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Physical and Chemical Composition of Soft Cheese

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Abstract: *The paper studies the physicochemical characteristics of soft cheeses obtained by thermoacid coagulation, which contributes to a significant increase in yield, a reduction in the duration of the technological process and an increase in the nutritional value of cheeses. The technological modes for improving the organoleptic characteristics of cheeses have been studied. As a result of a change in the modes of thermoacid coagulation, and the transition of cheese proteins to a more soluble state, due to the enrichment of the protein mass with soluble whey proteins and their hydrolysis products, the consistency of cheeses becomes soft, plastic.*

Keywords: *milk, whey, thermoacid coagulation, soft cheese, acidity, nitrogen-containing compounds.*

Introduction. In the production of soft cheeses, thermoacid coagulation is widely used, which contributes to a significant increase in yield, a reduction in the duration of the technological process and an increase in the nutritional value of cheeses. However, the expansion of the assortment and the increase in the production of low-fat and low-fat cheeses based on skim milk, buttermilk and whey produced by thermoacid coagulation are constrained by the deterioration of the consistency of the cheeses. In order to solve this problem, cheeses with thermal acid coagulation of milk proteins are obtained using various coagulating agents: a mixture of milk whey and fruit and berry juices, cheese whey fermented with Bulgarian bacillus culture and whey acidified with lactic acid, a solution of gluconic acid, curd whey with an acidity of 85 0T and others. [1, 2, 3]. To improve the quality, a number of cheeses are made with turmeric, replacing natural skim milk with reconstituted milk, increasing the dry matter content in raw materials, and others [4, 5, 6]. Along with these series, researchers have studied the physicochemical features of thermoacid coagulation of milk by the thermographic method, theoretically substantiated and investigated the regularities of the formation of cheeses with thermoacid coagulation of milk proteins [7, 8]. Based on the foregoing, the purpose of the work was to study the physicochemical composition of soft cheeses obtained using the new technology.

Materials and Methods. The following research methods were used in the work: titratable acidity according to GOST 3624-67; active acidity on the device pH 222; mass fraction of fat ***(m.f.f.)***according to GOST 5867-69; mass fraction of moisture and dry matter according to GOST 3626-73; mass fraction of sodium chloride in cheese according to GOST 3627-81; water-holding capacity according to the gravimetric version of the Grau-Hamm method modified by A.A. Alekseenko; water activity a_w at the installation for taking thermograms of drying; content of nitrogenous compounds by the Kjeldahl method. Repetition of analyzes 5 fold. The investigated products were obtained using a new technology with thermoacid coagulation of heat-treated milk proteins at 75 - 85 ° C. The experiments were carried out in a cheese-making pasteurizer model CP 35.02V.00.000 installed in the laboratory of the Samarkand Institute of Veterinary Medicine as follows. The initial raw materials (skim and normalized milk with a fat mass fraction of 1.1%), in order to maximize the extraction of milk proteins, were heat treated at a temperature of 95 ° C with an exposure time of 5 minutes. Control versions of soft cheeses were obtained using the same technology as the experimental ones, but with coagulation of milk proteins at the pasteurization

temperature. Curdled with acidic milk whey at 75 - 85 ° C for 5 min. After separation of the whey, self-pressing in molds for 60 minutes and salting with dry salt, the obtained protein mass was subjected to research.

Results and Discussion. To determine the influence of the adopted technological regimes on the physicochemical parameters of the composition, the experimental and control variants of fat-free and mass fraction of fat ***(m.f.f.)*** in dry matter of 20% soft cheeses were studied. Technological indicators of the production of low-fat cheeses and with a mass fraction of fat in dry matter of 20% in comparison with the control are shown in Table 1.

Table 1.

Indicators	Cheese			
	A	**B**	**C**	**D**
Pasteurization temperature, ^{0}C	95	95	95	95
Milk temperature before adding acid whey,^{0}C	75	95	85	95
Acid whey temperature, ^{0}C	35	35	35	35
Acidity of acidic whey,^{0}C	140	140	140	140
The amount of added whey, in% of the mass of milk	15,3	10	12,7	10
Duration of holding the mixture of milk with whey, min	5	5	5	5
Duration of self-pressing, min	60	60	60	60
Mass fraction of sodium chloride in cheese,%	2,0	2,0	2,0	2,0

A- *Fat-free cheese (experience);* ***B***- *Low-fat cheese (control);*

C- *Cheese with m.f.f. in dry matter 20% (experience);* ***D***- *Cheese with m.f.f. in dry matter 20% (control);*

As the research results show (Table 2), the use of thermoacid coagulation under the adopted regimes significantly changes the physicochemical characteristics of cheeses.

Table 2. Physicochemical indicators of soft cheeses

Index		Cheese name			
		A	**B**	**C**	**D**
Mass fraction, %	Dry matter	29,22	32,79	34,44	37,26
	Fat in dry matter			20,6	21,3
	Moisture	70,78±0,04	67,21±0,14	65,56±0,18	62,74±0,13
	Salt	2,0	2,0	2,0	2,0
Titratable acidity, ^{0}T		127±1,9	103±1,8	112±1,6	94,4±1,9
Active acidity, pH		5,90±0,01	6,09±0,01	6,00±0,01	6,10±0,01
Water activity, ед.		0,846	0,835	0,828	0,770
*WHA, %		67,11±3,10	72,20±2,50	58,22±2,61	62,41±4,02

**WHA - water-holding ability;*

At the same time, as a result of a decrease in the temperature of thermoacid coagulation of milk proteins, a_w humidity increased and the water-holding capacity of the experimental cheeses decreased compared to the control ones, which was caused by an increase in the structure of the cheeses of weakly bound moisture fractions. The active and titratable acidity of cheeses increased, but this increase was due to the use of increased doses of acidic milk whey.

The composition of nitrogen-containing compounds has noticeably changed (table 3). From the data obtained, it follows that as a result of a decrease in the temperature of thermoacid coagulation of milk proteins, the qualitative composition of nitrogenous compounds has changed. The content

of total soluble nitrogen has significantly increased, which occurs mainly due to protein soluble nitrogen. So, in experienced fat-free and with mdzh. in the dry matter of 20% cheeses, the content of soluble protein nitrogen was higher by 180.4 and 116.9%, respectively (if in the control cheeses this indicator is taken as 100%). Increasing the content of protein soluble nitrogen in fat-free and with mdzh. in dry matter, 20% of cheeses, apparently, is associated with a decrease in the coagulation temperature of milk proteins and an increase in the dose of added milk whey. At the same time, due to the enrichment of the protein mass with soluble whey proteins and products of their hydrolysis, the proteins of the cheeses pass into a more soluble state. The content of total nitrogen has slightly decreased due to the increase in the moisture content of the cheeses.

Table 3. Composition of nitrogen-containing compounds of soft cheeses

Cheese	Content of nitrogenous compounds						
	General, in grams (per 100 gr cheese)	Soluble		Protein-soluble		Non-protein soluble	
		In grams per 100 grams of cheese	In % Of the total	In grams per 100 grams of cheese	In % Of the total	In grams per 100 grams of cheese	In % Of the total
A	3,780±0,007	1,084±0,009	28,68	0,808±0,009	21,38	0,276±0,050	7,35
B	4,200±0,007	0,700±0,010	16,67	0,448±0,010	10,67	0,252±0,015	6,03
C	3,560±0,009	0,875±0,010	24,58	0,622±0,010	18,68	0,253±0,011	7,14
D	3,780±0,010	0,770±0,021	20,37	0,532±0,021	13,17	0,238±0,042	6,33

Changes in physicochemical parameters, the composition of nitrogenous compounds of cheeses have caused significant changes in their organoleptic characteristics. Experienced cheeses have a clean, fermented milk, with a pasteurized taste and a moderately salty taste and smell. As a result of changes in the modes of thermoacid coagulation, the consistency of cheeses has changed significantly: from hard, rubbery, it has become soft, plastic.

Conclusions. Thus, the use of thermoacid coagulation under the adopted regimes causes an increase in aw, humidity, active and titratable acidity and a decrease in the water-holding capacity of the test cheeses compared to the control ones. As a result of a decrease in the temperature of thermoacid coagulation of milk proteins, the qualitative composition of the nitrogenous compounds of cheeses has changed, which, due to the enrichment of the protein mass with soluble whey proteins and their hydrolysis products, turn into a more soluble state and the texture of the cheeses becomes soft, plastic.

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