

УДК 637.146 (571.52)

## TO THE QUESTION ON THE TECHNOLOGY OF KOUMISS PRODUCTION

### К ВОПРОСУ ПО ТЕХНОЛОГИИ ПРОИЗВОДСТВА КУМЫСА

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*Abstract.* This article is devoted to the analysis of methods of production of koumiss. Koumiss, unlike kefir, has a more delicate, soft and gentle sour-milk taste, and aroma has tender flakes of casein. The ways of making koumiss are described. An accelerated, easier method of preparing koumiss without maturation and without prolonged mixing is known. However, this method was not widely used.

The article describes that the technological regimes for the preparation of koumiss are controlled only organoleptically. The general techniques in the technology of making koumiss are revealed: the long-term fermentation method and the method of short-term fermentation. The article shows the technology of koumiss production. The inventions of koumiss preparation are considered.

It is concluded that there is a need for physicochemical studies of koumiss production and the establishment of its optimal regimes for Kazakhstan.

*Аннотация.* Данная статья посвящена анализу способов производства кумыса. Кумыс в отличие от кефира обладает более тонким, мягким и нежным кисломолочным вкусом, и ароматом, имеет нежные хлопья казеина. Описаны способы приготовления кумыса. Известен ускоренный, более легкий метод приготовления кумыса без созревания и без длительного вымешивания. Однако этот метод не получил широкого распространения.

В статье описано, что технологические режимы приготовления кумыса контролируются только органолептически. Выявлены общие приемы в технологии изготовления кумыса: метод длительного сбраживания и метод кратковременного сбраживания. В статье приведена технология приготовления кумыса. Рассмотрены изобретения приготовления кумыса.

Сделан вывод о необходимости физико-химических исследований производства кумыса и установления оптимальных его режимов для Казахстана.

*Keywords:* dairy product, food, production, technology, food industry.

*Ключевые слова:* молочный продукт, питание, производство, технология, пищевая промышленность.

### *Introduction*

Recently, the sector of milk, koumiss, and other fermented milk products has become one of the most significant in the food market. At the same time, there are significant differences in its formation in different regions of Kazakhstan. In recent years, the release of koumiss in Kazakhstan has been growing. Growth in output requires manufacturers to expand sales, increase shelf life, improve the quality of packaging and reduce its weight. It is established that this product contains over one hundred of the most valuable components. It includes all the substances necessary for the life of the body: proteins, fats, carbohydrates, mineral salts, vitamins. These components of koumiss are well balanced, due to which they are easily and completely absorbed [1].

Koumiss, is a dairy beverage, has its own characteristics, a product of mixed alcohol–lactic fermentation of mare’s milk. As a result of decomposition of milk sugar, up to 3.5% of ethyl alcohol, about 1% of lactic acid, and also a significant amount of carbon dioxide, volatile acids, aromatic substances, enzymes, etc. are accumulated in it. The starter for product consists of lactic streptococci, rods, yeast.

In connection with the foregoing, the current direction of research is the development of recipes, the improvement of technology and the study of consumer properties of koumiss functional purpose.

The purpose of the study is to analyze the technology of production of koumiss, derived from mare’s milk.

The research methods are the study and analysis of technical literature, the review of patents, the identification of positive and negative points in traditional production technology.

### *The production technology*

In Kazakhstan, particularly popular folk method of preparation of koumiss. For future use starter — kor is prepared: a mature koumiss for few days left in the vessel, in order to divide it into 2 layers — the upper liquid, transparent and lower thick, cheesy. The top layer is drained, the bottom is filtered through cheesecloth and dried in the sun. Dry yeast — kor is put into the vessel with lid and stored in a cool place until next season. Before use, kor has to be ground to powder, poured in fresh mare’s milk 3–4 tablespoons to 5 litres of milk and mixed [2].

The mixture is left for a day in a warm place, stirring occasionally. Prepared starter is used only once for getting the 1st batch of mare’s milk: the following is a starter of new mature mare [2].

Then, saba bag is made of leather an adult well–fed horses with a capacity of 100–150 liters; leather, previously shaved off her hair, stand in a strong solution of table salt, pull out and smoke on the smoke of the twig or birch and sew a bag of it. Ready Saba is only used for 1 season. To cook koumiss, 1/4-half of its volume is poured with fresh milk and starter and left for a night [2].

The next morning add a portion of fresh milk to it, mix thoroughly. After 10 to 15 hours, fresh milk is added to the full volume of the saba, thoroughly mixed. In a day koumiss is ready for consumption. The more they mix, the more delicious koumiss. Once in 10–15 days, saba is freed from koumiss, thoroughly washed with water, dried, rinsed with cow’s milk and smoked. Saba is again ready for use [2].

The technology of cooking koumiss came to us from handicraftsmen of koumiss.

Scientist Voytkevich A. F. first attempted a scientific justification of koumiss making. He introduced the first objective criterion in the production of koumiss in the form of taking into account the acidity for mixing starter with milk. Having established that coagulation of casein occurs at acidity of 45–50 Turner degrees (°T), Voitkevich A. F. believed, that the duration of the mixing should be only 5–10 minutes, since the role of mixing, in his opinion, consists in a uniform distribution of acidity in the whole mixture mass and breaking clots of casein at the time of gel formation, which is completely achieved with 10 minutes of mixing. The temperature of the mixture equals 30–32 °C. Then the fresh koumiss, with an acidity of at least 50 °T is bottled, sealed and left at room temperature for 20–30 minutes and stand on to the cooler chamber to accelerate the formation of gas [3].

Thus, he proposed an accelerated, easier method of preparing koumiss without maturation, without prolonged mixing.

However, this method is not widespread, as koumiss did not possess a completely specific taste and had a liquid consistency.

With the conclusions of Voitkevich A. F. data of the majority of researchers (Zhilin M. G., Zimnitskaya N. F., Daldina I. N., Sigrist A. I. and Bogdanov I. F. and others) do not correlate on the role of maturation and mixing in the production of koumiss [3].

Almost everywhere where koumiss is produced, an empirical method is used with maturation in various variants. It lies in the fact that after mixing starter culture with milk, the mixture is left at 25–27° for maturation for several hours during which mixture is periodically mixed at intervals (from 1/4 to 1.5 hours). During the ripening period, the mixture is rejuvenated with freshly milked raw as many times as the mares do [3].

Alternatively, the mixture is allowed to stand still for 2–3 hours, then it is shaken for a long time and vigorously by whorl from 1 to 3 hours. After that the koumiss is bottled, clogged, kept at room temperature for a while and carried to the cooler chamber [3].

But the principle of the second variant of maturation was prepared by koumiss researcher Zimnitskaya N. F. This method consist of following steps: production starter, prepared on pure cultures of lactic acid rods and yeast, after the maturation, which lasts 10–12 hours at a temperature of 25–26°, is carried to the cold, where it is cooled to 6–8° [3].

In preparation of koumiss, a cooled starter with an acidity of about 140–150° T is added to the new or warmed to 31–35° mare's milk in such a quantity that fermented milk had an acidity of 45 °T and a temperature of 25–26° [3].

During the infusion of starter to warm milk, the mixture is continuously mixed for 15–20 minutes [3].

After fermentation, the mixture is stirring for the first hour 3–4 times for 1–2 minutes and then left in a forage for ripening. When the acidity of the mixture reaches 50–55 °T and tastes like it approaches the taste of koumiss (which takes 2–3 hours), the mixture is re-kneaded for 30–60 minutes [3].

At the end of the koumiss blending, it is bottled, sealed with a cork stopper and left for a while in a workshop for carbonation. The duration of aerating depends on the room temperature and acidity of the cooked koumiss (approximately 20–30 minutes) [3].

Researcher Khaldina M. F., in order to identify the best method, conducted a study of koumisses prepared in various ways (with maturation and without maturation, with prolonged mixing and 10 minutes of kneading). Koumiss was made from the same initial products (starter and milk) [3].

These data show that during ripening alcoholic fermentation is stimulated, as a result of which more alcohol and substances, which determine the taste and aroma, are formed in koumiss. In koumiss, without maturation, the most active is lactic fermentation.

Stirring, according to Khaldina M. F., grinds the suspended proteinaceous particles, as a result, koumiss becomes much thicker [3].

Koumiss, cooked with maturation (2–3 hours) and long (30–60 minutes) stirring had a pronounced taste and aroma, a thicker consistency and received a higher rating than koumiss, prepared without maturing with 10 minutes of stirring [3].

Researcher Gritsenko T. T. conducted expeditionary survey of koumiss making Bashkortostan region, in order to study the currently existing methods of making koumiss on natural starter. Bashkortostan is still the center of koumiss therapy in the country. Gritsenko's data showed that, despite the high value of the product, koumiss products are carried out with very primitive methods not only on collective farms, but also in sanatoriums where koumiss is one of the factors in the treatment of patients [4].

Masters mostly are unfamiliar with the basics of dairy and microbiology. The technological regime is controlled only organoleptically. All this leads to frequent spoilage of the production starter and the arrest of taste and dietary properties of koumiss [4].

Of the many methods Gritsenko T. T. general techniques were identified in the technology of koumiss making, on the basis of which all methods were combined into two: the method of prolonged fermentation, which was used mainly in collective and state farms and the method of short-term fermentation used in koumiss camps [4].

The first method is the method of prolonged fermentation of the koumiss mixture at a temperature of 26–28° for 7–12 hours or more, with periodic, every 2–3 hours, refreshment of the mixture with fresh milk and subsequent fermentation of this mixture at a temperature of 18–22 °C for 8–10 hours. Koumiss, obtained by this method, has a characteristic tart koumiss flavor and smell. Its total acidity is 130–160 °T, and the constant is 125–145 °T. Alcohol is contained up to 2% [4].

The second method is the method of short-term fermentation of koumiss mixture with a high initial acidity (65–70 °T) at a temperature of 26–28° for 1–1.5 hours with single fermentation of milk and 40 minutes mixing, bottling and subsequent fermentation of mixture at temperature of 10–12 ° for 17–24 hours or more. Koumiss, obtained by the method of short-term fermentation, is more carbonated. The value of the total titratable acidity, equal to 140 °T is created not only by lactic acid, but also by the carbonic acid formed during alcoholic fermentation. The constant acidity is 70–110 °T, the alcohol content is 1.5–1.8% [4].

Table.

#### TECHNOLOGY OF KOUMISS PRODUCTION

<i>Production stage name</i>	<i>Technological characteristics</i>
Milk reception and quality assessment	Acidity no higher than 7 °T, t=26–28 °C
Filtration	
Pasteurization	t=74–76 °C T=20–30 sec;
Stirring	T=20 min
Fermentation	t=28±2 °C T=10±0,5 ч, 50–60 °T
Mixing	T=40–60 min
Cooling	t=6–8 °C
Filling, packaging, marking and maturing	T=from 12 hours to 3 days t=8–10 °C
Storage and transport	from 0 to 4 °C
Finished product	Acidity no higher than 80 °T, Mass fraction of fat no less than 1,0 Mass fraction of protein no less than 2,0 Temperature at release from facility 4±2 °C

The second method is more acceptable in conditions of large-scale production of koumiss, as it provides a rapid release of containers for fermenting new batches of milk and allows obtain koumiss with lower acidity [4].

Mare's milk and starter are taken by the quantity and quality established by requirements of the technochemical control, if necessary, cooled or heated to 26–28 °C. Heated starter is produced in a container for fermenting milk by passing water between the wall space with temperature of no higher than 45 °C with an agitator turned on [5].

Milk after preparation is fermented in long-lasting pasteurization baths at a temperature of 26–28 °C. The production starter is injected in such amount that the acidity of the mixture is 50–60 °T [5].

After starter entered into milk, immediately begin to mix, which continues for 20 minutes and with velocity of stirrer rotation 430–480 rpm [5].

The koumiss mixture, which was mixed for 20 min, is left in the same capacity for ripening for 1.5–2 hours to increase acidity to 68–72 °T [5].

When milk enters koumiss shop after each milking with an interval of 2.5 hours, milk is added to the original mixture, ripe to 68–72 °T. The acidity of the mixture is lowered at the same time, but no lower than 55 °T and is accompanied every time by a 20-minute stirring [5].

Fermentation temperature is set within 26–28 °C. Koumiss ripened to 68–72 °T is re-stirred for 40–60 minutes [5].

15–20 minutes before the blending ends in the interstitial space of long-lasting pasteurization bath, tap water is passed, cooling koumiss to 17 °C [5].

Filling, capping and marking is carried out in accordance with the requirements of the current standard for this product. Containers and packaging materials used for packing natural koumiss must comply with current standards [5].

After bottling and packing koumiss is cooled in a refrigerating compartment at a temperature of no more than 4 °C with 72 hours storage and no more than 2 °C at 120 hours storage, after which the technological process is finished and koumiss is ready for sale. At the same time, carbonation takes place, further maturation and storage of koumiss in hermetically sealed bottles. Koumiss is sold in a daily maturity with a temperature of no more than  $4 \pm 2$  °C [5].

At the moment there are many inventions that relate to the production of koumiss, the improvement of its production technology, organoleptic properties, etc.

The invention relates to the dairy industry and is intended for preparation of koumiss Bayanai from frozen mare's milk according to TC 9222-033-00670203-2011 by starter fermenting containing strains of lactic acid bacteria *L. acidophilus* SEAR-09, *L. acidophilus* SEAC-65, obtained from Yakut national product Tar. The method includes mare's milk thawing, pasteurization, cooling to the fermentation temperature, souring, fermentation at a temperature of 32 °C for 7–12 hours to an acidity of 60–120 °T, stirring every 3–4 hours for 10–15 minutes, cooling, kneading and bottling. The invention makes it possible to improve the quality and biological value of koumiss [6].

The invention relates to the dairy industry and is intended for preparation of koumiss Yakut according to TC 9222-017-00670203-2005. The method provides for use as a milk base of a mixture containing 60% mare's milk, 30% normalized to 1.0% whole cow milk, boiled water at room temperature in an amount of 10–15% of whole cow milk, depending on the content of casein in it. Pouring into pasteurized chilled milk and fermentation. The amount of starter is 10% of the milk base. The invention allows to increase the quality and biological value of koumiss while reducing its cost [7].

The invention relates to the dairy industry for the production of koumiss, which includes injection of koumiss into the mare's milk according to TC 9345-014-00840203-2002, mixing,



maturing, self-brewing, bottling, capping and dosing at a temperature of 4–6 °C, but usually mare's milk is used fresh; with constant mixing, it is poured into the starter with acidity of 120 °T in ratio of 1:3 at a temperature of 28–30 °C, maturation of the obtained mixture is performed until acidity is 60–70 °T and milk of next milking is added with further stirring for 1 hour, then held for 2 hours, capping is performed by crown plug, as a starter, the daily portion of koumiss in the active phase of fermentation [8].

### Conclusion

In conclusion of the article devoted to the issue of koumiss production should be said that despite more than 100 years of koumiss fame as a remedy, there is still no scientifically based technology for its production.

Existing in most sanatoriums and resorts methods of production of koumiss exclude the possibility of obtaining a standard drink in terms of chemical composition, organoleptic and medicinal properties.

This is primarily due to the fact that the composition of the microflora used by natural starter cultures is random. In addition, various methods of production of koumiss are selected empirically and scientifically not substantiated.

Most of the masters are unfamiliar with the basics of dairy and microbiology. The technological regime is controlled only organoleptically. All this leads to frequent spoilage of the production starter and a decrease in the taste and dietary properties of koumiss.

In this regard, physical and chemical research and establishment of modes of production of koumiss, has not only theoretical, but also practical significance for Kazakhstan. These questions are almost not covered in the literature.

### Reference:

1. Lazarev, D. (2002). Kumysodeliye (Koumiss making). *Konevodstvo i konnyi sport*, (1), 44
2. Kenzheakhmetuly, S. (2010). *Natsionalnaya kazakhskaya kuhnya* (National kazakh cuisine). Almaty, Almatykitap, 240
3. Skorodumova, A. M. (1961). *Diyeticheskiye i lechebnye kislomolochnye produkty (microbiologicheskiye osnovy)* (Dietary and therapeutic dairy products (microbiological basis)). Leningrad, Medgiz, 240
4. Gritsenko, T. T. (1964). *Vliyaniye mikroflory na sodержaniye vitaminov gruppy B v kumyse* (Influence of microflora on the content of vitamins of group B in koumiss): diss. ... CSc. Moscow, 235
5. Akhatova, I. S. (2004). *Molochnoye konevodstvo: plemennaya rabota, tehnologiya proizvodstva i pererabotky kobyliego moloka* (Dairy horse breeding: breeding work, technology of production and processing of mare's milk.). Ufa, Gilem, 323
6. Abramov A. F., Pavlova A. N. *Sposob prigotovleniya kumysa "Bayanai"*. Patent na izobretenie RUS 2503241 16.04.2012.
7. Ammosova T. V., Stepanov K. M., Abramov A. F. *Sposob prigotovleniya kumysa "Yakutskii"*. Patent na izobretenie RUS 2289932 29.03.2005.
8. Zinnatullin R. Kh., Sergeeva Yu. I. *Sposob proizvodstva kumysa*. Patent na izobretenie RUS 2355174 29.05.2007.

### Список литературы:

1. Лазарев Д. Кумысоделие // Коневодство и конный спорт. 2002. №1. С. 44.
2. Кенжеахметулы С. Национальная казахская кухня. Алматы: Алматыкитап, 2010. 240 с.

3. Скородумова А. М. Диетические и лечебные кисломолочные продукты (микробиологические основы). Л.: Медгиз, 1961. 204 с.
4. Гриценко Т. В. Влияние микрофлоры на содержание витамина группы В в кумысе: дисс. ... канд. биол. наук. М., 1964. 235 с.
5. Ахатова И. С. Молочное коневодство: племенная работа, технология производства и переработка кобыльего молока. Уфа: Гилем, 2004. 323 с.
6. Абрамов А. Ф., Павлова А. Н. Способ приготовления кумыса «Баянай». Патент на изобретение RUS 2503241 16.04.2012.
7. Аммосова Т. В., Степанов К. М., Абрамов А. Ф. Способ приготовления кумыса «Якутский». Патент на изобретение RUS 2289932 29.03.2005.
8. Зиннатуллин Р. Х., Сергеева Ю. И. Способ производства кумыса. Патент на изобретение RUS 2355174 29.05.2007.

*Работа поступила  
в редакцию 24.09.2017 г.*

*Принята к публикации  
26.09.2017 г.*

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*Ссылка для цитирования:*

Alexeyeva N., Mineyev E. To the question on the technology of koumiss production // Бюллетень науки и практики. Электрон. журн. 2017. №10 (23). С. 138-144. Режим доступа: <http://www.bulletennauki.com/alexeyeva> (дата обращения 15.10.2017).

*Cite as (APA):*

Alexeyeva, N., & Mineyev, E. (2017). To the question on the technology of koumiss production. *Bulletin of Science and Practice*, (10), 138-144