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TECHNOLOGY FOR PRODUCING KURT FROM CAMEL MILK

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The article is devoted to the preparation of kurut, a national dairy product made from camel milk. A technology has been developed for using plant raw materials to enrich national dairy products with vitamins. Camel milk from Southern Kazakhstan and rose hips from Eastern Kazakhstan were selected as research objects, with rose hips used as plant raw materials added to the finished curd mass in dried, powdered form. This is because the vitamin content in dried fruits and berries is preserved for a long period of time. Rose hips are rich in vitamins and are especially valuable as a primary source of ascorbic acid, containing ten times more than apples. Ascorbic acid plays a key biochemical and physiological role in the human body; it contributes to the normal development of connective tissues, stress resistance and normal immune function, and protects against viral and bacterial infections. Three samples of cow' s milk and three samples of camel' s milk were taken for the study, as well as a control sample and samples of cottage cheese enriched with 3% and 5% rosehip powder, and an analysis of the vitamin C enrichment level was carried out. The physicochemical, organoleptic and energy indicators of cottage cheese with added dry rosehip powder were calculated. The sample with 5% rosehip powder, which showed the best results, was recognised as optimal. The article is devoted to the preparation of kurut, a national dairy product made from camel milk. A technology has been developed for using plant raw materials to enrich national dairy products with vitamins. Camel milk from Southern Kazakhstan and rose hips from Eastern Kazakhstan were selected as research objects, with rose hips used as plant raw materials added to the finished curd mass in dried form. The vitamin C content in 100 g of the product was determined to be 11,754 ± 0,24%, protein-60,1, fat-3,1, carbohydrates-18,2, energy value-341,1 kcal.

Keywords: cow' s milk, camel milk, national product, kurt, vitamin C, rose hips.

ТЕХНОЛОГИЯ ПРОИЗВОДСТВА КУРТА ИЗ ВЕРБЛЮЖЬЕГО МОЛОКА

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Статья посвящена приготовлению национального молочного продукта-курута из верблюжьего молока. Разработана технология использования растительного сырья для обогащения национальных молочных продуктов витаминами. В качестве объектов исследования были выбраны верблюжье молоко из Южного Казахстана и шиповник из Восточного Казахстана, причем шиповник, используемый в качестве растительного сырья, добавлялся в готовую творожную массу в сушеном, порошкообразном виде. Это связано с тем, что содержание витаминов в сушеных фруктах и ягодах сохраняется в течение длительного периода времени. Шиповник богат витаминами, особенно ценен как основной источник аскорбиновой кислоты, содержащей в десять раз больше, чем яблоко. Аскорбиновая кислота играет ключевую биохимическую и физиологическую роль в организме человека; она способствует нормальному развитию соединительных тканей, стрессоустойчивости и нормальной иммунной функции организма, а также защищает от вирусных и бактериальных инфекций. Для исследования были взяты три образца коровьего молока и три образца верблюжьего молока, а также контрольный образец и образцы творога, обогащенного 3% и 5% порошком шиповника, и был проведен анализ уровня обогащения витамином С. Были рассчитаны физико-химические, органолептические и энергетические показатели творога с добавлением сухого порошка шиповника. Образец с 5% порошком шиповника, который показал лучшие результаты, был

признан оптимальным. Содержание витамина С в 100 г продукта было определено как 11,754 ± 0,24%, белок-60,1, жир-3,1, углевод-18,2, энергетическая ценность-341,1 ккал.

Ключевые слова: коровье молоко, верблюжье молоко, национальный продукт, курт, витамин С, шиповник.

ТҮЙЕ СҮТІНЕН ҚҰРТ ӨНІМІН ДАЙЫНДАУ ТЕХНОЛОГИЯСЫ

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Мақала түйе сүтінен ұлттық сүт өнімін-құртты дайындауға арналған.Ұлттық сүт өнімдерін дәрумендермен байыту мақсатында өсімдік тектес шикізаттар қолданудың технологиясы әзірленді. Зерттеу нысандары ретінде Оңтүстік Қазақстанда өсірілген түйе сүті және өсімдік шикізаты ретінде Шығыс Қазақстанда өсірілген итмұрын таңдап алынып, дайын болғаны сүзбе массасына құрғақ және ұнтақталған күйінде қосылды. Өйткені құрғақ күйде кептірілген жеміс-жидектердегі дәрумендердің мөлшері ұзақ уақыт аралығында сақталады. Итмұрын дәрумендерге бай, соның ішінде ең бірінші аскорбин қышқылының көзі ретінде құндылығы өте жоғары, алма жемісімен салыстырғанда 10 есе көп болады. Аскорбин қышқылы адам ағзасында негізгі биохимиялық және физиологиялық рөл атқарады, ол дәнекер тіндердің қалыпты дамуына, стресске төзімділікке, дененің қалыпты иммундық жағдайын қалыптастыруға, вирустық және бактериялық инфекциядан қорғауға ықпал етеді. Зерттеу жүргізу үшін сиыр сүтінің үш үлгісі, түйе сүтінің үш үлгісі алынып, бақылау үлгісі және 3%, 5% итмұрын ұнтағы қосылған құрт үлгілерінің С дәруменімен байытылу дәрежесі зерттелді. Зерттеу нәтижесінде құрғақ ұнтақталған итмұрын қосылған құрттың физика-химиялық көрсеткіштері, органолептикалық көрсеткіштері және энергетикалық құндылығы есептелді. Жоғары нәтиже көрсеткен 5% итмұрын ұнтағы қосылған үлгі оңтайлы деп тынылды.100 гр өнімдегі С дәруменнің мөлшері 11,754±0,24%, ақуыз-60,1, май-3,1, көмірсу-18,2, энергетикалық құндылығы-341,1 ккал болатындығы анықталды.

Түйін сөздер: сиыр сүті, түйе сүті, ұлттық өнім, құрт, С дәрумені, итмұрын.

Introduction. Currently, the global dairy market is actively developing, and the assortment of manufactured products is expanding day by day. However, due to the economic situation and changes in the international environment, new approaches and methods that ensure the production of high-quality products in the dairy production and processing sector are still being considered. One quarter of Kazakhstan is characterized as flat steppe, another quarter as foothill regions, while half of the country is considered desert and semi-desert areas where camel breeding plays a special role. As of the end of 2024, the number of camels in Kazakhstan exceeded 159,111 thousand, and there is a need to regulate industrial processing of camel milk into export-oriented products. For Kazakhstan, in order to further develop the sector, one of the main tasks at present is the industrial processing and production of camel milk, which is currently considered at a low level. The production of camel milk, as well as the preparation and consumption of products such as cheese and yogurt from it, has been growing significantly in recent years [1].

Camel milk differs from the milk of other agricultural animals in its chemical composition, nutritional and medicinal properties. Camel milk contains three times more vitamin C and ten times more iron than cow’s milk, as well as unsaturated fatty acids, B vitamins, and mineral substances. The average chemical composition of camel milk dry matter is 8.2%, fats-3.5%, proteins-2.9% (including casein-2.5%), carbohydrates-4.7%. Camel milk is also a rich source of calcium, phosphorus, and fat-soluble vitamins [2].

Known for its immune-forming, anti-inflammatory, apoptotic, and antidiabetic

properties, camel milk is considered a naturally beneficial food. Due to its high content of β-casein and various secreted antibodies, it is easily digestible and, compared to cow's milk, is capable of resisting bacteria and viruses. The β-casein in camel milk does not cause allergies and is well absorbed, as it is sensitive to gastrointestinal hydrolysis; therefore, due to the high level of β-casein, camel milk is beneficial to human health [3].

Kazakh national dishes represent a traditional diet formed over many centuries. The daily diet of nomads is very beneficial to health and is distinguished by hospitality and generosity unique to the Kazakh people. Based on the main ingredients in their composition, Kazakh national dishes are divided into four groups: flour-based dishes, cereal-based dishes, meat dishes, and dairy dishes.

Kurt is one of the Kazakh national products. It is produced by fermenting cow's, sheep's, or goat's milk with pure lactic acid streptococcal cultures, separating the whey from the curd, and then drying it.

Normalized milk with a fat mass fraction of 0.6% is pasteurized at a temperature of 80-85°C for 10-20 minutes and cooled to 32-34°C, after which 5% starter culture is added and the acidity during fermentation is brought to 75-76°T. Then the curd is heated to 38-42°C and held for 20-30 minutes to accelerate whey separation, the whey is removed, and the curd with a moisture content of 76-80% is pressed for 3-5 hours. If salted kurt is prepared, the curd is salted before drying. Then the kurt is shaped into pieces weighing 20-60 g and dried in special drying chambers at a temperature of 35-40°C. In the finished product, the mass fraction of fat should be at least 12%, moisture content 17%, salt content not exceeding 2.5%, and acidity not exceeding 400°T. The shelf life of fatty kurt does not exceed 3 months, while that of non-fat kurt does not exceed 9 months.

The national product kurt is divided into three types:

- salted, dried curd, to which salt is added and then shaped into balls or cylindrical forms and dried;

- boiled, dried curd, which is boiled for 2-3 hours and then shaped into balls or cylindrical forms and dried;

- boiled paste-like mashed kurt intended for adding to soups [4].

Rosehip (*Rosa canina L.)* grows in all regions of the world, including Europe, Africa, Central and Western Asia, and Russia, due to its non-selective nature regarding climate and soil requirements. In Kazakhstan, 25 species of rosehip are found, four of which are endemic. Rosehip occurs in the Eastern Kazakh Uplands, Karatau, and Western Tien Shan regions. They are perennial plants belonging to the Rosaceae family. *Rosa* has many species and varieties. Their fruits, in addition to ascorbic acid, contain vitamins P, B1, B2, A, K, and E, sugars, tannins, pectins, organic acids, flavonoids, pigments, and salts of iron, manganese, phosphorus, magnesium, and calcium [5].

Ascorbic acid in rosehip exists in reduced and oxidized forms. After entering the body, it participates in enzymatic processes, stimulates metabolism, increases resistance to infections, and enhances work capacity. Another medicinal property of rosehip is its effect on the blood coagulation system [6].

Vitamin C, or ascorbic acid, is one of the vitamins that performs important functions in various chemical reactions of cellular metabolism. A deficiency of vitamin C can lead to scurvy.

In addition, vitamin C deficiency may lead to infections, obesity, cardiovascular diseases, diabetes mellitus, bone diseases, and skin diseases [7].

Materials and methods. The research objects were camel milk, cow's milk, dried and powdered rosehip, and the finished product kurt. Experimental research work was carried out in the workshop "Experimental production for dairy processing".

Camel milk (Kyzylorda), cow's milk, and kurt product were selected as research objects. Each milk sample (200 ml) was aseptically collected into sterile plastic bottles with screw caps and immediately delivered to the laboratory in a refrigerated bag at a temperature of 4°C.

For the purpose of vitamin C enrichment, plant

raw material rosehip was selected. This is because the daily vitamin C intake for adult's ranges from 65 to 139 mg per day.

Research methods: determination of physicochemical parameters of milk, methods for determining moisture content and dry matter (GOST 17626-81), methods for determining acidity (GOST 3626-73), determination of the mass fraction of vitamin C (GOST 30627.2-98), as well as calculation of the energy value of the kurt product. In the laboratory of S. Seifullin Kazakh Agrotechnical Research University, the moisture content and acidity of the finished product were determined. The vitamin C content in the finished product was studied in the laboratory of Almaty Technological University [8-10].

A tasting evaluation of the finished product was conducted. Ten tasters were invited for the tasting, and the organoleptic characteristics were evaluated. Six samples of the finished product were taken for the tasting.

Results and discussion. During the research, for the purpose of enrichment with vitamin C, formulations of the national fermented dairy product in six different variants (Table 1) and a technological scheme (Figure 1) were developed.

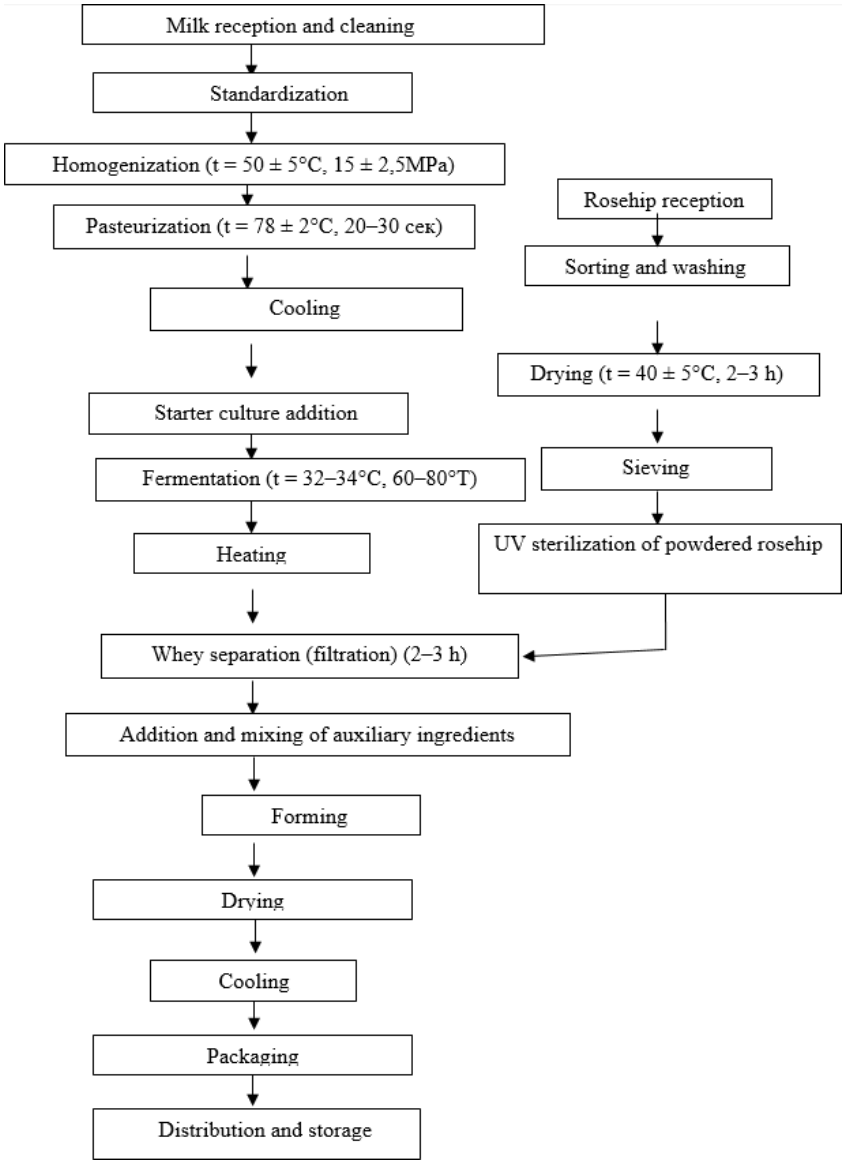


Fig.1 - Flow diagram of the production technology of kurt with the addition of dried powdered rosehip

Table 1 - Formulation of kurt with the addition of dried powdered rosehip (100 g)

Raw material name	Sample No.1	Sample No.2	Sample No.3	Sample No.4	Sample No.5	Sample No.6
Curd made from cow's milk	98	95	93	–	–	–
Curd made from camel milk	–	–	–	–	–	–
Dried powdered rosehip	–	3	5	98	95	93
Salt	2	2	2	2	3	5
Total	100	100	100	100	100	100

According to the organoleptic indicators, the best sample was selected depending on the level of vitamin C enrichment.

Figure 1 shows the technology of the national kurt product enriched with plant-based raw material rosehip.

Kurt should be stored at a temperature not exceeding 15°C and at a relative air humidity not exceeding 75%; fatty kurt should be stored for 1 month, and skimmed (defatted) kurt for 3 months. The physicochemical parameters of milk are presented in Table 2

Table 2 - Physicochemical parameters of milk

Parameters	Control sample (cow's milk)	Sample I (skimmed camel milk)
Acidity, °T	18	19
Fat, %	3,01	1,46
Dry matter, %	11,86	8,95
Solids-not-fat (SNF), %	10,41	8,85
Protein, %	3,33	3,30
Density, kg/m³	1031,28	1033,18

The evaluation of the organoleptic properties of kurt with the addition of dried powdered rosehip was carried out by assessing aroma, color, consistency, appearance, and taste. Table 3 presents the results of the tasting of the finished product, i.e., its organoleptic characteristics.

Table 3 - Organoleptic characteristics of kurt with the addition of dried powdered rosehip

Samples	Appearance and consistency	Taste and aroma	Color
Control sample (without additives)	Weight 2-60g, spherical. Irregular shapes, with grooves and rounded edges allowed. Hard and dry	Acidic and moderate	**Milky white**

Control sample (3% rosehip)	Weight 2-60g, spherical. Irregular shapes, with grooves and rounded edges allowed. Hard and dry	Acidic and moderate, slightly salty	**Yellowish**
Control sample (5% rosehip)	Weight 2-60g, spherical. Irregular shapes, with grooves and rounded edges allowed. Hard and dry	Acidic and moderate, slightly salty, rosehip taste not noticeable	**Light brown**
Kurt made from camel milk (without additives)	Weight 2-60g, spherical. Irregular shapes, with grooves and rounded edges allowed. Hard and dry	Acidic and moderate, slightly salty, rosehip taste weak	**White**
Kurt made from camel milk (3% rosehip)	Weight 2-60g, spherical. Irregular shapes, with grooves and rounded edges allowed. Hard and dry	Acidic and moderate, slightly salty	**Yellowish**
Kurt made from camel milk (5% dried rosehip)	Weight 2-60g, spherical. Irregular shapes, with grooves and rounded edges allowed. Hard and dry	Acidic and moderate, slightly salty, rosehip taste not noticeable	**Light brown**

The organoleptic properties were evaluated using a 5-point scale. In the overall score assessment, the kurt containing 5% dried powdered rosehip received the highest scores (4.9 and 4.89) (Figure 2). The control sample was rated 4,9 and 4,5 points for taste and aroma, while the kurt with 5% dried powdered rosehip received 4,7 and 4,7 points, respectively.

Based on organoleptic properties and vitamin C content, six samples were selected.

In 100 g of kurt with powdered rosehip, the fat content is 12,1 g, protein 53,2 g, carbohydrates 17,4 g, and its energy value is 391,3 kcal or 1637,2 kJ.

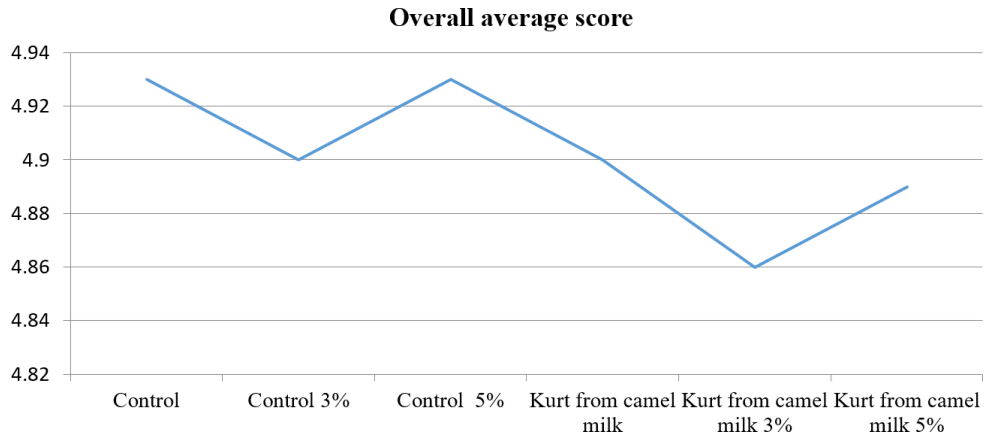


Fig.2 - Organoleptic score evaluation of kurt with the addition of dried powdered rosehip

Table 4 - Physicochemical parameters of kurt

Parameter	Control sample (without additives)	Control sample (5% rosehip)	Kurt from camel milk (5% rosehip)
Acidity, °T	320	330	350
Moisture content, %	15	17	17

In Table 4, the physicochemical parameters of the finished product were determined according to GOST 17626-81 and GOST 3626-73.

The content of vitamin C in 100 g of the finished product was determined using the colorimetric method according to GOST 30627.2-98 (Table 5).

Table 5 - Vitamin C content in 100 g of products

Sample	Vitamin C content, mg/100 g
Control sample (without additives)	1,13 ± 0,03
Control sample (5% rosehip)	8,125 ± 0,19
Kurt from camel milk (5% rosehip)	11,754 ± 0,24

Conclusion. Based on the results of the conducted research, the possibility of introducing dried powdered rosehip into production to preserve the quality of the finished product, enhance its nutritional value, and enrich it with vitamin C was studied. The technology for producing kurt with dried and powdered rosehip was developed. The physicochemical parameters of the kurt product were determined according to GOST 17626-81 and GOST 3626-73. The organoleptic characteristics, nutritional, and energy values of the finished product were evaluated. Based on the research results, the proposed national kurt product enriched with vitamin C can be considered a natural product recommended for general consumption.

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