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IMPROVEMENT OF THE TECHNOLOGY FOR THE PRODUCTION OF CREAM-SOAP

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Abstract: This article presents the results of a study based on the selection of optimal parameters of the technology for obtaining cream-perfume soaps by saponification of oil compositions obtained from unconventional oily raw materials. As a result of the research, oil compositions were saponified in alkaline solutions of various concentrations (20%; 40%; 60%), and 40% solution was selected as the optimal alkaline concentration. Also, the quality indicators of the cream-perfume soap samples obtained by us were compared with the physicochemical indicators of the currently available “Умка” cream-perfume soap. Also, the changes in the main physicochemical indicators of the obtained samples during 6 months of storage were analyzed.

Key words: cream-perfumed soap, organoleptic, physico-chemical, GOST, smell, color, shape, technology, "Умка", foaming, sample,

1. Introduction

Oil refining is recognized as one of the leading sectors of the food industry, with more than thirty large enterprises currently operating within our republic [1]. It is almost impossible to imagine modern life without the diverse range of products derived from this industry. These include numerous types of vegetable oils such as sunflower, mahogany, palm, cottonseed, soybean, and olive oils, as well as non-traditional oils extracted from grape and pomegranate seeds, vegetables, and legumes that are secondary products of other sectors of the food industry, particularly from enterprises engaged in the processing of grapes, fruits, and vegetables [2].

These types of oils are widely used in medicine, pharmaceuticals, cosmetics, and various branches of the food industry [3]. In traditional medicine, alternative oils have long been utilized for both preventive and therapeutic purposes. For example, grape seed, pomegranate, and cedar oils are known to strengthen the immune system, possess antibacterial and anti-inflammatory properties, improve blood circulation and metabolism in skin tissues, moisturize, nourish, enhance elasticity, and stimulate skin regeneration, thereby promoting overall skin health and vitality [4].

In the production of such products, it is more efficient to use blended oil compositions rather than a single type of vegetable oil [5]. In addition to studying the changes in their physicochemical properties during the formation of oil compositions, research has also been conducted to determine how the use of various oil blends affects the quality indicators of cream-perfumed soaps based on these compositions [5].

Egyptian scientist M.F. Ramadan and colleagues studied the optimal ratios of oil mixtures with high oxidation stability for application in the functional food industry [6]. They prepared oil blends by mixing sunflower oil with black cumin (Nigella sativa) and coriander (Coriandrum sativum) oils in various proportions. The research analyzed the antioxidant activity, oxidation mechanisms, and fatty acid composition of the oil blends and recommended the most suitable ratios for industrial application [6].

In a collaborative study by Egyptian researcher A.Y. Allam and Indian scientists, various oil compositions were developed by mixing palm and castor oils in different proportions [7]. The physicochemical parameters, including iodine value, peroxide value, viscosity, oxidation degree, refractive index, specific gravity, color, frying ability, and polymer content, as well as technological indicators, were determined. Blended oils that demonstrated optimal physicochemical and technological properties were recommended for industrial application in the production of functional food and cosmetic products [7].

In research conducted by Nigerian scientists O.F. Okemini et al., perfumed soaps were produced under laboratory conditions using coconut oil (Cocos nucifera L), melon seed oil (Cucumeropsis mannii), and their mixtures [8]. The physicochemical properties of each sample were studied in detail. The authors concluded that melon seed oil, obtained from secondary raw materials, is an effective and economical source for the formation of fatty acid compositions used in soap production [8].

At the Botswana International University of Science and Technology, T. Moatsela and colleagues developed oil compositions for perfumed soap production by recycling waste animal fats and vegetable oils collected from restaurants [9]. The proposed technology involved cleaning animal fats and used oils with a saline solution followed by treatment with hydrogen peroxide. The recycled fats and oils were then mixed with coconut oil in different ratios and used as raw materials for the manufacture of perfumed soaps, resulting in products with satisfactory physicochemical and sensory qualities suitable for commercial use [9].

In our research, oil compositions based on grape, pomegranate, and safflower oils with the predominance of palm oil were developed. The changes in their physicochemical parameters under various factors, particularly temperature, were investigated. As a result, three optimal compositions were identified for further research on their physicochemical and organoleptic characteristics [4, 5].

This paper presents the results of determining the optimal concentration of an alkaline solution in the production technology of cream-perfumed soaps based on the selected oil compositions. It also describes the physicochemical indicators and organoleptic properties of the final soap samples and analyzes the dynamics of quality changes during storage.

2. Materials and Methodology

2.1. Materials

Three oil compositions were used as the material for the study. These compositions were chosen as the most optimal in terms of physicochemical and organoleptic indicators based on the results of our previous studies. The oil content (%) in the composition of the selected oil compositions is presented in the table below.

Table 1

Blending oil compositions

№	Name of oils	Oil compositions		
		Comp-1	Comp-1	Comp-1
1	Palm oil	50 %	50 %	50 %

2	Grape seed oil	30 %	20 %	10 %
3	Pomegranate seed oil	10 %	20 %	30 %
4	Black seed oil,	10 %	10 %	10 %

2.2. Methodologies

2.2.1. Soap base production technology.

To obtain a cream-perfumed soap base based on non-traditional oily raw materials, we chose the technology of thermal soap making, using the following basic technological scheme of this technology. (Figure 1).

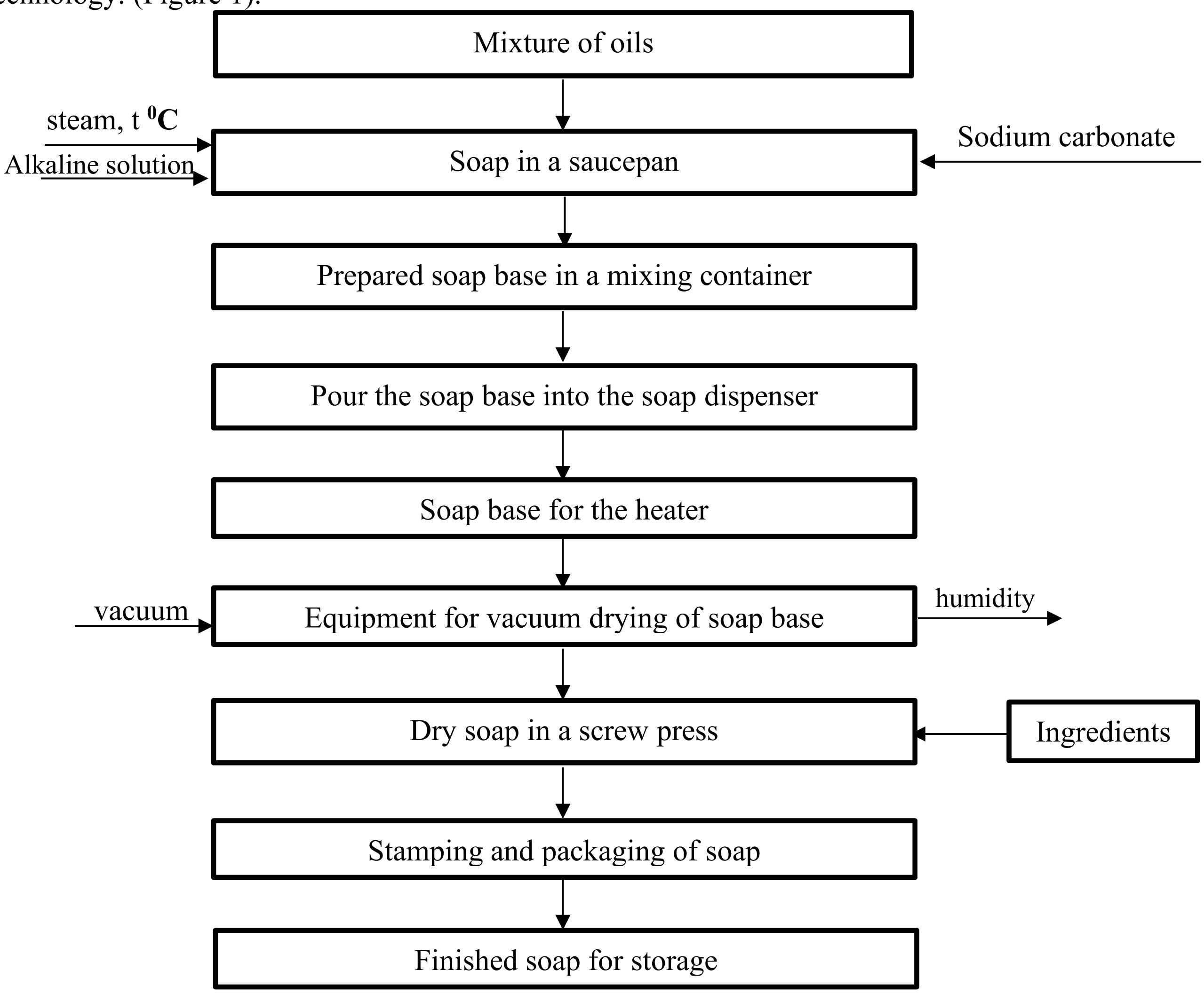

Figure 1. Basic technological scheme for obtaining a soap base

The above basic process flow diagram shows that the blended oil mixture is fed into the soap boiler in the process sequence with alkali (NaOH) and sodium carbonate solutions. The soap boiler is heated with steam (steam jacket), and the saponification process is carried out at a temperature of 100-120°C. The cream-perfumed soap base obtained in the soap boiler is first fed into the regulating tank, and then into the soap collector. The finished cream-perfumed soap base, pumped into the soap collector, after heating is fed to the vacuum packer for mechanical processing. In the vacuum dryer, moisture is removed from the cream-perfumed soap base, heated under vacuum, and the dried soap base enters the screw press, where the cream-perfumed soap is pressed with the addition of natural extracts for aroma and color. Pressed cream-perfumed soap is transferred to stamping and packaging equipment. Finished packaged soap with creamy fragrance is placed in the warehouse.

2.2.2. Determining the total alkali consumption for the saponification process. In the manufacture of cream-perfumed soap, the amount of alkali required to saponify the oil composition is determined by the saponification number of the oil. The saponification number is expressed in milligrams of alkali (KOH) consumed to saponify 1 g of oil. For an oil composition, the average saponification number (C_1) of the composition was found by multiplying the percentage of each oil in the mixture by the saponification number [8]. The saponification number of palm oil is 0.242 mgKOH/g, grape seed oil - 0.175 mgKOH/g, pomegranate seed oil - 0.191 mgKOH/g, and sedan oil - 0.151 mgKOH/g [5]. Alkali consumption is calculated using the following formula:

Alkali consumption= $\frac{C1*м}{1000}$; (гр)

where: C_1 = average saponification number, mgKOH/g;
m - mass of oil mixture, g;
1000 – 1 g = 1000 milligrams;

2.2.3. Organoleptic test. The assessment of the organoleptic characteristics of soap is somewhat subjective and is determined by sensory assessment using human olfaction and vision. Organoleptic tests of cream-scented soap were conducted according to the method of A. Rusdianto et al. [10].

2.2.4. Determination of soap *pH*. The pH value of the soap was determined using the methods developed by O.F. Okemini et al. [8]. 10 g of the soap obtained for the experiment was placed in a container and dissolved in distilled water, obtaining a 10% solution. The pH value of the soap solution was measured using a pH meter.

2.2.5. Determination of moisture and volatile matter content in soaps. Glass, pre-dried at 102–105°C for 30 minutes, was weighed on a glass scale. Then 5 g of the soap sample was measured out and placed in a glass. The glass was dried at 105°C for 30 minutes. After cooling the glass in a desiccator, it was weighed on a scale. The measurement result was recorded, and the glass with the soap sample was dried until the total weight reached a constant value. The experiment was repeated 3 times, drying was carried out for 15 minutes in each experiment [8,11].

The amount of moisture and volatile matter X (in %) was determined by the following formula:

$$X = (м_1 - м_2)\ 100/м\ ;\ (\%)$$

where: $м_1$ - is the mass of the glass beaker with soap before drying, g;
$м_2$ - is the mass of the glass beaker after drying with soap, g;
м - is the weight of the soap sample, g.

2.2.6. Determination of the titer index. The titer of soap is an index that determines the melting temperature, and according to international standards, the titer of solid perfumed soaps is set within the range of 35–41°C. The titer indices of cream-perfumed soap samples were determined using the method described in the international standard GOST 790-89 [11] “Methods for acceptance and determination of indices of solid household and perfumed soap”.

2.2.7. Determination of free alkali. The amount of free alkali in the sample was determined using the method of O.F. Okemini et al. [8]. From a sample of creamy-perfumed soap taken for the experiment, 5 g was collected in a beaker and dissolved by adding 30 ml of ethanol as a solvent. Several drops of phenolphthalein and 10 ml of a 20% $BaCl_2$ solution were added to the solution formed during the dissolution of the soap. The mixture was titrated with 0.05 M H_2SO_4. The amount of free alkali was determined using the following formula.

$NaOH = \frac{V_a}{W} \quad 0{,}31,$

where: x - is the mass fraction of fatty acid tannin in 100 g of soap, %;
м - is the actual mass of a bar of soap, g;

2.2.9. Determination of the initial foam volume. The initial foam volume, which determines the quality indicator of the three samples of cream-scented soaps taken for the study, was determined using the method given in the international standard GOST 790-89 [11].

2.2.10. Determination of foaming ability. The method used in the studies of O.F. Okemini et al. [8] was used to determine the foaming ability of cream-scented soap. During the experiment, 0.2 g of cream-perfumed soap was taken and placed in a 100 ml graduated cylinder, 10 ml of distilled water was added and the height of the mixture was recorded using a cylinder meter. The soap-water mixture in the cylinder was shaken for 2 minutes until soap foam was formed. After foaming, the cylinder was cooled for 10 minutes and the foam height of the cooled soap solution was recorded. The foaming ability of the cream-perfumed soap was calculated by the difference between the measured height of the solution and the foam height.

2.2.11. Determination of hand erosion. The degradation of the soap sample during hand washing was determined using the method proposed by M.E. Jinn et al. [12]. According to him, for the experiment, 5 grams of cream-perfumed soap sample was weighed on a balance and hand washed with warm water for 1 minute. The soap bar used for washing was left to dry for 24 hours at room temperature (24°C, 40% relative humidity), and then the final value was reweighed. The difference between the initial and final values determined the erosion index.

2.2.12. Methods of storing soap. Cream-perfumed soap is stored in accordance with the standards specified in the International Standard GOST 28546-2002 [13] "General specifications for solid perfumed soaps". According to the methodology, it was stored in a dry, closed, well-ventilated room, at a temperature of no lower than minus 5 °C and a relative humidity of no more than 75%.

3. Results and discussions

3.1. Development of the process flow chart.

Based on the outlined basic process flow chart, the following process flow chart was developed for obtaining a cream-perfumery soap base from mixed non-traditional oil compositions and its mechanical processing (Figure 2).

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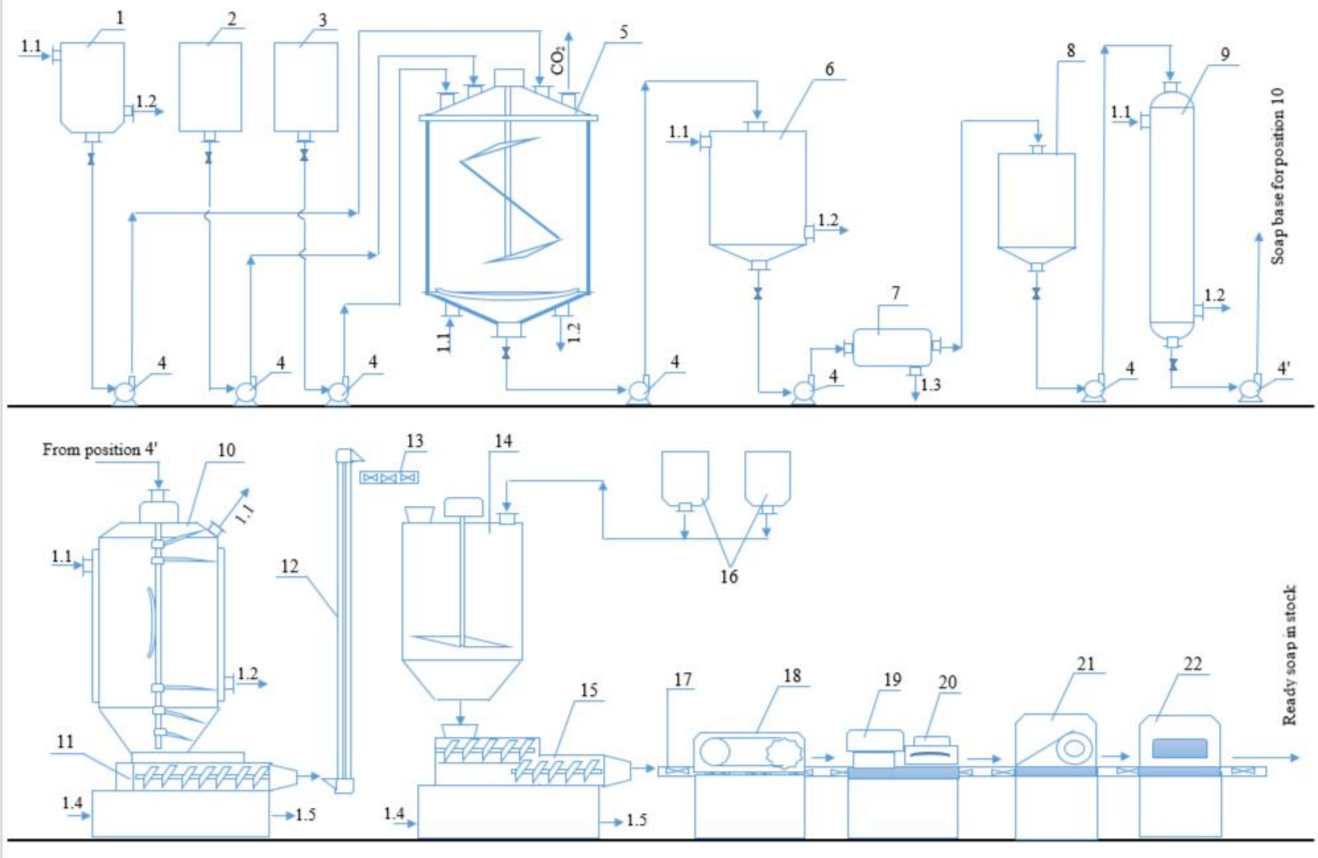

Figure 2. Flow chart of obtaining cream-perfumed soap base and its mechanical processing. 1 - container for oil mixture; 2 - container for alkaline solution; 3 - container for Na2CO3; 4 - centrifugal pump; 5 - soap pot; 6 - container for collecting soap base; 7 - filter; 8 - coordination capacity; 9 - heat exchanger; 10 - vacuum drying equipment; 11 - extruder; 12 - belt conveyor; 13 - screw; 14 - mixer; 15 - two-stage screw press; 16 - container for natural ingredients; 17 - belt conveyor; 18 - soap cutting equipment; 19 - soap stamping equipment; 20 - refrigerator; 21 - soap packaging equipment; 22 - equipment for gluing soap packages.
Note: 1.1 – water vapor; 1.2 – condensate; 1.3 – soap waste; 1.4 – cold water; 1.5 – sewer water.

Description of the process flow chart:
The oil mixture is pumped from the tank (1) to the soap boiler (5) through the centrifugal pump (CP) (4) in the required volume using a flow metering screw. The oil mixture is heated in the soap boiler while stirring to a temperature of 60-65 °C. The alkaline solution prepared in the tank (2) and the Na_2CO_3 solution from the tank (3) are added to the heated oil mixture in the soap boiler using screws, the required amount is passed through the CP (4) and mixed, and the saponification process is carried out. The temperature in the soap boiler is increased using steam. After the saponification process is completely completed, the resulting soap base is pumped by the CP (4) through the screw in the lower part of the equipment into the soap base collection tank (6). The mixture of excess gases formed during the saponification process is ejected from the upper part of the equipment. The soap base collected in the collecting tank is fed to the filter (7) by means of the CP (4), filtered, and the filtered soap base is fed to the coordination tank (8). To heat the soap base, it is transferred from the coordination tank (8) by means of the CP (4) to the heat exchange device (9) and heated to 140-145°C by means of steam. The heated soap base leaving the heat exchanger is transferred through the CP (4) to the vacuum dryer (10). In the

vacuum drying equipment, the soap base is sprayed onto the inner walls by means of a sprayer, and then the soap base is dried under the influence of temperature in vacuum conditions. To prevent the soap base from sticking to the walls of the equipment, it is cleaned by means of knives fixed on the shaft in the center. The moisture released under the influence of temperature is transferred to the cyclone from the upper part of the equipment. The dried soap base is fed from the bottom of the equipment into the primary screw extruder (11) for the production of soap bars. The resulting soap streams are transferred by means of a conveyor belt (12) to the screw (13) and fed from above to the mixer (14) for mixing the soap base. Natural ingredients that impart aroma and color to the soap are transferred from the container (16) to the mixing equipment. The soap bars and ingredients are mixed in the mixing equipment, and the resulting soap mass is fed into a two-stage screw press (15) for pressing, where the soap base is compacted, pressed and plasticized. The pressed soap mass enters the belt conveyor (17) and is fed to the soap cutting equipment (18) for cutting into identical sizes and producing soap bars. The resulting soap bars are transferred to the stamp press (19) and stamped to give them a square and round shape. The soap bars are cooled in a refrigeration unit with freon (20), which gives them shine and prevents them from sticking together. The stamped, cooled soap bars are packed in soap packaging equipment (21), the packed soap is placed in boxes, glued (22) and sent to finished product storage warehouses.

3.2 Effect of alkali concentration on the production of cream-scented soap. The change in the quality indicators of cream-scented soaps also depends on the concentration of the alkali epitome that reacts during saponification. In this study, each oil composition was saponified with alkali solutions of 20%, 40% and 60% concentration, and the effect of changing the alkali concentration on the quality indicators of soap was determined, and the results are presented in the table below. (Table 2).

Table 2

The influence of alkali concentration on the production of cream-perfumed soap

№	**Name of the indicators**	**Samples**	**Alkali concentration, %**		
			20 %	**40 %**	**60 %**
1	Lathering time, min.	Sample-1	90	40	28
		Sample-2	80	40	32
		Sample-3	80	40	38
2	Moisture content, %	Sample-1	25	14	10
		Sample-2	23	14	14
		Sample-3	18	12	8
3	Titer, °C	Sample-1	38,4	37,1	39,1
		Sample-2	38,8	37,2	38,5
		Sample-3	38,7	37,4	39,5
4	Amount of free alkali, %	Sample-1	0,075	0,115	0,29
		Sample-2	0,072	0,112	0,27
		Sample-3	0,073	0,113	0,24
5	Quality indicators (fatty acid content in 100 g of soap bar), g, not less than	Sample-1	65,1	78,2	78,6
		Sample-2	65,2	79,1	79,8
		Sample-3	65,6	78,4	78,6

As can be seen from the table, when the alkali concentration was changed by 20%, the saponification reaction time was 80-90 minutes, and when using 40% and 60% alkali solution concentrations, the reaction time decreased by 2.25-3.21 times and was 40 minutes and 28-38 minutes, respectively. Other parameters of the scented cream soap samples also changed,

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including humidity, titer, free alkali content, and quality indicators. When treating sample 1 with a 20% alkali solution, the humidity was 25%, and when treated with a 60% alkali solution, this indicator was 10%. In sample 3, it was found that the raw material humidity decreased from 18% to 8% depending on the alkali concentration. Only in sample 2 did the change in this indicator not change at concentrations of 40% and 60% and was 14%. Changing the alkali concentration has virtually no effect on the titer indicators of the samples. It was found that the amount of free alkali in the samples increases with increasing alkali concentration, with the arithmetic mean value ranging from 0.073% to 0.267%.

As is known, the qualitative and quantitative indicators of soaps are the indicators that determine the amount of saponified fatty acids, which also affects the change in other indicators. A low number of quality indicators leads to the fact that the saponification reaction did not go to completion, its duration is long, and the amount of free alkali is large. The qualitative numerical indicator of the studied samples was 65.3% in a 20% alkali solution, 78.57% and 79% in 40% and 60% concentration, respectively.

The results of the sample studies showed that in the production of cream-perfumed soaps, different ratios of oil compositions and changes in the concentration of alkali lead to changes in the quality indicators of the resulting cream-perfumed soaps. Continuing our studies, the physicochemical indicators of the developed composition of cream-perfumed soaps were compared with regulatory documents and samples of cream-perfumed soaps that are widely used at present.

3.3. Results of physicochemical parameters of samples of cream-scented soaps. The quality parameters of samples of perfumed cream soap: Sample-1, Sample-2 and Sample-3 were compared with hypoallergenic perfumed cream soap "Умка" for children, produced by LLC "Belaya Manufaktura", Nizhny Novgorod Region, Russian Federation, currently presented in the markets of Uzbekistan. The results of the study are presented in the table below.

Table 3

Physicochemical parameters of standard cream-scented soaps and samples

№	Indicator name	Standard according to GOST	Cream soap "Умка"	Creamy scented soap samples		
				Sample -1	Sample -2	Sample -3
1	Moisture content, %	10-15	13	12,8	13,4	11,2
2	Title, °C	35-41	36,2	38,4	37,1	40,2
3	Free alkali content, %, no more than	0,2	0,09	0,1	0,09	0,1
4	Quality number (fatty acid content in 100 g of soap), g, no less than	74	76,1	78,5	78,6	78,6
5	Foaming capacity, cm^3	-	3,67	3,5	3,8	3,1
6	Initial foam volume, cm^3, no less than	320	338	330	348	320
7	Erosion during hand washing, g	-	0,38	0,48	0,38	0,185
8	*pH*	7,8-8,5	8,5	8,8	8,1	10,4

The table shows that the humidity (13%), titer index (36.2°C), free alkali content (0.09%), quality number (76.1 g), initial foam volume (338 cm^3), *pH* level (8.5 *pH*) of the cream-perfumed soap "Умка" taken for comparison during the experiments correspond to the norms established by international standards.

Determining the moisture content of soap is important for assessing its shelf life, and high moisture content, in turn, reacts with unsaponifiable fatty acids, forming glycerols with free fatty acids. It was found that the average moisture content of the samples obtained during the experiments was 12.46%, which is close to the moisture content of Умка soap (13%). Also, given that the titer of soaps determines their melting point, according to the results of our studies, the titer of the first sample of cream-perfume soap was 38.4 °C, the second sample - 37.4°C, the third sample - 40.2°C. The analysis showed that these values the titer of Умка cream perfumed soap (36.2°C). In addition, it was found that the content of free alkali in the samples of cream-scented soap was 0.098%, and the quality number was 78.6 grams, and the compliance of these indicators with the values allowed in the requirements of the international standard was studied.

The foaming ability of soap is determined by the amount of foam formed by the soap solution with the help of surfactants and determines the quality of soap [17]. Comparison showed that the foaming ability of sample 1 was 3.5 cm, and sample 3 - 3.1 cm, which is lower than the foaming ability of Умка soap (3.61 cm), and the indicator of sample 2 is higher (3.8 cm). It was also determined that the initial foam volume in our samples was as follows: 330 cm^3, 348 cm^3, 320 cm^3. These values were relatively close to the value of the initial foam volume (338 cm^3) of the cream-perfumed soap Умка, with which they were compared.

The *pH* level of the cream-perfumed soaps taken for comparison in sample 1 (8.8) and sample 3 (10.4) was higher than the *pH* value of the cream-perfumed soap "Умка" (8.5), while the *pH* value of sample 2 (8.1) was lower. It is recommended that the pH level of hygienic soap used for human skin be no lower than 3-5 *pH* and no higher than 10-11 *pH* [14]. In addition, as can be seen from the above results, it can be noted that the erosion index values during hand washing for the three samples are 0.48 g, 0.38 g and 0.185 g for samples 1, 2 and 3, respectively. It turned out that the values of these samples are identical to the indicators of sample 2, which was compared with "Умка".

The results of the study showed that the physical and chemical indicators of Sample 2 among the samples of cream-perfumed soap correspond to a greater extent to the indicators of the other samples of the quality indicators of cream-perfumed soap "Умка", selected for comparison. One of the indicators that determine the marketability of any manufactured product and form the first impression of the product among buyers is the organoleptic indicators of the product. In the course of our research, the organoleptic indicators of the above-mentioned samples of soap with creamy fragrance were studied and compared with soap "Умка".

3.4. Organoleptic test. An evaluation test was conducted to determine the organoleptic parameters of the cream-scented soap samples obtained in our study. Twenty participants who voluntarily agreed to participate in the experiment and were not familiar with this field were selected. The organoleptic test included 5 parameters: color, odor, appearance, effervescence, and impression after use. When using cream-scented soap, participants rated the quality indicators on a 5-point scale, and the average score was determined using the ANOVA method [10]. The scores were: 1 (not at all liked), 2 (did not like), 3 (satisfactory), 4 (liked), 5 (really liked). The following figure shows the results of the organoleptic test. (Figure 3).

As can be seen from Figure 3 below, the results of the organoleptic test conducted on the samples of cream-perfumed soap had different values. When evaluating a product using an organoleptic test, the first impression is associated with its appearance, which affects the user's interest. According to the results of assessing the appearance of soaps with a creamy scent, among three samples, the score assigned to sample 2 (4.5) was higher than that of the other two samples (3.3; 3.5 points) and coincided with the score (4.5) of the control soap "Умка".

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Consumers always like perfumed soaps with a pleasant smell. The samples of creamy scented soaps were mixed with the same proportion of natural peppermint extract to ensure their aroma. The fact that fatty acids are mixed in different quantities is considered to be the factor that causes the different smells of the soaps. According to the test results, the first sample received the lowest rating (2.6 points), and the second and third samples received the highest rating (4.4; 4.2 points). The control soap with its unique aroma received a rating of 4.9.

Since the mint extract has a light green color, the cream-scented soap samples also looked close in color to the extract. The opinion of the survey participants showed that consumers prefer soaps of bright colors. Cream-perfumed soaps of the first and third samples showed a lower rating (3.4; 3.9), since they had a darker color, and soaps of sample 3 and the control sample had a specific color (4.6; 4.8 points).

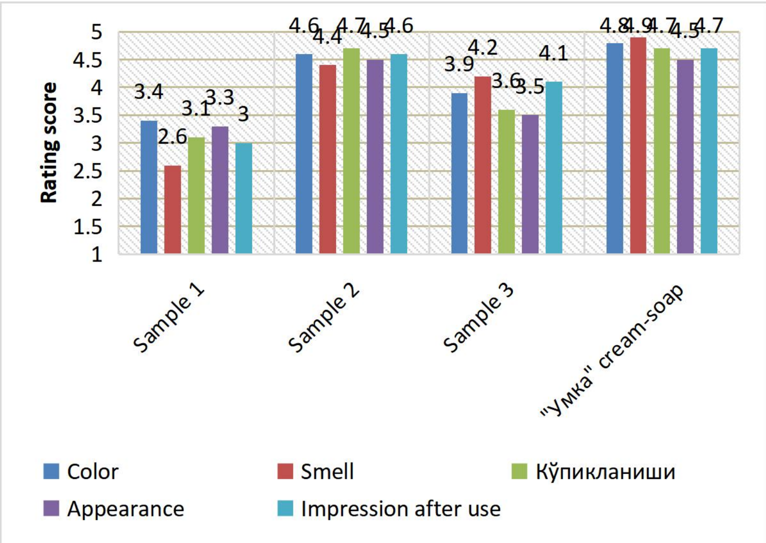

Figure 3. Results of the organoleptic test of soap samples with a creamy scent

Table 4

Changes in physical and chemical properties of soap samples during storage (over 6 months).

Expiry date (months)							
Parameters / Samples	**Present time**	**1**	**2**	**3**	**4**	**5**	**6**

	M.c %	Q.ng	M.c %	Q.ng	M.c %	Q.ng	M.c %	Q.ng	M.c %	Q.ng	M.c %	Q.ng	M.c %	Q.ng	E.F.H	Cons.	Foaming
Sample-1	13,0	78,5	13,0	78,5	12,7	78,7	12,7	78,5	12,5	78,6	12,1	78,6	11,7	78,8	0,41	soft	medium
Sample-2	13,5	78,6	13,5	78,6	13,2	78,8	13,1	78,9	12,1	79,1	12,1	79,1	12,4	79,1	0,3	medium	good
Sample-3	11,8	78,6	11,8	78,6	11,4	78,8	11,2	79,1	10,8	79,2	10,2	79,4	9,8	79,8	0,15	hard	medium

Explanation: M.c - moisture content; Q.n - quality number**; E.F.H –** erosion from handwashing**;** Cons **– consistency**

In this case, the foaming of the cream-scented soap was the same as that of the control sample (4.5 points), while the first and third samples showed a comparatively lower rating (3.1; 3.6 points). In addition, soap is considered a skin cleanser, and it is important to evaluate its benefits after use. If the amount of eccrine alkali in the soap is high, the negative impact on the skin will increase. According to the results of the organoleptic rating, the participants gave low ratings (3) to their impressions after using the first sample. The third sample scored more points than sample 1 (4.1 points), and the second and control samples of the cream-perfumed soap "Умка" showed the highest rating points (4.6; 4.7 points). According to the results of the organoleptic study, the rating points of sample 2 were close to the rating points of the perfumed cream soap "Умка", obtained for Narotar. An important factor is the change in the physicochemical properties of soap in the form of finished products during storage. Changes in the physicochemical and organoleptic properties of cream soap samples obtained during our research were analyzed during 6 months of storage.

3.5. Changes in physicochemical parameters during storage of samples at room temperature (for 6 months).

Samples of cream-perfumed soap were stored in a closed room with good air circulation and at room temperature with a relative air humidity of no more than 75% for 6 months. At the end of each month, the quality parameters of the samples were analyzed, and the results of the changes were recorded. The results obtained are presented in Table 4 above, and according to the results, it is clear that the average moisture content of the cream-scented soap samples (12.76%) decreased by an average of 1.1-2% compared to the initial value over 6 months of storage. This is due to the loss of natural moisture during soap storage. During the initial storage period (for 2 months), it was found that the moisture content of the cream-scented soap samples did not change, and from the 3rd month of storage, the moisture content decreased.

The change in the calculated numerical quality indicators, which is one of the main indicators of the quality of cream-scented soap, during the shelf life was also analyzed. The analysis showed that the quantitative indicators of the samples increased by 0.3-1.2 g compared to the initial average values (78.55 g). The main factor is that the quality of the soap increases during storage, and the free bases in this soap are saponified over time by the remaining free fatty acids.

In addition, the organoleptic properties (erosion, consistency and foaming during hand washing) of the cream-perfumed soap samples were studied, as well as the degree of their change after 6 months of storage. According to the results of the studies, it was found that the erosion (erosion) of sample 1 during a single wash of the lake was 0.41 g compared to the sample of 100 g soap, sample 2 - 0.3 g, and for sample 3 of cream soap this value was 0.15 g. The specific gravity of the cream-perfumed soap of the first sample is 0.41 g higher than that of the other samples, the soft consistency is the main factor that the oil mixture of this sample contains 30% grape seed oil, rich in unsaturated fatty acids. The hardness of the consistency indicator of the third sample is explained by the high titer of this sample (40.2 °C).

According to organoleptic indicators, the second sample had a medium consistency and good foaming. According to the results of the study, the second sample was chosen to be a sample of cream-perfumed soap that retained the best quality indicators after a 6-month shelf life.

4. Conclusion

Based on the results of the study, the following conclusions were made:

1. When obtaining samples of cream-perfumed soap, alkaline solutions of various concentrations (20%, 40% and 60%) were used to saponify oil mixtures. Based on the analysis of the quality indicators of the obtained cream-perfumed soaps, a 40% alkaline solution was chosen as the most optimal solution.
2. The physicochemical and organoleptic (humidity, free alkali content, quality number, pH, titer, washability during hand washing, initial foam volume) indicators of the soaps in the samples were compared with the standards specified in the GOST for Umka cream-perfumed toilet soap.
3. When analyzing the organoleptic properties of soaps, an organoleptic test was conducted on 5 parameters (smell, color, appearance, foaming, impression after use) and the average rating of the soap samples was determined on a rating scale from 1 to 5.
4. Samples of creamy scented soap were stored for 6 months in accordance with GOST requirements, and changes in the physicochemical properties of the soap were analyzed monthly during storage. The analysis results showed that after 6 months of storage, the moisture content of the soap samples decreased to (1.3-2%), the quality number increased to (0.3-1.2 g), KBE (0.15-0.41 g), the consistency was soft, medium and hard, foaming was good and average.
5. In general, of the 3 samples of cream-perfumed soap, the second sample of cream-perfumed soap was chosen as the most suitable for further research, since its physicochemical and organoleptic indicators were close to international standards (GOST) and the control soap "Умка, it received the highest rating among the participants based on the results of the organoleptic test and retained its quality indicators well after a 6-month shelf life.

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