



## The Oldest Fermented Turkish Beverage in Traditional Turkish Cuisine: Koumiss (Kımız)

\*Gülşen BAYAT<sup>a</sup> 

<sup>a</sup> Iğdır University, Faculty of Tourism, Department of Gastronomy and Culinary Arts, Iğdır/Turkey

### Article History

Received: 23.02.2020

Accepted: 25.05.2020

### Keywords

Koumiss

History

Traditional

Fermentation

Health

### Abstract

Fermented foods and beverages have a significant place in human diet in different parts of the world. These products not only supply valuable sources of nutrients but also have big capacity to maintain health and prevent diseases. Various kinds of traditional fermented foods and beverages are made at homes in Anatolia beside the commercial production. Fermented beverages include fermented milks such as yoghurt, kefir, koumiss, and non-alcoholic beverage such as boza. That's the fact that there are some differences to prepare traditional foods and beverages from region to region. Koumiss (kımız), a traditional Turkish drink, is very famous and popular in Turkish history. In some regions, it is called as "Kumuz", while it is known as "Turkistan Boza" among the Anatolian Turks. In the stories of the famous Dede Korkut in Turkish History, the name of koumiss is mentioned frequently. It's a long-lasting drink. It has been consumed by nomadic Turks both for the purpose of health and thirst. It is produced from mare's milk and its taste can be described as sour buttermilk drink. The focus of this study is to give a small review about the characteristics, history, production, nutritional properties and health benefits of koumiss.

### Article Type

Research Article

\* Corresponding Author

E-mail: gulshen.bayat@igdir.edu.tr (G. Bayat)

DOI: 10.21325/jotags.2020.581

## INTRODUCTION

Fermented products are produced by converting raw materials to more durable and robust food with the contribution of different microorganisms at a suitable temperature (Yücel & Köse, 2002). The nutritional value, functional and digestible properties of fermented foods are superior as compared to the non-fermented products (Hancioğlu & Karapınar, 1998; Bayat & Yıldız, 2019). Kımız known as koumiss is a fermented dairy drink commonly produced from mare milk via fermentation, originated from the nomadic tribes of Central Asia. Even though it is a valuable beverage especially for Turkish, Bulgar, and Mongol people, it is also significant for the Kazakhs, Kyrgyz, Mongols, Uygurs, and Yakuts (Wang et al., 2008). The name of “koumiss” is mentioned in *Divanü Lugat-it Türk* and it is also in Turkish dialects today. In addition, “sour apple” has been used for “koumiss” (Kaşgarlı Mahmud, 1992) which explains why “koumiss” connotes sourness when thinking the meaning of “sour”. Koumiss is a long-lasting drink. Therefore, it has been consumed by nomadic Turks both for thirst and health. There are two types of koumiss: White and Black Koumiss. White koumiss contains less alcohol than nuts such as tangerines and oranges. When the white koumiss is kept for a few months, the alcohol content increases and it becomes an alcoholic and delicious drink called as black koumiss. Kımız is moderately alcoholic and has a acidic aroma. Kımız is identical to kefir, however is made from the fluid starter, in contrary to hard *kefir* “grains” (Danova et al., 2005).

Kaşgarlı Mahmut defines the koumiss as “soured mare's milk”. He described it in the *Divan*: “Koumiss is an old fermented dairy product which has a low alcohol content, sour taste and soda flavor, obtained by fermenting mare's milk. It smells like sour buttermilk or sour cheese. When it's shaken, there are foams”. Sour milk is made with yeast. As in cheese yeast, The Turks call koumiss yeast as “cor” as in cheese yeast. Cor is the dense residual of remaining finished koumiss at the bottom of the container. The mare's milk is poured over this smeared residue and the milk is soured, or rather fermented. However, the mare milk mixed with yeast is not immediately used right away, it should be shaken. Even in some location of the earth where kımız is a famous produce, mare milk stays a restricted material. On that account, for commercial preparation of kımız, cow milk is generally preferred to be used which has higher in terms of fat and protein and lower in lactose in comparison with mare milk. Right before fermentation, the cow milk is enriched in order to let an equivalent fermentation (Malacarne et al., 2002). The energy degree of mare milk which is 480 kcal/kg is less than in comparison with human and cow milk on a small scale because of the fact that lower fat composition. The median content of mare milk is 2.1 % protein, 1.2 % fat, 6.4 % lactose, & 0.4 % ash (Malacarne et al., 2002). The corresponding of average composition of milk of mare and cow's milk is tabulated in Table 1.

**Table 1.** Average composition of milk of cow and mare's milk

Species	Fat (%)	Lactose (%)	Protein (%)	Ash (%)	Water (%)
Cow	3.9	4.7	3.3	0.7	87.4
Mare	1.9	6.2	2.6	0.5	88.8

□

(Tamine & Robinson, 1999).

## History

Koumiss as a drink is a drug that is inherited from the Turkish ancestor. It is a drug; because it is very beneficial for lots of diseases. According to a Kazakh chemist, it is not easy to describe the benefits and qualities of the koumiss in a few articles or books. The information about the use of Koumiss goes back to ancient times, to the Hun Turks. According to historical records, in the age of the Great Hun State of Asia, the Turks were drinking koumiss. In addition, the history records indicate that the European Huns and the Gok Turks also produced koumiss. Herodotus, an ancient Greek historian, states that the Scythians made a delicious drink of mare's milk. Russian historians also write that the ambassadors sent by the Russians to Kipchak Turks were welcomed with Koumiss. Koumiss is not used much by the Anatolian Turks today, but its production and use are still widespread among the Turks living in Central Asia. It was also adopted by the Mongols. Koumiss is loved by the Eastern Turks so much and there is a saying "Who doesn't drink koumiss?" is one of the most common terms among the Kazakh Turks. Koumiss is abundant in the summer months, but not in winter (Tamine & Marshall, 1984).

Kimiz is accepted as the oldest fermented drink based on dairy basis. Ancient evidences explain that Greeks and Romans are used to produce different types of beverages by milk. Along with nearly two-thousand years before, the nomadics in both South Russia and the Scythia tribes in Central Asia are familiar with to produce kimiz from mare milk. In 5<sup>th</sup> century, Herodotus recorded the use of kimiz. William Lubuluqi, a French missionary, came to China in the 13<sup>th</sup> century and taught a precise method of kimiz to the Mongols. This is declared in William Lubuluqi's research *Lubuluqi Journey to the East*. Production of kimiz in China is also recorded in ancient times. Approximately 1500 BC, domestic horses were used to make fermented milk produce. Well-known persons of China attained popularity in kimiz production in the course of the Han Yuan Dynasty (202 BC to AD 202) and Yuan Dynasty (AD 1271–1368). In a short while, fermented equine milk is broadly called with several names and consumed in Russia, Mongolia, Kazakhstan, and Eastern Europe, especially for its therapeutic benefit. In Mongolia, kimiz is the national (*Airag*), and a high-alcohol drink made by distilling kimiz (*Arkhi*) is also produced (Kanbe, 1992), with *per capita* consumption of kimiz around 50 l per year. Kimiz is still produced in distinct parts of Mongolia via traditional techniques however with expanded interest, elsewhere it is nowadays (Tamine & Marshall, 1984).

## The Place and Importance of Koumiss in Turkish Cuisine

The Central Asian Turks, who run after water and grass, provide their nutrition mainly from animal products due to conditions of the region they live in. Horse ranks first among the animals raised from the Huns. In ancient Turks, for example, in Uighurs, the word of drink has been used with food. The Turks, who offered food and drink on the table in a balanced manner, used to put the dinner plates as well as drink cups and glasses on the tables. Koumiss was a drink that the Turks consumed a lot. Utilizing Chinese sources, Eberhard states that Turks eat meat and drink koumiss. It can be said that among all the internal Asian immigrants, koumiss is consumed as a common beverage. Turks living in steppe prepared koumiss in the leather bags. The fresh milk and a third of this fresh milk pre-prepared koumiss was added in the leather bags. The leather bag is kept a warm place, is often beaten with a stick from the mouth and koumiss formed about 12 to 24 hours (Alpargu, 2008, p.17-25).

The effects of steppe culture continue in the period of Karahanlılar. In this period, in addition to those brought from the past, it has started to take place in Turkish cuisine in newly learned agricultural products. Wines (Drinks), boza, koumiss, honey wine are among the drinks of this period (Çetin, 2008, p.27-31).

Turkey Seljuk and Principalities period cuisine can be considered as a continuation of the traditional Turkish cuisine. They were influenced by the migration process that started in Central Asia and the geography they passed and the food culture of Anatolia where they settled. Turkey Seljuk and principalities period the most common types of beverages from a variety of fruits, sherbet constituted derived from honey or sugar. Another commonly consumed drink is boza. In this period, boza was produced from barley or wheat (Şahin, 2008, p.39-55).

In 14th century Anatolian and Classical period Ottoman palace kitchens, it was very common to use sherbets made from various fruits as beverages in kitchens. Boza is one of the drinks that continued to be used in the kitchens of this period. The culinary habits of Turks from Central Asia continued in this period as well. There is no evidence for the use of steppe life drink koumiss in Seljuk and Ottoman cuisine. With the transition from nomadic life to settled life, the introduction of fruits and vegetables into the Turkish cuisine caused some old habits to be abandoned. After the transition of the Turks to the settled life and acceptance of Islam, koumiss, the consumption of the koumiss was quite limited and was not consumed in the kitchens in the following periods.

### **Production**

Making yeast of koumiss is a very complicated and difficult task. The unique characteristics of koumiss comes from the yeast. The Kyrgyz and Bashkir Turks use the old koumiss as the best yeast. In autumn, leavened koumiss is kept in a well-sealed bottle. In the summer, when it is time to stir, fresh mare milk is combined to this yeast at the same rate & kept in a warm place for 24 hours. On the second day, twice as much fresh milk is added. Normally, three or four days later, the bacteria begin to breed (Dhewa et al., 2015).

In controlled preparation, to make kimız, mare and/or cow milk is warmed up to until 90 °C – 92 °C for 5 to 10 minutes and cooled down around to 26 °C – 28°C, and the starter is added (one part of *Lb. bulgaricus* grown at 37 °C in cow milk for 7 h and two parts of *Torula* ssp. at 30 °C for 15 h) at an inoculum rate of 10 % – 30 % to give a primary acidity of 0.45 % lactic acid and is after that incubated at 28°C till an acidity of 0.7%–0.8 % is accomplished. It is then cooled to 20°C, while stirring for 1 – 2 h. The finished produce is bottled, capped, and let to ripen at 6 °C – 8 °C for 1 – 3 days (Fig. 1) (Dhewa et al., 2015). The appearance of finished product is shown in Figure 2. Koumiss itself has a low degree of alcohol. Three types of koumiss are made based on the lactic acid content (Dhewa et al., 2015).

### **Strong Koumiss**

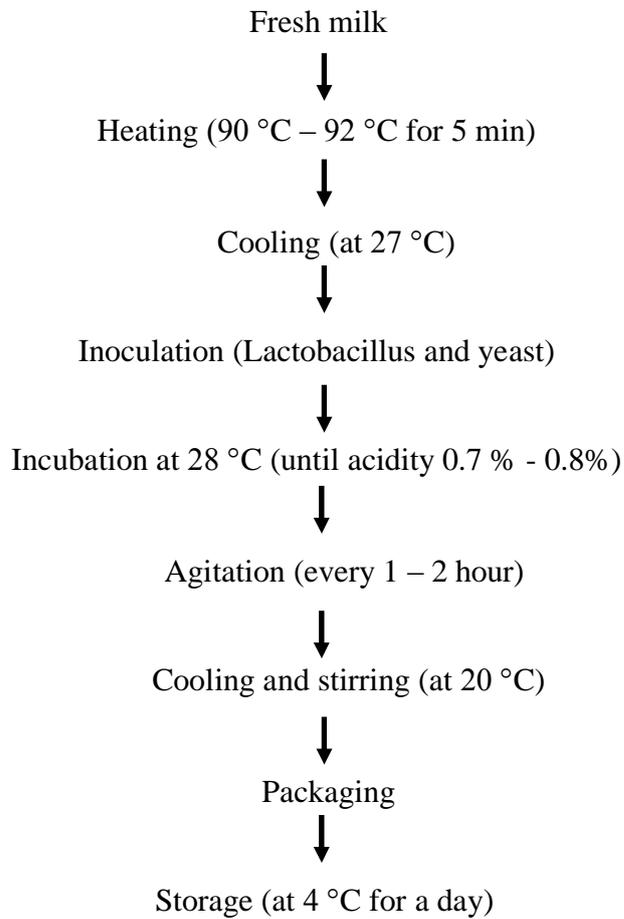
It is prepared by the LAB (*Lb. bulgaricus* and *Lb. rhamnosu*) that acidify the milk to pH 3.3–3.6 and whose conversion rate of lactose into lactic acid is around 85 %. Because of its low pH and higher lactic acid composition, it classifies in the strong koumiss classification (Dhewa et al., 2015).

### **Moderate Koumiss**

This kind of koumiss includes *Lactobacillus* bacteria (*Lb. acidophilus*, *Lb. plantarum*, *Lb. casei*, and *Lb. fermentum*) with restricted acidification characteristics which decrease the pH to around 3.9–4.5 at the end of fermentation, and the conversion rate averages 50% (Dhewa et al., 2015).

### Light Koumiss

This type of Koumiss is a slightly acidified produce (around pH 5.0) and is arranged by *Str. thermophilus* and *Str. Cremoris* (Dhewa et al., 2015).



?



**Figure 2.** Appearance of Koumiss

### Nutritive Characteristics of Kımız

Kımız has various ingredients including organic and inorganic materials for instance protein, fat, lactos, mineral, enzyme, vitamin, immune cell, and pigments. The content of kımız based on the milk origin (mare and/ or cow milk, the rates of fat: from 1.1% to 3.9%, protein: between 3.3% and 3.5%, sugar: between 4.7% and 6.1%, and finally

calcium: from 90 to 120 mg, subsequently), and different bioactive ingredients may be made by the microbial fermentation. On that account, in finished kımız, there might be light differences for the reason of those different ratios. For instance, mare milk is high in lactoalbumin, pepton, aminoacids, essential fatty acid, vitamin & minerals with the comparison of cow & sheep milk (Lv & Wang 2009).

Kımız comprises each and every essential amino acid which are necessary for people. For this reason, kımız answers the nutritional needs of the humans in relation with the amino acids needs. Kımız includes various kinds of inorganic materials useful for the people, for instance, phosphor, Ca, Mg, zinc, iron, manganese, and copper. More than that, the rate of Ca to P is 2:1, which is very close to human milk (Ha, Leng, & Mang, 2003). Kımız has a relatively high ascorbic acid ratio that is responsible for specific pharmacologic effects. Last but not least, it is also rich in other vitamins including A, B, E, B<sub>1</sub>, B<sub>2</sub>, B<sub>12</sub>, pantothenic acid & bacteriocins. High ratio of lactose in milk produce (approximately 6 – 7 %) favors microbial fermentation, as it is decomposed via the starter culture into lactic acid, ethanol & other molecules. The ratios of lactose in kımız is approximately from 1.4 % to 4.5%. Fat is the one of the most significant ingredient of kımız that includes essential fatty acids (for example, linoleic and linolenic acid). On the whole, mare milk comprises more essential fatty acid compared to the cow milk (Huo, Rong, & Leng, 2003). Different kinds of fatty acids are very helpful to promote the health and needed by people. Protein composition of kımız is changed from 1.7 % to 2.2 % and based on the milk resource, for example, in the comparison with cow milk protein composition is quite less than in mare milk. The rate of casein to whey protein is 1:1, which is identical to human milk. The main nutritive properties of kımız are tabulated in Table 2 (Ha, Leng, & Mang, 2003).

**Table 2.** Composition of Koumiss

Nutrient	%
Protein	1.7 – 2.2
Lactose	1.4 – 4.5
Fat	1.1

(Source: Lv & Wang 2009)

**Health Benefits of Koumiss**

Between the fermented milks, kımız is more important for the reason that of its dietary content. In fermentation step, the lactose in the milk transformed into lactic acid, ethanol, and carbon dioxide, and the milk becomes a resource of food for the people who can not digest lactose. At the time of milk fermentation, the content of the inorganic materials does not change. On the other hand, the content of proteins, carbohydrates, vitamins & fat changes. These differences cause some specific physical impacts as microorganisms and their metabolites play a significant role in the enhancement of the dietary and therapeutic degrees of these kinds of milk produce via making lactic acid, alcohol, CO<sub>2</sub>, antibiotic and vitamins (Lozovich, 1995).

It has been known since ancient times that koumiss is a beneficial and healing drink. Koumiss is not only useful for tuberculosis, but also for stomach diseases, anemia and other diseases. It prevents fatigue and gives strength. It is good for those who is tired because of illness. It is recommended that those who use koumiss as a medicine should drink 0.5 - 2 liters per day. It would be more appropriate to drink koumiss between meals or 1.5 - 2 hours before a meal. It is best to drink koumiss one or two cups, and sometimes three glasses depending on the needs of the body. Research has shown that the patient has an appetite after drinking one or two cups of koumiss.

The nutrients found in mare's milk undergo chemical transformation during the souring process in the production of koumiss. In other words, casein and albumin in mare's milk turn into acidamine and peptone. Since these are absorbed directly in the stomach and intestines without the need for chemical transformation again, the patient's nutritional status improves in a short time and the stomach and intestines do not get tired. In addition, it saves time and prevent fatigue for the chemical conversion of nutrients in the digestive organs (Doreau & Martin-Rosset, 2002; Mu & Bai, 2003).

The acid lactic and alcohol in koumiss have a feature that makes digestion easier. It is also a substance that allows the stomach to function. It has been used as a medicine in gastric diseases and gastritis, which shows a decrease in acids and salt-acids. It is effective not only on the stomach and intestines, but also on the heart and vascular systems. Although some patients initially experience some little heart palpitations, this is quickly resolved. For this reason, researchers also write that the blood pressure increases with the influence of the koumiss. It is a medication that provides normal working ability to the heart and vascular system. Kidney effects have also been observed in the kidney system (Zha, 1987).

Koumiss, in shortly;

- Lowers triglycerides and cholesterol in the blood, reducing the risk of heart attack and acute stroke.
- Strengthens the immune system.
- Provides protection against cancer.
- Brain, retina, sperm, skin cells are strengthened.
- Useful for diabetes.
- Thins blood and facilitates flow, prevents blood clotting.
- Provides protection against rheumatic diseases.
- It has effects on the healthy functioning of the brain and nervous system.
- Supports depression treatment.
- Helps reduce the risk of dementia and Alzheimer's disease.
- Supports mood, concentration, memory, attention and behavior disorders.
- Helps reduce aggression
- It has a positive effect on temperament, responsiveness and personality.
- The risk of yellow spot damage due to age in the eye can be prevented in people who drink koumiss.
- Koumiss has an anti-inflammatory effect. It also has beneficial effects on the musculoskeletal and immune system.
- It is effective and beneficial for the health of bones, and joints.
- Provides strength to support calcium accumulation in bones.
- Reduces joint inflammation and cartilage damaging enzyme activity.

- Reduces joint sensitivity and morning stiffness.
- Koumiss is especially useful for cardiovascular diseases.
- Deaths due to coronary heart disease are less common in people who drink koumiss.
- Helps maintain heart health for those who suffering from cardiovascular disease.
- Slows arteriosclerosis.
- Lowers the blood level of triglycerides.
- In heart diseases, bad cholesterol is decreased and good cholesterol increased.
- Reduces the stroke, risk of a second heart attack or death after a heart attack (Dhewa, Kumar, Mishra, & Sangu, 2015).

### **Conclusion**

Functional foods propose a recent approach to make better human health in modern society where the diseases and old people are thought as a threat for the well-being of society. Consumption of milk and dairy products regularly and adequately is an indispensable part of a healthy diet in every period of life. In addition, there is a recent trend in the health protector effects of living microorganisms in the composition of fermented milk products.

There is an increasing interest for fermented foods and beverages in recent years due to the rise in awareness of nutritional values and health advantages of these products. Koumiss, which is very popular among fermented milk products, can be part of a nutritionally healthy diet by both nutritional composition and probiotic properties. Koumiss is a highly nourishing beverage that can be digested easily. It is a rich source of vitamins, essential amino acids & fatty acids. In addition, koumiss enriches the consumers' daily diet and supports the health maintenance of people of all ages. Koumiss production has a long history and is produced both in the houses traditionally and in small-scale enterprises. The consumption of koumiss traditionally in our country, easy accessibility and its affordable cost facilitate positive suggestions that can be given for this product. This product, which has a unique and good taste, should meet more people thanks to its high nutritive value and health benefits. Furthermore, the production of the koumiss in a large scale should be more widespread. Last but not least, the processing conditions of koumiss should be standardized and this historical fermented beverage should be brought to its deserved position.

### **REFERENCES**

- Alpargu, M. (2008). 12. Yüzyıla kadar iç Asya'da Türk mutfak kültürü. İçinde Arif Bilgin, Özge Samancı (Ed.), *Türk Mutfağı* (s.17-25). Ankara: Reta.
- Bayat, G. & Yıldız, G. (2019). The special fermented Turkish drink: Boza. *Journal of Tourism and Gastronomy Studies*, 7 (4), 2438-2446.
- Danova, S., Petrov, K., Pavlov, P., & Petrova, P. (2005). Isolation and characterization of Lactobacillus strains involved in koumiss fermentation. *International Journal of Dairy Technology*, 58, 100–105.

- Dhewa, T., Kumar, N., Mishra, V., & Sangu, K. (2015). Koumiss: The Nutritional and Therapeutic Values. In A.K Puniya (Eds.). *Fermented Milk and Dairy Products Edition*. Publisher: Boca Raton, FL: CRC Press.
- Doreau, M. & Martin-Rosset, W. (2002). Dairy animals: Horse. In H. Roginski, J.A. Fuquay, and P.F. Fox (Eds.) *Encyclopaedia of Dairy Sciences*, 630–637. London: Academic Press.
- Çetin, A.(2008). Karahanlı- Selçuklu- Memluk çizgisinde Türk mutfağı. İçinde A. Bilgin & Ö. Samancı (Edt.), *Türk Mutfağı* (s.27-31). Ankara: Reta
- Ha, S., Leng, A.M.G., & Mang, L. (2003). Koumiss and its medicinal values. *China Journal of Chinese Material Medica*, 28(1), 11–14.
- Hancıoğlu, Ö., & Karapınar, M. (1998). Hububat bazlı fermente ürünler ve fermantasyon işleminin sağladığı avantajlar. *Gıda*, 23(3), 211-215.
- Huo, Y., Rong, H.S.S., & Leng, A.M.G. (2003). A study of koumiss nutritional composition and molecules. *Inner Mongolia Husbandry*, 6, 22–23.
- Kambe, M. (1992). Traditional fermented milk of the world. In Y. Nakazawa and A. Hosono (Eds.) *Functions of Fermented Milk: Challenges for the Health Sciences*, London: Elsevier Applied Science.
- Kaşgarlı Mahmud (1992). *Divanü Lugat-it Türk*, I- IV, (çev. Besim Atalay), Ankara: Türk Tarih Kurumu Basımevi,
- Lozovich, S. (1995). Medical uses of whole and fermented mare milk in Russia. *Cultured Dairy Products Journal*, 30, 18–21.
- Lv, J. & Wang, L. (2009). Bioactive components in kefir and koumiss. In Y.W. Park (Ed.), *Bioactive Components in Milk and Dairy Products*, ed., (ss. 251– 260). Ames, IA: Wiley-Blackwell.
- Malacarne, M., Martuzzi, F., Summer, A., & Mariani, P. (2002). Protein and fat composition of mare's milk: Some nutritional remarks with reference to human and cow's milk. *International Dairy Journal*, 12, 869–877.
- Mu, Z. & Bai, Y. (2003). Mare milk. *Journal of Inner Mongolia Agricultural University*, 24(1), 116–120.
- Şahin, H. (2008). Türkiye Selçuklu ve Beylikler dönemi mutfağı. İçinde A. Bilgin, & Ö. Samancı (Ed.), *Türk mutfağı* (s.39-55). Ankara: Reta.
- Tamine, A.Y. & Marshall, V.M.E (1984). Microbiology and technology of fermented milk. In F.L. Davies, and B.A. Law (Ed.), *Advances in the Microbiology and Biochemistry of Cheese and Fermented Milk*, (ss. 118–122), London: Elsevier Applied Science.
- Tamine, A.Y. & Robinson, R.K. (1999). *Yoghurt: Science and technology*. Cambridge: Woodhead Publishing Ltd.
- Wang, J., Chen, X., Liu, W., Yang, M., Airidengcaicike, & Zhang, H. (2008). Identification of lactobacillus from koumiss by conventional and molecular methods. *European Food Research and Technology*, 227(5), 1555–1561.
- Yücel U., & Köse, E. (2002). İzmir'de üretilen bozaların kimyasal bileşimi üzerine bir araştırma. *Gıda*, 27(5), 395-398.
- Zha, M. (1987). *Koumiss Therapy*. Huhehaote, China: Inner Mongolian People's Publishing House.