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INVESTIGATION OF THE NUTRITIONAL VALUE OF A WHOLE CAMEL MEAT PRODUCT

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Camel meat products are attracting increased interest worldwide due to their high functional properties and nutritional value. Camel meat products contain many essential nutrients as well as some components with potential bioactive properties that may be beneficial to human health and well-being. Camel meat products can be used as therapeutic and prophylactic food products if their dietary value and bioactive components are determined, which are potentially beneficial to the health of consumers. Meat consumers prefer to consume healthier meat products without changing their fundamental dietary patterns. This attitude could favor the development of the camel meat market. This article discusses and focuses on the study of nutritional value, the effect of plant additives on the softening of a camel meat product. The use of camel meat as a source of non-traditional resource. By adding vegetable raw materials, you can increase the nutritional value of the product. The frozen side of camel meat was used for the experiment. Brine from goji berries and rosemary was used as vegetable raw materials. Due to the influence of brine, the structure of the meat was softened and made softer. During the process of the study, analyses for indicators of the nutritional value of products were carried out at the "Scientific Research Institute of Food Safety" of the Almaty Technological University. The physical-chemical parameters of the product were determined: the mass fraction of protein, which was 18.7%, fat – 2.71% and carbohydrates – 48.75%. In addition, the indicators were determined as moisture retention capacity (MRC) – 85.43 ± 1.05%, fat retention capacity - 90.76 ± 0.90. The amino acid and fatty acid composition were also determined. The product contains high concentration of amino acids, with following amino acids being the most abundant: arginine - 2.211±0.885%, lysine - 2.088±0.710%, tyrosine - 1.597± 0.479%, phenylalanine - 1.597±0.479%, leucine+isoleucine - 2.334±0.607%, valine - 1.843±0.737%, proline - 3.317±0.862. These amino acids play a crucial role in growth, development, and maintaining overall health. The study results demonstrated that these plant-based products preserved the biological value of the final product.

Keywords: meat products, vegetable raw materials, brine, goji berries, rosemary, meat production, nutritional value.

ИССЛЕДОВАНИЕ ПИЩЕВОЙ ЦЕННОСТИ ЦЕЛЬНОКУСКОВОГО ПРОДУКТА ИЗ ВЕРБЛЮЖАТИНЫ

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Продукты из верблюжьего мяса вызывают повышенный интерес во всем мире благодаря своим высоким функциональным свойствам и питательной ценности. Они содержат множество необходимых питательных веществ, а также некоторые компоненты с потенциальными биологически активными свойствами, которые могут быть полезны для здоровья и благополучия человека. Продукты из верблюжьего мяса можно использовать как лечебно-профилактические продукты питания, если определить их диетическую ценность и биоактивные компоненты, которые потенциально полезны для здоровья потребителей. Потребители мяса предпочитают потреблять более здоровые мясные продукты, не меняя при этом фундаментального режима питания. Такое отношение могло бы способствовать развитию рынка верблюжьего мяса. В данной статье рассматривается и обсуждается исследование пищевой ценности, действие растительного сырья на размягчение продукта из верблюжьего мяса, а также использование верблюжьего мяса как источника нетрадиционного ресурса. Добавляя растительное сырье, можно повысить пищевую ценность продукта. Для эксперимента использовалась замороженная боковая часть мяса верблюда. В качестве растительного сырья был использован рассол из ягод годжи и розмарина. Благодаря влиянию рассола была изменена структура мяса, что сделало его более мягким. В ходе исследования анализы на показатели пищевой ценности продуктов проводились в "Научно-исследовательском институте безопасности пищевых продуктов" Алматинского технологического университета. Были определены физико-химические показатели продукта: массовая доля белка, которая составила – 18,7%, жира – 2,71% и углеводов – 48,75%. Кроме того определялись такие показатели как влагоудерживающая способность (ВУС) – 85,43±1,05%, жироудерживающая (ЖУС) способность - 90,76±0,90. Также были определены аминокислотный и жирнокислотный состав. В наибольших количествах из аминокислот в составе продукта содержались: аргинин - 2,211±0,885%, лизин - 2,088±0,710%, тирозин - 1,597±0,479%, фенилаланин - 1,597±0,479%, лейцин+изолейцин - 2,334±0,607%, валин - 1,843±0,737%, пролин - 3,317±0,862. Эти аминокислоты играют важную роль в росте, развитии и поддержании здоровья организма. Результаты исследования показали, что данная растительная продукция сохранила биологическую ценность готового продукта.

Ключевые слова: мясные продукты, растительное сырье, рассол, ягоды годжи, розмарин, производство мяса, пищевая ценность.

ТҮЙЕ ЕТІНЕН ӨНІМІНІҢ ТАҒАМДЫҚ ҚҰНДЫЛЫҒЫН ЗЕРТТЕУ

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Түйе етінің өнімдері жоғары функционалдық қасиеттері мен тағамдық құндылығына байланысты бүкіл әлемде қызығушылықты арттырады. Түйе етінен жасалған тағамдарда көптеген маңызды қоректік заттар, сондай-ақ адамның денсаулығы мен әл-ауқатына пайдалы болуы мүмкін биологиялық белсенді қасиеттері бар кейбір компоненттер бар. Түйе етінің өнімдерін тұтынушылардың денсаулығына пайдалы диеталық құндылығы мен биоактивті компоненттері анықталса, емдік-профилактикалық тағам ретінде пайдалануға болады. Ет тұтынушылары негізгі диеталық әдеттерін өзгертпестен пайдалы ет өнімдерін тұтынуды жөн көреді. Бұл көзқарас түйе еті нарығының дамуына ықпал етуі мүмкін. Бұл мақалада түйе етінің өнімін жұмсартуға әсер ететін тағамдық құндылықты зерттеу қарастырылады және талқыланады. Түйе етін дәстүрлі емес ресурстың көзі ретінде пайдалану. Өсімдік шикізатын қосу арқылы өнімнің тағамдық құндылығын арттыруға болады. Тәжірибе үшін түйе етінің мұздатылған жағы пайдаланылды. Өсімдік шикізаты ретінде годжи жидектері мен розмарин тұзды ерітіндісі қолданылды. Тұзды ерітіндінің әсерінен ет құрылымы жұмсарып, оны жұмсақ етті. Зерттеу барысында АТУ университетінің "Азық-түлік қауіпсіздігі ғылыми-зерттеу институтында" азық-түліктің тағамдық құндылығы көрсеткіштеріне талдау жүргізілді. Өнімнің физика-химиялық көрсеткіштері анықталды: ақуыздың массалық үлесі – 18,7%, май-2,71% және көмірсулар-48,75%. Сонымен қатар, көрсеткіштер ылғал

ұстау қабілеті – 85,43±1,05%, май ұстау қабілеті - 90,76±0,90 деп анықталды. Аминқышқылдары мен май қышқылдарының құрамы да анықталды. Өнімнің құрамындағы аминқышқылдарының ең көп мөлшері аргинин - 2,211±0,885%, лизин - 2,088±0,710%, тирозин - 1,597±0,479%, фенилаланин - 1,597±0,479%, лейцин+изолейцин - 2,334±0,607%, валин - 1,843±0,737%, пролин - 3,317±0,862. Бұл аминоқышқылдар организмнің өсуінде, дамуында және адам денсаулығын сақтауда маңызды рөл атқарады. Зерттеу нәтижелері көрсеткендей, қосылған өсімдік шикізаты өнімнің биологиялық құндылығын сақтап қалды.

Негізгі сөздер: ет өнімдері, өсімдік шикізаты, тұзды ерітінді, годжи жидектері, розмарин, ет өндірісі, тағамдық құндылық.

Introduction

Goji berries (GB) are one of the most valuable medicinal plants that contain a unique complex of vitamins, minerals, and trace elements that slow down the aging process of the body, strengthen and support the nervous and immune systems, improve the general condition of the body, stimulate mental activity, vision and memory, reduce the feeling of fatigue.

GB contribute to the normalization of blood pressure and circulation, regulate blood sugar levels, strengthen the cardiovascular system, and improve digestion, liver and kidney function. Vitamins that are abundant in GB: A, B1 and B2, PP and vitamin C.

According to Vardanyan L.R. that goji berries are better known as a useful product that promotes longevity, an excellent medicine for the cure of many diseases, like cancer, heart attacks, diabetes, obesity, fever, vision impairment, etc [1].

The consumption of these berries helps regulate blood sugar and cholesterol levels, reduce fat deposits, strengthen bones and teeth, normalize blood pressure, alleviate headaches, and support the elimination of toxins from the body.

Such unique properties of goji berries are due to their chemical properties. It has been established that goji berries contain 38 amino acids (8 of them are essential); A, B, E, C vitamins (the content of vitamin C in GB is 522 times higher than its amount in an orange), more than 22 minerals (including calcium, potassium, zinc, iron, sodium, copper, manganese, magnesium, germanium, selenium, etc.), polysaccharides, unsaturated fatty acids (omega-3,6), carotenoids, flavonoids, biologically active substances and other useful components [2].

In the study, Taeva A.M. utilized goji berries to prepare a brine for tenderizing whole-muscle meat products. The proposed brine demonstrated excellent performance, ensuring uniform saturation of the meat pieces, minimal brine loss after injection, and even distribution of salting substances throughout the meat. Thanks to the high levels of vitamins E, A, and B in goji berries and their antioxidant properties, the processed meat exhibited enhanced elasticity and juiciness during heat treatment, as well as improved tenderizing qualities [3].

According to Asuman D., this study explored the effects of dietary supplementation with goji berry (*Lycium barbarum L.*) leaves (GBL) on various parameters in broiler chickens, including performance, meat lipid oxidation, chemical composition, carcass traits, internal organ development, digestive tract sections, and blood parameters. A total of 144 day-old mixed-sex chicks (Ross-308) were weighed and randomly assigned to four experimental groups, each with three replicates of 12 chickens. The dietary treatments included: (i) a basal diet (control), (ii) a basal diet with 1 g/kg GBL, (iii) a basal diet with 5 g/kg GBL, and (iv) a basal diet with 10 g/kg GBL. Statistical analysis using one-way ANOVA revealed that supplementation with 10 g/kg GBL significantly enhanced body weight (0–6 weeks) ($p<0.01$), body weight gain (4–6 weeks), and feed intake (4–6 and 0–6 weeks) ($p<0.05$). However, the feed conversion ratio did not show a significant improvement ($p>0.05$). Furthermore, the inclusion of 10 g/kg GBL in the diet increased heart weight and proventriculus length ($p<0.05$) while reducing breast meat lipid oxidation on day 21 ($p<0.05$). While no significant effects were observed on total cholesterol, HDL, glucose, and triglycerides ($p>0.05$), LDL levels were notably reduced ($p<0.05$). In conclusion, supplementing broiler diets with 10 g/kg GBL may enhance growth performance, reduce breast meat lipid oxidation, and lower LDL levels in blood serum, offering potential benefits for poultry production [4].

According to Ya. I. Sharygina's science research work the use of natural antioxidants-extracts of spices and rosemary plants - will give positive results when storing pure fats, and allows to stabilize the destruction of the lipid fraction of multicomponent products. At the same time, the biological value of the product increases due to the essential oils and bioflavonoids contained in the extracts: catechins and phenolic acids [5].

Also, camel hump fat was added for prototype No. 2 (F). The benefits of camel fat, its beneficial effect on the well-being and appearance of a person are officially confirmed by

nutritionists. It is not surprising, because the unique properties of fat deposits and a full supply of nutrients and trace elements allow camels to survive for a long time in the desert expanses without water and food. Prevention and treatment with animal fats is a fairly common phenomenon. Nowadays people prefer to use fish, badger, bear, goose fats [6].

The lipids contained in them are able to keep the human body in constant tone. The food acquires a slightly specific, sweet taste, pleasant aroma, which gives it a certain piquancy. Moreover, such food will never become a factor in gaining excess weight, because camel fat is a dietary product [7].

Decreasing of fat intake is important to potentially reduce obesity, and hypercholesterolemia [8]. An epidemiological study by Siri-Tarino P.W. [9] et al. supported the association between saturated fatty acid (SFAs) and cardiovascular disease and recommended to reduce intake of SFAs and increasing consumption of omega-3 [8]. In this respect, Kadim I.T. et al. found that camel meat products containing relatively high level of polyunsaturated fat acids and low cholesterol levels, which it can be recommended to reduce obesity [10]. Mozaffarian D. et al. stated that the high contribution of saturated fat in consumers' diets connected with high cholesterol intake is assumed to be linked with the incidence of diet-related diseases including coronary diseases [11]. Therefore, to lower meat fat intake, camel meat product can be considered a suitable product due to low intramuscular fat content. On average 45.0% of total fatty acids is SFAs in the camel muscle and approximately ½ of the SFA is palmitic acid (16:0), and 1/3 is stearic acid (18:0). The predominant fatty acids in dromedary camel meat were in the same order: oleic (33.5%), palmitic (28.5%), 357 stearic (19.3%), and palmitoleic acid (6.3%) with a percentage of polyunsaturated of 5.6% only [12]. On the other hand, polyunsaturated fatty acid (PUFAs) ranged from 7.2% to 12.8% of total fatty acids. In this respect, twice the amount of oleic (C18:1) and less than ½ the amount of linoleic acid (C18:2) were found in camel meat products [13].

The main PUFAs in camel meat products were linoleic acid (C18:2n6c) and arachidonic acid (C20:4n6). The amount of PUFA in camel meat product (11.2%), that is higher than beef (8.8%) and lower than deer (31.4%). The ratio of C18:2n6c and C18:2 in camel meat product is 13:9 whereas it is higher in meat of cattle, sheep, or goat (2.0, 2.4, and 2.8, respectively). Compared to other red meat, camel meat has the higher essential amino-acid index et al., emphasizing its high proteinic value. The non-essential amino acid profiles slightly varied also between camel meat cuts [14].

The range of glutamic acids, aspartic, arginine, and proline were from 15.2%–18.6%, 8.6%–10.8%, 6.6%–7.8%, and 3.9%–5.9%, respectively. The range of serine, tyrosine, and alanine were 3.1–4.1, 3.0–4.2, and alanine 3.9–6.4 g/100 g protein, respectively. Moreover, camel meat may be a better source of non-essential amino acids than beef, lamb, and goat meats [14].

The study aimed to investigate the nutritional value of a whole-meat product prepared from camel meat with the incorporation of vegetable-based ingredients.

Materials and research methods

For the experiment, meat from a double-humped camel was used, sourced from the Kazakh agro-enterprise "Daulet-Beket," known for its flagship camel milk restaurant-store. The frozen flank portion of the camel, maintained at -19°C, served as the base material. Camel meat prepared in brine was utilized for the experimental process.

Goji berries were used in their whole form, later ground into powder, while rosemary was utilized directly in its powdered form. The chemical composition of rosemary is rich in nutrients, making it invaluable in traditional remedies and pharmacology. It contains vitamins A, C, and B-group; calcium; potassium; phosphorus; magnesium; sodium; and iron [15].

The beneficial effects of rosemary on the human body have been well-recognized for years, including protecting vessel walls, accelerating the healing of wounds and abrasions, enhancing immunity, combating fungi and staphylococcus, normalizing the cardiovascular system, improving blood circulation, alleviating muscle and joint pain, enhancing digestion, boosting performance, relieving stress and overstrain, and improving skin and hair condition [16].

Table 1. Technological map of restructured meat product from camel meat in the form with the addition of vegetable raw materials

Components	Per 1 serving, g/ml		Per 1000 g of product, g/ml	
	Gross weight	Net weight	Gross weight	Net weight
Beef	250	200	313	250
Camel meat	415	380	519	475
Chicken meat	140	100	175	125
Chicken skin	30	25	37	31
Camel hump fat	90	88	113	110
Salt	2	2	2,5	2,5
Spices	5	5	6,5	6,5
Total	-	800	-	1000
Brine composition:				
Goji berries	-	66	-	82,25
Rosemary	-	3	-	3,75
Water	-	40	-	50
Total	-	109	-	136

Technological process:

The technology for producing a camel meat product with the addition of vegetable raw materials is as follows:

1. Preparation of Spices: The necessary spices are prepared.
2. Primary Processing of Camel Meat: The meat undergoes primary processing.
3. Massage (Massager - Tenderizer): The meat is massaged for 40 minutes to soften it. It is then cut into slices 2-3 cm thick, folded into layers, and rolled with other raw materials.
4. Brining: The meat is kept in brine in a refrigerated chamber for 48 hours. Salt and nitrite are added. For every 1 kg of meat, 10 g of spices are used.
5. Cooking: The product is cooked in an oven with electric or gas heating at 180°C for 30 minutes, followed by cooking at 120°C for an additional 45 minutes. The finished product is allowed to cool in a refrigerated chamber.

To create the brine composition, goji berries and rosemary are crushed, poured with boiled water, and allowed to infuse the brine for 2 days. Massaging (mechanical treatment) accelerates the absorption of the brine into the muscle tissue of the meat, enhancing its penetration and distribution. Salt acts as both a flavor enhancer and preservative for the muscle tissue, promoting its swelling.

Nitrite salt is a mixture of sodium nitrite and table salt. This mixture inhibits the growth of pathogenic bacteria, preventing the formation of botulism toxins in food. Additionally, its use enhances the final taste of the product, making the meat flavor more pronounced, adding aroma, and helping to preserve the color of the meat. Sodium nitrite also has an active antioxidant effect on fats, which extends the shelf life of meat products. Nitrite salt serves as an optimal and safe substitute for saltpeter.

Camel fat is used for the following purposes: to strengthen weakened immunity, to increase the protective barrier of the whole body; as a preventive agent that suppresses the growth and development of cancer cells; as a preventive, therapeutic agent for diabetes mellitus; to fight against diseases that are chronic in nature; to improve the digestive process, stimulate the proper functioning of the intestine; to help with cough, bronchitis, fever, inflammatory processes of a different nature. Its use is recommended for children, and elderly people to replenish their energy reserves. The product is easily digested, guaranteeing a quick return of nutrients to the human body [17]. The rationale for choosing camel meat is to use non-traditional raw materials due to the lack of domestic resources.

Also, the indicators of WHC (water holding capacity), OHC (oil holding capacity) were determined. The most important functional properties of meat raw materials include its ability to bind water, retain moisture, and oil/fat holding capacity. These properties enhance juiciness, tenderness, and overall quality of the meat [18].

In the course of the study, analyses were carried out to determine the nutritional value indicators of the control and experimental samples in the "Research Institute of Food Safety" of Almaty Technological University. The following physical and chemical parameters were determined:

The mass fraction of protein was analyzed according to GOST 25011-2017;

The mass fraction of fat was according to GOST 23042-2015;

The mass fraction of carbohydrates was determined by the Permanganatometrically method.

The indicators of WHS were analyzed according to the method of Vartanyan;

The indicators of OHC were studied according to the Refractometrically method.

The amino acid composition was determined by the method of M -04-38-2009;

The fatty acid composition was determined by GOST 30418-96.

In Figure 3 and Figure 4, the chromatography of the fatty acid composition indicators for the control and experimental samples are presented. The test was conducted under the following conditions: temperature of 21°C and relative humidity of 61%. The analysis temperature is 30°C. The graph data are presented in Table 2.

Results and discussion

The raw form of the experimental sample weighed 800 g, while the control sample weighed 840 g. After cooking, the results are presented in Figure 1. On the right side from above, the prototype weighs 650 g, and the control sample, located below, weighs 570 g. According to the data, it can be concluded that due to the brine from goji berries and rosemary, the water-holding capacity of the product has significantly increased. This makes it possible to reduce the loss of the product during cooking.

Figure 1. Photos of samples from the experiment: raw and finished with the final output of products.

A profilogram for the organoleptic parameters of both samples is presented in Figure 2.

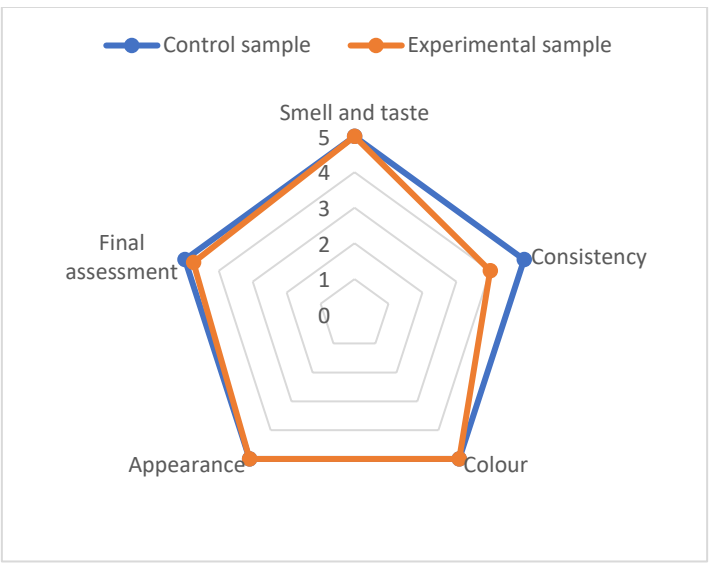

Figure 2. Profilogram of the results of organoleptic analysis.

According to Figure 2, it can be concluded that the prototype has good organoleptic characteristics.

Table 2. Sensory control of organoleptic indicators of products

Indications	Experimental sample	Control sample
Appearance	4	3
Color	4	3
Smell	5	4
Taste	5	4
Consistency	5	4
Final grade	4,6	3,6

Experimental sample and control sample of molded products from camel meat were analyzed for physical-chemical indicators (Table 3). Camel meat with the addition of Goji berries was used as the prototype. A brine made from Goji berry and rosemary was added as plant raw material to enhance the high nutritional content. The addition of rosemary to the meat not only infused the dish with a pleasant aroma but also softened the taste of the meat.

Table 3**.** The result of physical and chemical indicators

Name of indicators, units of measurement	Actual results	
Physical and chemical indicators:	ES	CS
- mass fraction of protein, %	18,7	11,79
- mass fraction of fat, %	2,71	16,60
- mass fraction of moisture, %	48,75	49,62
- WHC, %	85,43±1,05	79.12±1,21
- OHC, %	90,76±0,90	81,36±0,85

The results of the control sample indicate that, in terms of the content of physico–chemical indicators, the ratio of the mass fraction of proteins is greater compared to the control sample—11.79% versus 18.7%. The mass fraction of fats has significantly decreased, nearly by a factor of five—down to 2.71%. Table 3 also presents the indicators of Water Holding Capacity (WHC) and Oil Holding Capacity (OHC). These indicators are notably higher in the experimental sample with goji berries and rosemary. The tests were conducted at a temperature of 21 °C and a humidity of 61%. The analysis temperature was 30 °C, using the method of absolute calibration and absolute graduation.

If we compare the data in Tables 2 between A and B, we will observe that the fatty acid content is notably higher. Fatty acids such as Methyl Butyrate, Myristyl Myristate, Methyl cis-10 Pentadecenoate, and Methyl cis-10 Heptadecanoate were identified, and their indicators show significant differences. The fatty acid composition of the meat product is crucial due to its significant effects on consumers' health [19]. The protein content in camel meat is significantly greater, while the intramuscular fat content is notably lower compared to veal [10].

Chromatographs of the fatty acid composition of both samples are presented *in Figures 3, 4.*

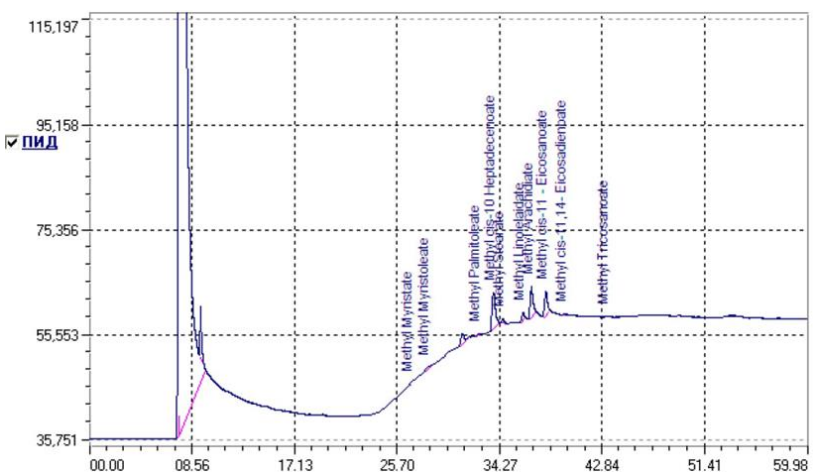

Figure 3. Chromatography of the fatty acid composition indicator in the control sample.

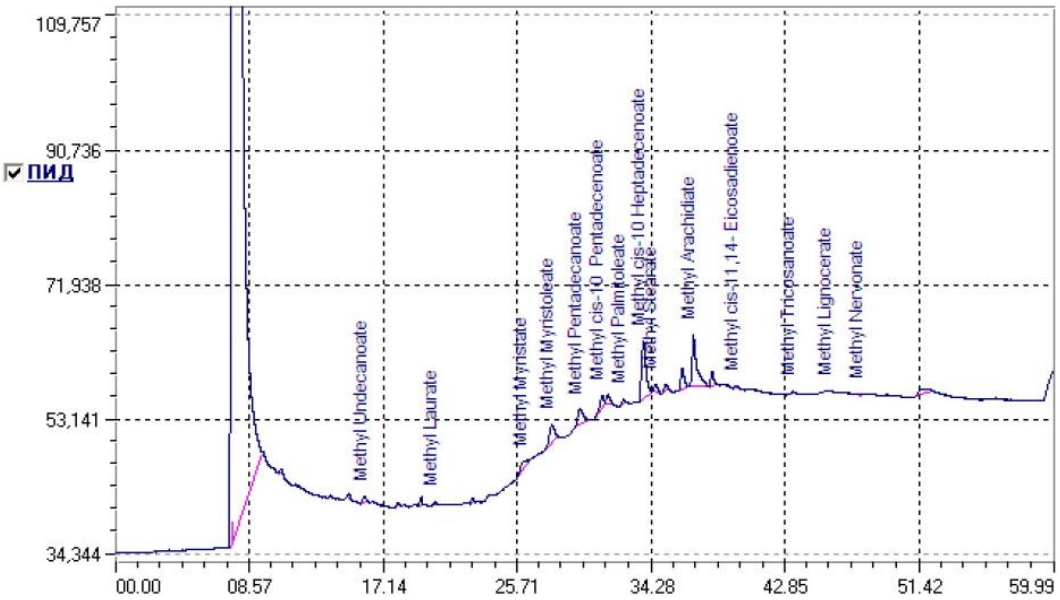

Figure 4. Chromatography of the fatty acid composition indicator in the experimental sample.

The intramuscular fat in camel meat products contained 50 mg/100 g cholesterol, which is lower compared to lamb and beef meat fats (196 and 206 mg/100 g fresh weight, respectively). This conclusion was supported by Kadim I.T. et al. [12] and Raiymbek G. et al. [13].

The concentration indicators of the amino acid composition of the prototype are presented in Table 4.

Table 4. Amino acid content of the prototype.

N	Time	Component	Height	Start	Finish	Square	Conc.,mg/l	Mass fraction of amino acids in %,
1	6.018		7.465	5.977	6.070	143.3	0.00	0,00
2	6.102	arginine	5.250	6.070	6.367	160.1	180.0	2,211±0,885
3	7.988	lysine	11.770	7.898	8.072	360.2	170.0	2,088±0,710
4	8.227	tyrosine	4.340	8.153	8.255	127.9	130.0	1,597±0,479
5	8.328	phenylalanine	4.866	8.255	8.387	133.5	130.0	1,597±0,479
6	8.585	histidine	1.774	8.500	8.685	72.8	68.0	0,835±0,418
7	8.823	leucine+isoleucine	9.357	8.685	8.882	529.9	190.0	2,334±0,607
8	8.937	methionine	2.925	8.882	8.970	85.68	71.0	0,872±0,297
9	9.045	valine	6.694	8.970	9.085	224.9	150.0	1,843±0,737
0	9.212	proline	10.386	9.085	9.240	431.0	270.0	3,317±0,862
1	9.290	threonine	6.142	9.240	9.322	152.0	98.0	1,204±0,482
2	9.540	serine	6.395	9.420	9.567	214.4	110.0	1,351±0,351
3	9.627	alanine	6.300	9.567	9.683	178.6	76.0	0,934±0,243
4	10.035	glycine	4.281	9.940	10.078	117.8	40.0	0,491±0,167

The highest concentrations of amino acids in the composition are observed in arginine, lysine, tyrosine, phenylalanine, leucine + isoleucine, valine, and proline.

The most abundant essential amino acids in camel meat products were lysine, then leucine, methionine, isoleucine, threonine, and phenylalanine [20, 21]. Leucine and lysine were present in the range of 6.8%–9.9% and 8.1%–9.9% of the total protein, respectively.

Conclusion

Goji berries can increase the protein content of camel meat. As a result, the test sample contains less fat compared to the control sample. According to the indicators of the protein component, the sample with brine exhibited higher values. The protein content in the control sample was 11.79%, while in the experimental sample it increased to 18.7%. Water-holding capacity (WHC) values were also improved, with the control sample showing 79.12% and the experimental sample reaching 85.43%. Oil-holding capacity (OHC) indicators were higher in the experimental sample (81.36%) compared to the control (90.76%). The addition of goji berries and rosemary significantly enhanced the nutritional profile of the product, especially increasing the concentration of amino acids such as arginine, lysine, tyrosine, phenylalanine, leucine + isoleucine, valine, and proline.

According to the data obtained, it can be concluded that due to the brine from goji berries and rosemary, the moisture-retaining ability of the product has significantly increased. This process enables the reduction of product loss during the cooking process.

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