



AMINO ACID SPEED OF CHEESE

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<https://doi.org/10.5281/zenodo.7989209>

Annotation. The paper studied the amino acid composition of proteins and the qualitative composition of free amino acids of soft cheeses received by new technology. The results of calculations of the amino acid score are shown by the originality of the cheese of the cheese with indispensable amino acids and their high biological value.

Keywords: milk, serum, thermal acid coagulation, soft cheese, amino acid, amino acid

Introduction. According to scientifically based nutritional standards, the need for proteins per person is 90-100 g per day. The share of proteins of animal origin should be 55%. Protein deficiency in the nutrition of the population is experienced by all countries of the world. Significant reserves of milk protein are found in low-fat milk raw materials. They contain the entire set of amino acids, including essential ones, and their ratio in these proteins is selected through evolutionary selection so that it meets the needs of the human body for good nutrition.

Usually, in a ripening cheese, the cheese mass, under the action of enzymes secreted by lactic acid bacteria, undergoes biochemical transformations that cause a specific taste, smell, color and pattern in the cheese. The breakdown of proteins in ripening cheese leads to the accumulation of numerous and diverse nitrogenous compounds: water-soluble proteins, polypeptides, peptides, amino acids and products of deeper decomposition (amines, free ammonia). In fresh cheeses, the processes of protein breakdown are not very intensive, however, the study of the initial amino acid composition of cheeses is of particular scientific interest. In scientific data, there are many reports on studies of the general amino acid composition of soft cheeses of the Adyghe type. In particular, the results of the calculation of the amino acid score carried out by O.A. Suyunchev showed the high biological value of the proteins of the "Adyghe Alpine" and Adyghe cheeses, for all essential amino acids the score increased by 100% [1].

According to T.N. Ryzhkova and others in the experimental batch of Orion goat cheese produced using the new technology, the mass fraction of protein (total protein), including essential amino acids, was higher by 2.21 and 1.5%, in comparison with similar indicators in the control batch soft goat cheese "Adyghe" [2]. However, the free amino acids of soft cheeses have not been adequately studied. The aim of our research was to study the amino acid composition of a new soft cheese developed by the authors, produced by complex coagulation of milk proteins.

Materials and methods. The content of total and free amino acids in the experimental and control cheeses was determined on the Hitachi 835 amino acid analyzer (Japan) in accordance with ISO 13903:2005 "Compound animal feed. Determination of amino acid

content. The studied products were obtained using a new technology with thermal acid coagulation of heat-treated milk proteins at 75 - 85 °C. The experiments were carried out in a cheese-pasteurizer model SP 35.02V.00.000 as follows. The feedstock (skimmed and normalized milk with a mass fraction of fat of 1.1%) was subjected to heat treatment at a temperature of 95 °C for 5 minutes in order to maximize the extraction of milk proteins. Control variants of soft cheeses were obtained using the same technology as the experimental ones, but with coagulation of milk proteins at the pasteurization temperature. Coagulated with acid whey at 75 - 85 °C for 5 minutes. After separating the whey, self-pressing in molds for 60 min, and salting with dry salt, the resulting protein mass was subjected to research.

Results and discussion. The analysis of the conducted studies showed that all the studied samples of soft cheeses are rich in both quantitative and qualitative composition of amino acids. 17 amino acids were found in the proteins of all cheese varieties: aspartic acid, threonine, serine, glutamic acid, proline, glycine, alanine, cysteine, valine, methionine, isoleucine, leucine, tyrosine, phenylalanine, histidine, lysine and arginine; their greatest content falls on the share of glutamic acid, leucine and proline. Both the content of individual amino acids and their total amount in the experimental cheeses is less than in the control ones. This, apparently, is due to the fact that the experimental cheeses have an increased mass fraction of moisture.

All essential amino acids were found in the proteins of the studied samples of soft cheeses (tryptophan was not determined). The total amount of essential amino acids in the proteins of the studied cheeses is 36.38 - 39.63%, and their number is almost the same in the experimental and control cheeses. Our data are in good agreement with studies conducted by Pavlenkova T. P. et al., which found that the total amount of essential amino acids in the proteins of Adyghe cheese is 37.7% [3].

From the obtained data on the composition and content of free amino acids of the studied samples, it follows that the absolute amount of free amino acids in the experimental and control variants of fat-free and with a mass fraction of fat (mfl) in the dry matter of 20% cheeses is not the same. So, the total amount of free amino acids in the experimental and control fat-free and with mdzh. in dry matter 20% cheeses was 11.5, 8.96, 11.3 and 8.34 mg per 100 g of product. The relative increase in free amino acids in the experimental fat-free and with mdzh. in the dry matter of 20% soft cheeses compared to the control is 128.3 and 135.5%.

The qualitative composition of free amino acids in experimental and control cheeses is also different. In the composition of experimental cheeses, both fat-free and with m.d.zh. fat in dry matter 20% is dominated by glutamic acid, glycine, alanine, valine and tyrosine. Such a difference in the composition of free amino acids in the experimental and control variants of cheeses is explained as follows: whey fermented with pure cultures of lactic acid bacteria and used as a coagulant contains significantly more free amino acids, which is associated with a deeper hydrolysis of milk proteins under the action of lactic acid bacteria enzymes, as well as lactic acid; experimental versions of cheeses were obtained with the addition of 17.5-18.5% whey and differed by a markedly increased mass fraction of moisture and whey.

It is known that the taste and smell of cheeses is affected by the content of such amino acids as glycine, alanine, proline, threonine and serine, which have a sweet taste. These amino acids were found both in the composition of total and in the composition

of free amino acids. Perhaps they have a positive effect on the formation of the spicy taste of cheeses.

The biological value of the proteins of the studied cheeses was determined by the amino acid score method, based on comparing the results of determining the amino acid composition of the product proteins with the corresponding amino acid composition of the "ideal" protein. Currently, most researchers use a hypothetical (theoretical) protein recommended by the FAO and WHO in 1973 as an "ideal" protein. 1 g of such a protein contains the following amount of essential amino acids (in mg): isoleucine - 40, leucine - 70, methionine + cystine -35, lysine - 55, phenylalanine + tyrosine - 60, threonine - 40, tryptophan - 10, valine - 50.

The results of calculations of the amino acid score of experimental and control fat-free ism.d.zh. in dry matter, 20% of cheeses are given in Table. 1, 2. Evaluating the quality of cheese proteins by the amino acid score method, it can be noted that they are well balanced. So the optimal content of one of the essential amino acids - leucine in the "ideal" protein should be 70 mg per 1 g, while in the proteins of the experimental and control fat-free and with mdzh. in dry matter of 20% of cheeses, this figure was 98.8, 97.4, 103.7, 107.0 mg. As can be seen from the results of calculating the amino acid score, the experimental cheeses (both low-fat and fatty ones) are not inferior to the control cheeses in terms of the balance of essential amino acids and have a high biological value. The limiting amino acids are methionine and cysteine, the rate of which for the studied cheeses was 34.7-50.3%.

Table 1

Essential amino acids	Mass fraction, g per 100 g			Chemical score	
	A	B	C	D	E
Isoleucine	4,0	4,27	4,15	106,6	103,6
Leucine	7,0	9,88	9,74	141,2	139,2
Methionine+	3,5	1,65	1,76	47,2	50,3
cystine	5,5	6,63	6,39	120,5 ,	176,2
Lysine	6,0	7,60	5,60	126,6	93,4
Phenylalanine + tyrosine	4,0	3,90	3,90	100,0	100,0
Threonine	5,0	5,25	4,84	105,1	100,0

A - "ideal" protein; B- fat-free soft cheese (experiment); B- fat-free soft cheese (control); C- fat-free soft cheese (experiment); D - fat-free soft cheese (control);

Table 2

Essential amino acids	Mass fraction, g per 100 g			Chemical score	
	A	B		A	B
Isoleucine	4,0	4,57	4,45	114,3	111,2
Leucine	7,0	10,37	10,6	148,2	152,8
Methionine+	3,5	1,66	1,21	47,5	34,7
cystine	5,5	6,86	7,05	124,7	128,1
Lysine	6,0	6,59	6,52	109,8	108,7

Phenylalanine tyrosine	+	4,0	4,15	4,17	103,9	104,3
Threonine		5,0	5,43	5,00	108,7	100,0

Conclusions. Thus, all studied samples of soft cheeses are rich in both quantitative and qualitative composition of amino acids. 17 amino acids were found in the composition of proteins of all types of cheeses. The lower content of both individual amino acids and their total amount in the experimental cheeses, compared to the control ones, is apparently due to the fact that the experimental cheeses have an increased mass fraction of moisture.

In the proteins of the studied samples of soft cheeses, all essential amino acids were found, the total amount of which in the proteins of the studied cheeses is 36.38 - 39.63% and their amount is almost the same in the experimental and control cheeses.

The results of studies of the composition and content of free amino acids also established a relative increase in free amino acids in the experimental fat-free and with mdzh. in dry matter 20% of soft cheeses compared with the control, which are respectively 128.3 and 135.5%. A different qualitative composition of free amino acids in experimental and control cheeses was also established. So, in the composition of experimental cheeses, both fat-free and with m.d.zh. fat in dry matter 20% is dominated by glutamic acid, glycine, alanine, valine and tyrosine.

The results of amino acid score calculations established a good balance of experimental cheeses (both low-fat and fatty) with essential amino acids and their high biological value.

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