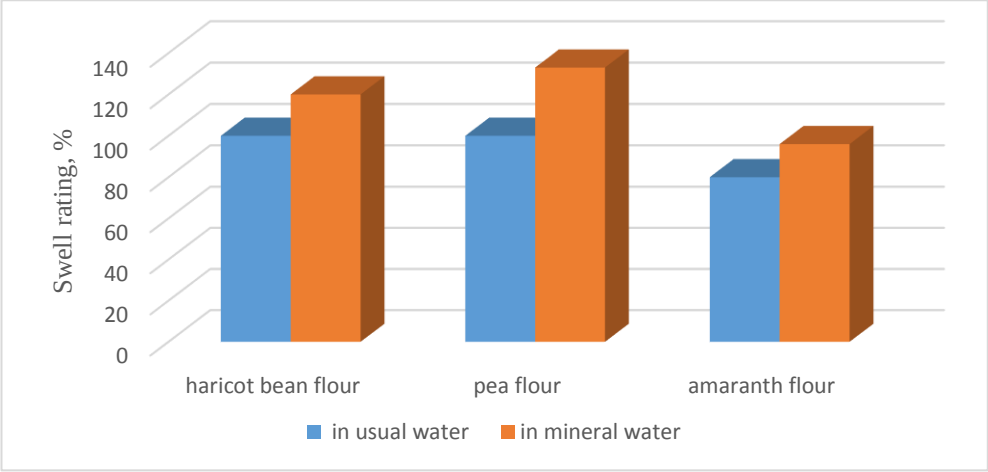

Figure 1 Swell rating of haricot bean, pea and amaranth flours in usual water and in mineral water.

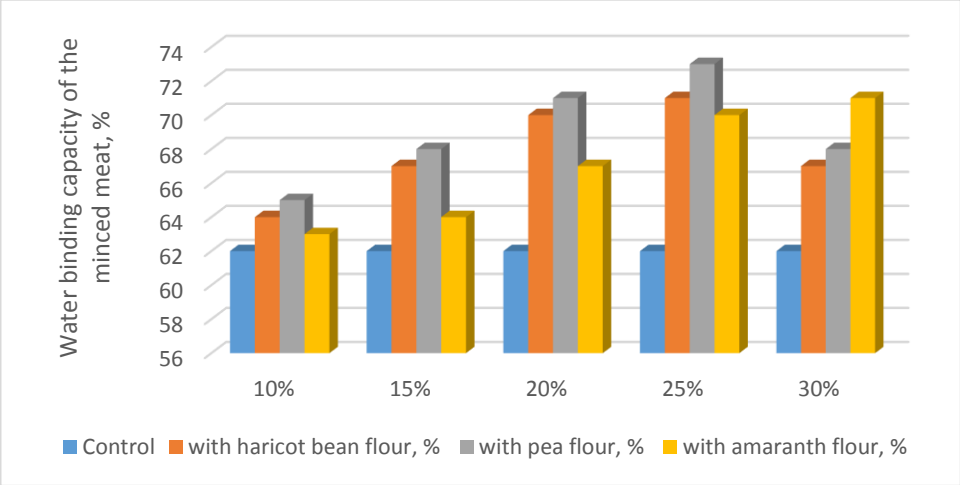

Figure 2 Water binding capacity of the minced meat (p <0.05).

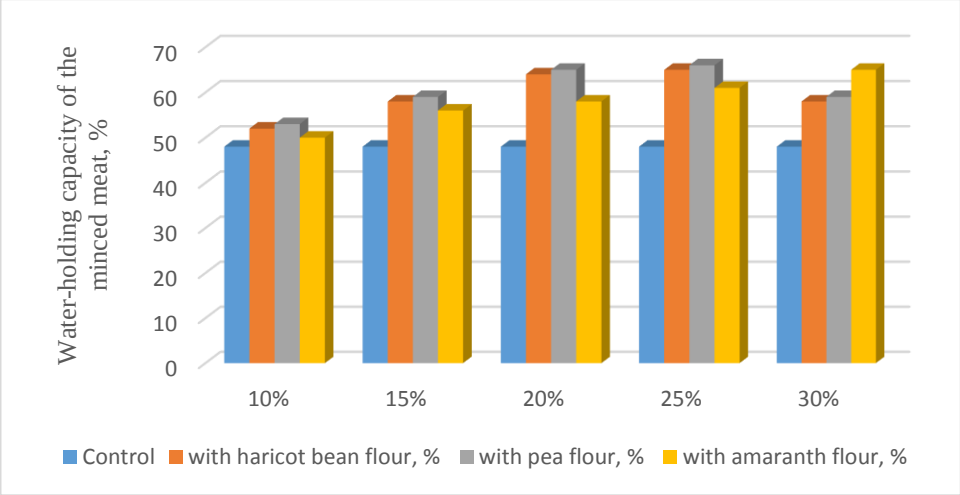

Figure 3 Water-holding capacity of the minced meat (p <0.05).

The obtained results are shown in Figures 2 and Figure 3. The diagrams illustrate that the increase in the dosage of all kinds of vegetable supplements leads to increasing water binding capacity and water holding capacity, and this can be explained by the fact that water is held due to significant amount of starch and cellulose existing in the supplements, while the relatively high water binding capacity is typical of the pea flour, and then of the haricot bean and amaranth flours.

Adding of 15 and 30% of the hydrated haricot bean flour increases the water binding capacity of the minced meat by 7.5 - 11.4% in comparison with a reference sample, and the water holding capacity in the same model minced meat was increased by 17.2 - 18.8%, in comparison with a reference sample.

We have obtained almost the same results for pea, and as for the amaranth, there is a slightly different picture: adding of 15 - 30% of the hydrated amaranth flour increases the water binding capacity and the water holding capacity by 3.2 - 12.7% and 14.3 - 26.2%, respectively, in comparison with a reference sample.

We have obtained almost the same results for pea, and as for the amaranth, there is a slightly different picture: adding of 15 - 30% of the hydrated amaranth flour increases the water binding capacity and the water holding capacity by 3.2 - 12.7% and 14.3 - 26.2%, respectively, in comparison with a reference sample.

The results we obtained confirm the similar data available in the literature on the positive impact of plant raw materials on the functional-technological properties of the minced meat, and in some cases, they even exceed them. For instance, according to **Shtakhova (2008)**, adding of the pea flour increases the water holding capacity of the minced meat by 6.9% - 8.4%, and the water binding capacity by 5.7% - 12.5%, and according to **Kidyayev, Litvinova and Jamalov (2017)**, adding of 9% of the hydrated amaranth flour into sausage products with the irrigation modulus ratio of 1:1.8 increased by the water holding capacity of the minced meat by 4%, in comparison with a reference sample according to **Gorodok (2009)**, by adding the amaranth flour into the minced chicken meat semi-finished products, the water holding capacity was increased by 10.46%; according to **Samchenko and Mihina (2013)**, it has been established that the increase in the dosage of the flax meal supplements leads to the increased water binding and water holding capacities of the minced meat**.**

The amount of lactulose to be added into the minced rabbit meat together with the vegetable supplements was determined with account for its daily consumption norms and organoleptic indices of product. We have established that Lactulose dosage was 1.5 - 2% of minced meat mass.

This concentration of lactulose does not have a negative impact on the functional-technological properties of semi-finished and finished products enriched with the plant supplements, as well as on organoleptic indices, in contrast, it increases slightly the water binding and water holding capacities, which is also confirmed by similar data available in the literature that lactulose and the biologically active supplements containing it, by improving the functional characteristics of stuffed products, give them the probiotic properties and promote the prevention of gastrointestinal diseases.

In particular, adding the lactulose-containing biologically active supplement “KUMELAK” into sausage products increases the water binding and water holding capacities of the minced meat from 3 to 7% **(Dolgova, Khramova and Proskurina, 2013)**; adding of up to 3% of lactulose into the minced fish impacts positively on the organoleptic and functional-technological properties of stuffing: the yield of product and water holding capacity are increased **(Yartseva and Dolganova, 2010)**; adding of 2.5 - 3% of the biologically active supplement "LACTUSAN" into culets with "Khabarovsk lactulose", increases the pH value and water binding capacity, and reduces the losses during the thermal treatment **(Okara et al., 2008)**.

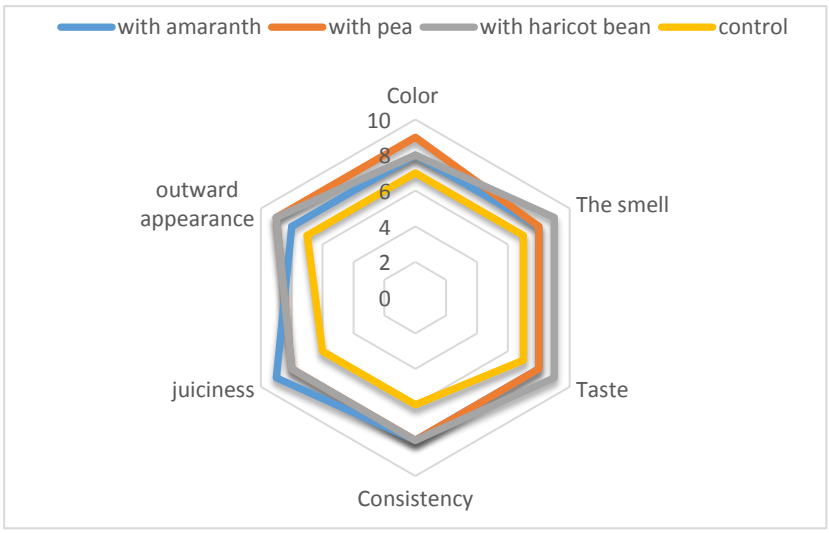

Figure 4 Organoleptic estimation of product.

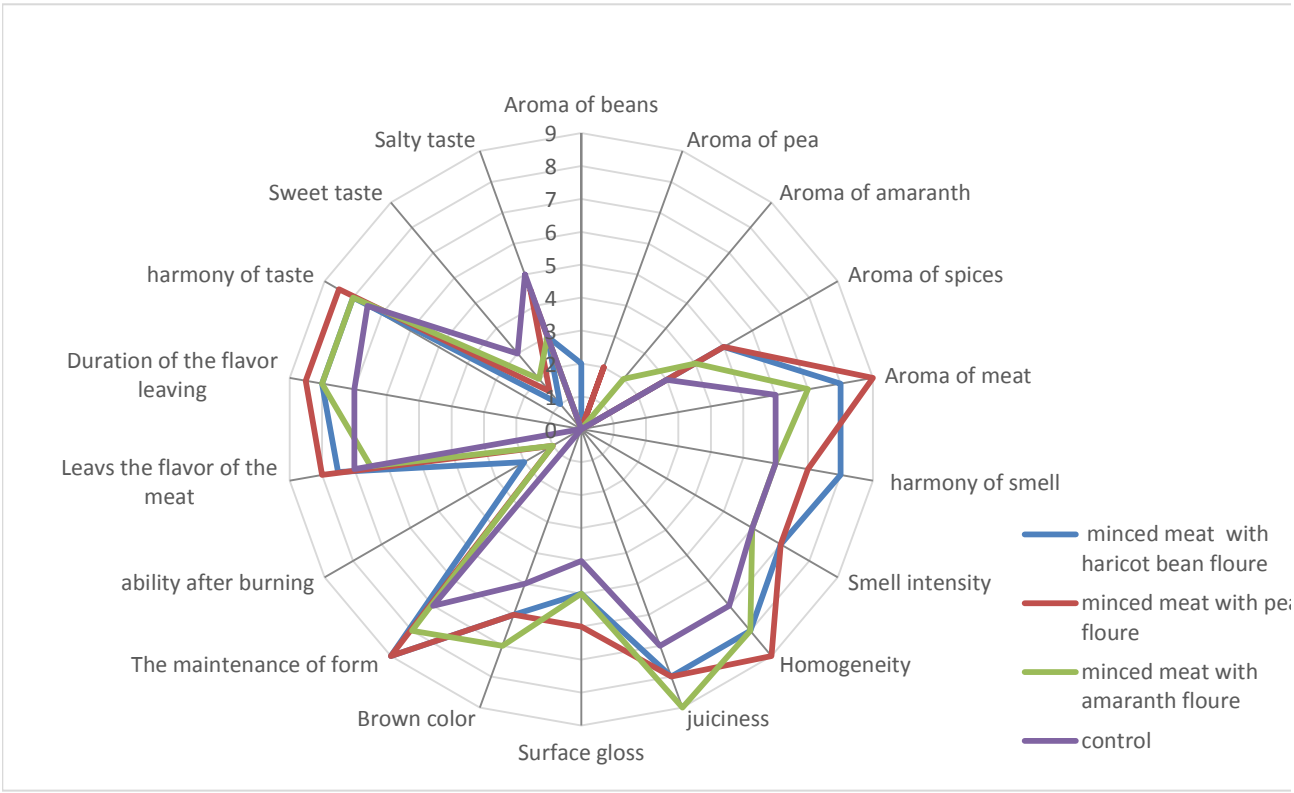

Figure 5 Profilogram of the taste-aroma characteristics of product.

We have made organoleptic estimation of the quality of model product enriched with vegetable supplements and lactulose, which has shown that with the same contents of, lactulose in the minced meat, adding of 10 - 15% of the haricot bean and pea flours did not affect organoleptic indices of stuffing, in comparison with a reference sample; the addition of 20% has improved organoleptic indices of stuffing, and by adding 25% of the plant supplements there have been improved the taste, aroma and colour of finished product, as well as its tenderness and succulence. Increasing the amount of haricot bean and pea flours to 30% led to the weakening of the taste and aroma of meat against the background of strengthening the aroma of leguminous crops, moreover, the colour of product has become darker and its consistency - denser.

As to the amaranth, we have obtained the similar results, when the number of supplements exceeded 30%.

Thus, the optimal amount of non-traditional bio-correcting ingredients, which improve the functional-technological and qualitative characteristics of finished products make up for haricot bean or pea 25% of the minced meat mass, for the amaranth flour 30%, and for lactulose 1.5 - 2%.

In order to neutralize specific taste of rabbit meat and to give product taste and aroma characteristic of Georgian cuisine, we added a set of Georgian spices.

"Khmeli suneli" into the minced meat. Its composition includes the spices (dried crushed herbal spices - coriander, dill, basil, bitter red pepper, crocus, marjoram, blue fenugreek, savoury, parsley, celery, bay leaf, etc.), which are known for their antioxidant and medical-preventive effect.

At the next stage of the work, we have studied the effect of used supplements on the mass loss during the thermal treatment. It has been established that replacing the part of the minced rabbit meat by the haricot bean, pea or amaranth flours results in a reduction in the mass loss of semi-finished products, by 7.5%, when adding the haricot bean flour, 7.2%, when adding the pea flour and by 8.1%, when adding the amaranth flour.

Organoleptic estimation of the quality of developed product was made on a scale of 1 to 9. The appropriate profilogram of the reference and model minced meats is shown in Figure 4, and their taste-aroma characteristics in Figure 5.

The profilogram shows that organoleptic indices in model product are better in comparison with a reference sample, in particular, the consistency, coloration, tenderness, succulence, aroma strength, surface smoothness, shape retention capacity during frying, meat aroma, taste harmonicity, no supplement taste.

The carried-out studies indicate that the non-traditional supplements we studied - haricot bean, pea or amaranth in conjunction with lactulose can be considered to BeBio-correcting ingredients, and they can be used in the technology for producing animal products.

Thus, the technological scheme of the minced rabbit meat product that we developed offers: making stuffing; the hydration of the haricot bean, pea or amaranth flours in mineral water, its binding with lactulose; mixing stuffing with the supplements; blending with spices and salt; the formation of semi-finished products and proper thermal treatment.

We have studied microbiological indicators of a new type of the minced rabbit meat product. The analysis was carried out on the existence of mesophilic-aerobic and facultative-anaerobic microorganisms, *Salmonella* and the *E. coli* group bacteria (Table 4).

The Table 4 shows that the number of mesophilic-aerobic and facultative-anaerobic microorganisms in the experimental samples was from that in the sample samples the number of mesophilic aerobic and facultative anaerobic microorganisms varied from 2.6×10^{-3} to 3.2×10^{-3} cfu.g^{-1} (colony-forming unit per gram), which does not exceed the values established by sanitary norms and regulations, the *E. coli* group bacteria have not been found in a 0.01 g sample, and it was in line with the microbiological safety hygienic requirements, and pathogenic microorganisms, including *Salmonella,* have not been identified in a 25 g sample, which also meets the microbiological safety norms and points to the safety of product.

The obtained data set indicates the appropriateness of using a new type of product in a functional, dietetic and preventive nutrition.

Table 4 Microbiological indicators of the minced rabbit meat product.

Indicators	Normalized value	Control	Experimental samples		
			with 25% haricot bean flour	with 25% pea flour	with 30% amaranth flour
Number of mesophilic-aerobic and facultative-anaerobic microorganisms, cfu.g^{-1}, (colony-forming unit per gram), less than	5×10^6	1.8×10^3	2.6×10^3	2.9×10^3	3.2×10^3
E. coli group bacteria, in a 0.01 g sample	Not allowed in 0.01g	have not been identified	have not been identified	have not been identified	have not been identified
Mould, cfu.g^{-1}, (colony-forming unit per gram), less than	500	have not been identified	have not been identified	have not been identified	have not been identified
Pathogenic microorganisms, including *Salmonella,* in a 25g sample	Not allowed in 25g	have not been identified	have not been identified	have not been identified	have not been identified

CONCLUSION

There has been justified the appropriateness of using plant raw materials and lactulose in the production of the minced rabbit meat products.

There have been established the hydration conditions and modes of vegetable supplements - haricot bean, pea and amaranth flours: the hydration in mineral water containing the ionized calcium chloride, the irrigation modulus ratio for haricot bean and pea is 1:3, the hydration duration 30 - 40 minutes; for amaranth - the irrigation modulus ratio is 1:2 and the hydration duration 50 - 60 minutes.

There have been determined the optimal amounts of the hydrated vegetable supplements and lactulose to be added into the minced rabbit meat, which is 25% for haricot bean and pea, 30% for amaranth, and 1.5 - 2% for lactulose.

The set of the developed supplements improves the functional-technological characteristics of semi-finished and finished products, in particular, the water binding capacity – for haricot bean or pea flours by 11.4%, the water holding capacity by 18.8%. For amaranth flour, accordingly by 12.7 and 26.2%. Also, it improves the quality organoleptic indices.

The study of microbiological indicators of the developed product points to its safety. The obtained data set indicates the appropriateness of using a new type of product in a functional, dietetic and preventive nutrition.

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Acknowledgments:

This work was supported by Shota Rustaveli National Science Foundation of Georgia (SRNSFG) [grant FR 17 – 353 "Development of technologies for Producing and Storage of Healthy foods by Using Rabbit Meat"].

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