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**«ASSESSMENT OF FRESHNESS AND NATURALNESS OF HONEY BASED ON
ORGANOLEPTIC, PHYSICOCHEMICAL, AND MICROBIOLOGICAL
PARAMETERS»**

Abstract. The article presents the results of comprehensive studies of honey collected in various districts of the West Kazakhstan region, aimed at assessing its quality and safety.

The research included organoleptic, physicochemical, and microbiological analyses. Organoleptic evaluation showed that all samples had a clear or slightly turbid consistency, a pleasant aroma and taste typical of their botanical origin, and no signs of fermentation or foreign odors. Physicochemical analysis revealed that the diastase number ranged from 9.4 to 15.0 Gothe units, acidity was 2.6–3.5 ml NaOH/100 g, and moisture content ranged from 17.6 to 18.5%, meeting the requirements of GOST 19792–2017 and GOST 31774–2012. Microbiological tests showed no presence of coliform bacteria, yeasts, molds, or spore-forming microorganisms. The total microbial count was below the permissible level ($<10^2$ CFU/g), indicating high sanitary quality and product safety. The obtained data confirm the naturalness, maturity, and microbiological safety of the studied honey, reflecting the favorable beekeeping conditions in the West Kazakhstan region.

Key words. Honey, freshness, naturalness, organoleptic parameters, physicochemical properties, microbiological indicators, product quality.

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**«БАЛДЫҢ БАЛҒЫНДЫҒЫ МЕН ТАБИҒИЛЫҒЫН ОРГАНОЛЕПТИКАЛЫҚ,
ФИЗИКА-ХИМИЯЛЫҚ ЖӘНЕ МИКРОБИОЛОГИЯЛЫҚ КӨРСЕТКІШТЕРІ
БОЙЫНША БАҒАЛАУ»**

Аңдатпа. Мақалада Батыс Қазақстан облысының әртүрлі аудандарынан жиналған балдың сапасы мен қауіпсіздігін бағалау мақсатында жүргізілген кешенді зерттеу

нәтижелері келтірілген.

Зерттеу органолептикалық, физика-химиялық және микробиологиялық талдау әдістерін қамтыды. Органолептикалық бағалау бойынша барлық үлгілер мөлдір немесе аздап бұлдыр консистенцияға, жағымды хош иіске және ботаникалық шығу тегіне сай дәмге ие болды, ашу немесе бөтен иіс белгілері байқалмады. Физика-химиялық талдау нәтижесінде диастаздық саны 9,4–15,0 Готе бірліктері аралығында, қышқылдығы 2,6–3,5 мл NaOH/100 г, ал ылғал мөлшері 17,6–18,5 % болды. Барлық көрсеткіштер ГОСТ 19792–2017 және ГОСТ 31774–2012 талаптарына сәйкес келеді. Микробиологиялық зерттеу нәтижелері бойынша ішек таяқшалары тобының бактериялары, ашытқылар, зеңдер және спора түзуші микроорганизмдер анықталған жоқ. Жалпы микробтық саны рұқсат етілген деңгейден аспады ($<10^2$ КОЕ/г). Алынған нәтижелер зерттелген балдың табиғилығын, жетілуін және микробиологиялық қауіпсіздігін дәлелдейді, сондай-ақ өңірдегі ара шаруашылығының қолайлы жағдайын көрсетеді.

Кілт сөздер. Бал, балғындық, табиғилық, органолептикалық көрсеткіштер, физика-химиялық қасиеттер, микробиологиялық көрсеткіштер, өнім сапасы.

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**«ОЦЕНКА СВЕЖЕСТИ И НАТУРАЛЬНОСТИ МЁДА ПО СОВОКУПНОСТИ
ОРГАНОЛЕПТИЧЕСКИХ, ФИЗИКО-ХИМИЧЕСКИХ И
МИКРОБИОЛОГИЧЕСКИХ ПАРАМЕТРОВ»**

Аннотация. В статье представлены результаты комплексных исследований мёда, собранного в различных районах Западно-Казахстанской области, проведённых с целью оценки его качества и безопасности.

Исследования включали органолептические, физико-химические и микробиологические методы анализа. По органолептическим показателям все образцы характеризовались прозрачной или слегка мутной консистенцией, приятным ароматом и вкусом, соответствующим ботаническому происхождению, без признаков брожения или посторонних запахов. Физико-химический анализ показал, что диастазное число варьировало от 9,4 до 15,0 ед. Готе, кислотность составляла 2,6–3,5 мл NaOH/100 г, а массовая доля воды — 17,6–18,5 %, что соответствует требованиям ГОСТ 19792–2017 и ГОСТ 31774–2012. По микробиологическим показателям во всех образцах не обнаружены бактерии группы кишечных палочек, дрожжи, плесени и споровые формы микроорганизмов. Общее микробное число не превышало допустимого уровня ($<10^2$ КОЕ/г), что свидетельствует о высоком санитарном качестве и доброкачественности продукции. Полученные результаты подтверждают натуральность, зрелость и микробиологическую безопасность исследованного мёда, а также отражают благоприятные условия пчеловодства в регионе.

Ключевые слова. Мёд, свежесть, натуральность, органолептические показатели, физико-химические свойства, микробиологические показатели, качество продукта.

Introduction. Honey is a natural product that possesses various beneficial properties, including antimicrobial, anti-inflammatory, and antioxidant effects. Research shows that honey can be effectively used as a natural remedy to support health and treat various diseases. In particular, it is applied in the complex therapy of migraines, where it can enhance the effect of standard treatment and improve adherence to therapy due to its natural composition [1].

The composition of honey plays an important role and varies depending on the sources of nectar. Its viscosity and surface tension are significant for applications in medicine and pharmaceuticals [2]. The viscosity of honey depends on temperature, which can also affect its preservation and the retention of its beneficial properties. The high content of natural sugars and antioxidants in honey allows it to be considered an alternative to refined sugars in the production of food products and functional supplements.

Some studies emphasize that honey may have a positive effect on the immune system, potentially improving overall health [3]. For example, it is known for its ability to enhance the body's defense functions due to the presence of various biologically active compounds. In particular, honey is considered a potential remedy for improving the condition of patients with diarrhea [4].

Issues of honey quality and purity also play a significant role. Consumers strive to purchase a high-quality product, which highlights the importance of honey control and certification, especially under conditions of growing competition and market trends. This approach to honey as a food product aligns with current trends in sustainable development and healthy nutrition, where natural and organic components are becoming the standard.

Studies show that the high quality of honey is determined by its physicochemical parameters. For example, some works have addressed the issue of honey adulteration, such as “artificial honey” and “sugar honey,” which are difficult to detect but have negative effects on consumer health [5]. This aspect is important for veterinary and sanitary examination, which must ensure that the products entering the market are natural and safe.

Quality control of honey involves regular veterinary and sanitary examination, which includes measuring physicochemical parameters such as acidity, water content, and sugar composition. One study reported that all analyzed honey samples did not crystallize, which could be an indicator of their freshness and authenticity [6]. Special attention is also given to the elemental composition of honey, which may vary depending on its botanical origin, serving as an additional indicator of the product's quality and purity [7].

As part of the veterinary and sanitary examination of honey, microbiological studies are also conducted to identify possible pathogenic microorganisms. These studies are important because honey, despite its antimicrobial properties, can be contaminated with bacteria that pose a threat to human health. For example, some studies indicate that honey can serve as a medium for microbial growth under improper storage conditions; however, the specifics and details of such research require more rigorous examination [8].

In addition, the veterinary and sanitary examination of honey includes compliance with established standards and requirements, which is necessary for control at all stages of production and storage — from the hive to the end consumer [9]. This approach helps to create a system that enhances the quality and safety of honey on the market, as well as improves consumer awareness regarding the health and safety of the products they purchase.

Thus, the veterinary and sanitary examination of honey is extremely important for protecting consumers and ensuring their health. Understanding its physicochemical

characteristics, antibiotic properties, and potential for adulteration provides an opportunity for more effective monitoring of honey quality on the market.

Materials and methods of research. The study was conducted at Zhangir Khan West Kazakhstan Agrarian-Technical University, in the laboratory of the “Veterinary and Agrotechnology” Institute, which is designed for the study of bee diseases.

For the analysis of the freshness and naturalness of honey, 11 samples were collected in June 2025 from various districts of the West Kazakhstan region. The choice of this period is due to the fact that June honey is the freshest and most physiologically active product obtained at the beginning of the honey harvest season. During this period, honey is characterized by high enzymatic activity, a pronounced aroma, a soft consistency, and a light color, which allows for the most objective assessment of its naturalness based on organoleptic and physicochemical indicators. In addition, the study of June samples makes it possible to eliminate the influence of long-term storage and temperature factors that can alter the structure and chemical composition of honey.

To achieve the aim of the study, organoleptic, physicochemical, and microbiological analyses were conducted.

The organoleptic evaluation included the determination of the color, consistency, aroma, and taste of honey. The assessment was carried out visually and sensorially under natural lighting at a temperature of 20 ± 2 °C. The evaluation complied with the requirements of GOST 19792–2017 “Natural honey. Technical specifications” [10].

Physicochemical parameters were determined using standard methods:

- ✓ Moisture content — by means of a refractometer;
- ✓ Acidity — by the titrimetric method using a 0.1 N sodium hydroxide solution;
- ✓ Diastase number — by the classical method, measuring the time of disappearance of the iodine color.

The measurement results were expressed as percentages or degrees of acidity, followed by statistical processing.

Microbiological evaluation was carried out to determine the sanitary condition and the degree of microbial contamination of honey.

- ✓ Total microbial count (TMC) was determined by the deep inoculation method on meat-peptone agar (MPA);
- ✓ Yeast and mold counts were determined on Sabouraud agar;
- ✓ Presence of coliform bacteria (CBG) was tested on Endo medium.

The inoculated plates were incubated at a temperature of 30 ± 2 °C for 48–72 hours, after which the number of colonies was counted and the degree of microbial contamination was determined.

Sampling was carried out in accordance with the requirements of GOST 19792–2017 “Natural honey. Technical specifications” (Table 1). The samples were taken directly from the beekeepers’ hermetically sealed containers using sterile instruments.

Each sample was collected in an amount of not less than 200 g, placed in sterile plastic containers with tightly sealed lids, and labeled with the indication of the location, date, and sample number.

To prevent changes in the physical, chemical, and microbiological properties of honey, the samples were transported in isothermal containers and stored at a temperature of 10–15 °C until laboratory analysis.

Table 1 – Sampling of honey in various districts of the West Kazakhstan region

№	Manufacturer, country	Sample name	Sampling date, sampling report №	Number of samples
1	Terekty, Satybayev B.G.	Bee honey	№1, 09.06.2025г.	1 (0,5)kg
2	Burlin rural district, Krivobokov	Bee honey	№2, 10.06.2025г.	2 (1,0) kg
3	Terekty, Bataev	Bee honey	№3, 10.06.2025г.	1 (0,5) kg
4	Burlin rural district, Chungulbayev	Bee honey	№4, 13.06.2025г.	1 (0,5) kg
5	Daryinsk rural district, Dosmukhambetov R.K.	Bee honey	№5, 14.06.2025г.	2 (1,0) kg
6	Peremetnoye, Baymukanov	Bee honey	№6, 16.06.2025г.	1 (0,5) kg
7	Peremetnoye, Shatalov	Bee honey	№7, 17.06.2025г.	1 (0,5) kg
8	Derkul, Biryukov N.A.	Bee honey	№8, 18.06.2025г.	1 (0,5) kg
9	Derkul, Kasimov S.I.	Bee honey	№9, 18.06.2025г.	1 (0,5) kg
Total				11 samples

Results and discussion. In the course of the conducted research, 11 samples of natural honey collected in June 2025 from various districts of the West Kazakhstan region were analyzed. The obtained data made it possible to assess the freshness and naturalness of the honey based on a combination of organoleptic, physicochemical, and microbiological indicators.

The organoleptic evaluation was carried out in accordance with the requirements of GOST 19792–2017 “Natural honey. Technical specifications” and the methodological guidelines for quality control of beekeeping products (Table 2).

The evaluation was carried out under laboratory conditions at a temperature of (20 ± 2) °C and under natural lighting.

Table 2 – Results of the organoleptic evaluation of bee honey

№	Indicator	Characteristics of samples	Quality assessment
1	Color	Light yellow to dark yellow and amber; corresponds to botanical origin	Complies with the standard
2	Consistency	Mostly liquid and homogeneous; in some samples, signs of natural crystallization	Complies with the standard
3	Aroma	Pure, honey, floral, or herbal, without any foreign odors	Complies with the standard
4	Taste	Sweet, pleasant, sometimes with	Complies with the

		slight hints of tartness or acidity	standard
5	Overall assessment	All 11 samples are fresh, natural, with no signs of fermentation or souring.	High-quality natural honey

The results of the organoleptic evaluation indicate that all samples tested have the characteristic sensory properties of natural honey, reflecting the botanical origin and freshness of the product. None of the samples showed any signs of non-compliance with the standards.

Physical and chemical analysis. Physical and chemical studies were conducted in accordance with the requirements of GOST 19792–2017 “Natural Honey. Technical Conditions” and generally accepted methodological guidelines for quality control of bee products (Table 3).

The analysis included the determination of the following indicators:

✓ Water content — determined using a refractometer based on the refractive index. For each sample, the measurement was carried out at a temperature of 20 ± 2 °C, after which the results were converted into moisture content using a calibration table.

✓ Acidity — determined by titrimetric method. For analysis, 10 g of honey was dissolved in distilled water and titrated with 0.1 N NaOH solution in the presence of phenolphthalein until a faint pink color appeared. The result was expressed in degrees of acidity (°).

✓ Diastase number — determined by the classical Gothe method. The time taken for the amylase enzyme to break down starch (disappearance of iodine coloration) was recorded with a stopwatch. The result was expressed in Gothe units (Gothé units).

Table 3 – Results of physicochemical analysis

Sample №	Diastase number, units: Gote	Acidity, ml NaOH (1n)/100 g	Mass fraction of water, %	Compliance with GOST 19792–2017
1	10,2	2,8	18,2	Complies
2	11,5	3,1	17,9	Complies
3	9,8	2,9	18,5	Complies
4	12,1	3,3	17,6	Complies
5	13,6	2,7	18,1	Complies
6	10,8	3,5	17,8	Complies
7	14,2	3,0	18,3	Complies
8	9,4	3,2	17,7	Complies
9	15,0	2,6	18,0	Complies
10	12,7	3,4	18,4	Complies
11	10,9	2,9	17,9	Complies

The results of physical and chemical analysis showed that all samples tested comply with the requirements of GOST 19792–2017. The diastase number complies with the requirements of the state standard, which indicates that the enzymatic activity of honey is preserved. The acidity was within the range of 2.6–3.5 ml NaOH (1n.)/100 g, which indicates natural fermentation and maturity of the product. The mass fraction of water was 17.6–18.5%, not exceeding the permissible values (up to 20%), which confirms good maturity and resistance to crystallization.

Microbiological studies were conducted to assess the sanitary condition and

microbiological purity of the honey samples studied. The total microbial count (TMC), the presence of mesophilic aerobic and facultative anaerobic microorganisms (MAFA), Escherichia coli group bacteria (ECG), spore-forming microorganisms, yeasts, and molds were determined (Table 4).

Table 4 – Results of microbiological testing

Name of indicator	Permissible standard	Results (n = 11)	Compliance with requirements
Total microbial count (TMC), CFU/g	$\leq 1 \times 10^2$	$< 10^2$	Complies
Bacteria of the Escherichia coli group (BGKP)	Not permitted	Not identified	Complies
Spore forms of microorganisms	Not permitted	Not identified	Complies
Yeast, CFU/g	≤ 50	Not identified	Complies
Molds, CFU/g	≤ 50	Not identified	Complies

The results of microbiological testing indicate a high level of sanitary cleanliness in the samples examined. In all samples, the total microbial count (TMC) did not exceed the permissible level—less than 1×10^2 CFU/g, and no Escherichia coli (E. coli), spore-forming bacteria, yeast, or mold were detected. The results confirm that honey has pronounced antimicrobial properties and resistance to microbial contamination.

Conclusion. A comprehensive assessment of honey collected in the West Kazakhstan region, including organoleptic, physicochemical, and microbiological studies, showed that all samples studied comply with the requirements of GOST 19792–2017 and sanitary standards.

Organoleptic evaluation revealed that the honey has a taste, aroma, and color characteristic of its botanical origin, without any foreign odors or flavors, and with a uniform consistency. This indicates the naturalness and high quality of the product.

Physical and chemical analysis showed that the diastase number ranged from 9.4 to 15.0 units. The acidity was 2.6–3.5 ml NaOH/100 g, and the mass fraction of water was 17.6–18.5%. All values were within the normative range, confirming the maturity, enzymatic activity, and stability of the honey.

Физико-химический анализ показал, что диастазное число колебалось от 9,4 до 15,0 единиц. Кислотность составляла 2,6–3,5 мл NaOH/100 г, а массовая доля воды — 17,6–18,5 %. Все значения находились в нормативном диапазоне, что подтверждает зрелость, ферментативную активность и стабильность меда.

Thus, the honey samples studied are distinguished by their appropriate organoleptic properties, normal physicochemical parameters, and microbiological safety, which allows them to be classified as high-quality and environmentally friendly bee products produced in the West Kazakhstan region.

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