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## COMPARATIVE ASSESSMENT OF THE QUALITY AND COMPETITIVENESS OF NATURAL HONEY SAMPLES FROM VARIOUS MANUFACTURERS

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**Abstract.** In the conditions of the modern economy, the problem of increasing the level of competitiveness of products is most acute, since the success of any company will depend on a correctly chosen and developed marketing strategy. The competitiveness of products is influenced by many factors: organoleptic, physicochemical, microbiological indicators, safety criteria, product price, packaging condition and labeling content. The purpose of this study was to identify the most competitive product on the example of natural honey samples. The work consisted of several stages. At the first stage, a visual assessment of the state of the package and the content of the label was carried out for compliance with the requirements of the Technical Regulations of the Customs Union «Food products in terms of their labeling» (TR CU 022/2011). At the second stage, the organoleptic and some physical and chemical parameters of the tested samples were studied for compliance with the requirements of GOST 19792-2017 «Natural honey. Specifications». At the next stage, weight coefficients were calculated for each selected consumer property, group indicators of product competitiveness, relative level and integral indicator of competitiveness of evaluated samples compared to a competitor sample (base sample). Based on the calculations, the most competitive sample was determined.

**Keywords:** comparative assessment, quality, natural honey, competitiveness, expert group, individual consumer criteria, complex consumer criteria, packaging, labeling, physical and chemical indicators.

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## СРАВНИТЕЛЬНАЯ ОЦЕНКА КАЧЕСТВА И КОНКУРЕНТОСПОСОБНОСТИ ОБРАЗЦОВ НАТУРАЛЬНОГО МЕДА РАЗЛИЧНЫХ ПРОИЗВОДИТЕЛЕЙ

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**Аннотация.** В условиях современной экономики проблема повышения уровня конкурентоспособности продукции стоит наиболее остро, поскольку успех любой компании будет зависеть от правильно выбранной и разработанной маркетинговой стратегии. На конкурентоспособность продукции влияет множество факторов: органолептические, физико-химические, микробиологические показатели, критерии безопасности, цена продукта, состояние упаковки и содержание маркировки. Целью данного исследования было выявление наиболее конкурентоспособного продукта на

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примере образцов натурального меда. Работа состояла из нескольких этапов. На первом была проведена визуальная оценка состояния упаковки и содержания маркировки на соответствие требованиям Технического регламента Таможенного союза «Пищевая продукция в части ее маркировки» (ТР ТС 022/2011). На втором этапе были исследованы органолептические и некоторые физико-химические показатели испытуемых образцов на соответствие требованиям ГОСТ 19792–2017 «Мед натуральный. Технические условия». На следующем этапе были рассчитаны коэффициенты весомости для каждого выбранного потребительского свойства, групповые показатели конкурентоспособности продукта, относительный уровень и интегральный показатель конкурентоспособности оцениваемых образцов по сравнению с образцом-конкурентом (базовый образец). На основании проведенных расчетов был определен наиболее конкурентоспособный образец.

**Ключевые слова:** сравнительная оценка, качество, натуральный мед, конкурентоспособность, экспертная группа, индивидуальные потребительские критерии, комплексные потребительские критерии, упаковка, маркировка, физико-химические показатели.

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**Introduction.** Products are the driving force of the market, having two main economic properties: customer value and cost. The ability of a product to be attractive compared to other products of a similar type and purpose due to a better match of its characteristics to market requirements and consumer assessments expresses its competitiveness.

The competitiveness of a product is a certain level of its economic, technical and operational characteristics that allow a product to compete with other similar products on the market.

In the modern world, the problem of quality and competitiveness of products is acute. The relevance of the work is to identify the most competitive sample of natural honey in terms of quality due to the frequent falsification of the products under study.

The aim of the work is to evaluate the quality indicators of natural honey samples from various manufacturers and identify the most competitive sample.

In accordance with the set goal, the following tasks were solved in the work:

- assessment of the state of packaging and the content of the labeling of the samples under study;
- organoleptic and physico-chemical assessment of the quality of the studied samples;
- calculation of the competitiveness of each sample and determination of the most competitive one.

**Materials and methods.** The objects of the study are three samples of natural honey from various manufacturers:

- sample № 1 – natural linden honey with herbs (manufacturer – CHERNETSOV-TRADE COMPANY LLC);
- sample № 2 – natural mixed herbal honey (manufacturer – HONEY VOIN LLC);
- sample № 3 – natural flower honey (manufacturer – HONEY VEK LLC).

The work used standardized methods for assessing the quality of natural honey:

- the state of the packaging was assessed for compliance with the requirements of the Technical Regulations of the Customs Union «On the safety of packaging» (TR TS 005/2011) and GOST 19792-2017 «Natural honey. Specifications»;

– the content of the labeling was assessed for compliance with the requirements of the Technical Regulations of the Customs Union «Food products in terms of their labeling» (TR TS 022/2011) and GOST 19792-2017 «Natural honey. Specifications»;

– organoleptic quality indicators were determined for compliance with the requirements of GOST 19792-2017 «Natural honey. Specifications»;

– the mass fraction of moisture was determined by the refractometric method according to GOST 31774-2012 «Med. Refractometric method for determining water», diastase number – by the Gothe method according to GOST 34232-2017 «Med. Methods for determining the activity of sucrose, diastase number, insoluble substances» for compliance with the requirements of GOST 19792-2017 «Natural honey. Specifications».

The competitiveness of samples was determined by comparing the integral indicator of the competitiveness of a single product with a reference sample.

The weight coefficient ( $M_i$ ) for each consumer property was calculated using formula 1.

$$M_i = \frac{\sum_{i=1}^m X_{ij}}{\sum_{j=1}^m \sum_{i=1}^n X_{ij}}, \quad (1)$$

where  $X_{ij}$  is the estimate of the  $i$ -th property of the  $j$ -th expert;

$m$  is the number of experts;

$n$  is the number of properties.

The calculation of group indicators of the competitiveness of the studied samples of natural honey is calculated according to formula 2.

$$Lmn_j = \sum_{i=1}^n M_i * \Pi_i, \quad (2)$$

where  $M_i$  is the weight of the  $i$ -th property in the general set of consumer properties;

$P_i$  is average score of the  $i$ -th indicator;

$n$  is the number of parameters involved in the evaluation.

The calculation of the relative level and integral index of competitiveness of the evaluated samples in comparison with the base sample was carried out in accordance with formulas 3 and 4.

$$K = \frac{Imn_j}{Imn_{j-1}}, \quad (3)$$

$$K_i = \frac{Imn_j}{C_j}, \quad (4)$$

where  $K$  is the relative level of competitiveness;

$K_i$  is integral index of competitiveness;

$Imn_j$  is a group indicator of consumer properties for the  $j$ -th product;

$I_{mnj}$  is a group indicator of consumer properties for a competitor product;

$C_j$  is the cost of the product.

If the indicator is greater than one, then the level of competitiveness of the product is greater than that of a competitor; if the indicator is less than one, this indicates the opposite.

Studies of samples of natural honey were carried out on the basis of the Testing Laboratory of the Federal State Budgetary Institution «Krasnoyarsk Reference Center of Rosselkhoz nadzor» upon receipt of samples by the Institution at the request of the Customer.

Table 1. Content of labeling of the studied samples of natural honey

Indicator	Samples		
	Natural lime honey with various herbs	Honey is natural mixed herb	Natural flower honey
Name	Natural lime honey with various herbs. GOST 19792–2017	Honey is natural mixed herb. GOST 19792–2017	Natural flower honey. GOST 19792–2017
Year of collection	2021	2020	2021
Date of packing (packing), date of packing	18.04.2021	06.07.2020	17.01.2021
Manufacturer	LLC «CHERNETSOV–TRADE COMPANY», 660135, Russian Federation, Krasnoyarsk krai, Krasnoyarsk, Oktyabrskaya str., 2A	Honey Warrior LLC, 630119, Russian Federation, Novosibirsk region, Novosy–birsk, Petukhova str., 79	Honey Age LLC, 117437, Russian Federation, Moscow, Akademika Artsimovich str., 8, floor No. 1A, room 2, room 11
Storage conditions	At a temperature not higher than +20 °C		
Net weight, g	0,250 kg	500 g	250 g
Expiration date	2 years from the date of packaging (manufacture)		
Nutritional value	B – 1, W – 0, U – 80, 1360 kJ/320 kkal	B – 0.8, U – 80, 3, 1378.7 kJ/324.4 kkal	U – 80, 1360 kJ/320 kkal
EAC	+	+	+
GMO Information	Missing		
Document designation	GOST 19792–2017		
Trademark	–	–	–
Voluntary certification	–	–	–

### Results and discussion.

1. When checking the condition of the packaging, it was found that all samples were packed in glass jars with tightly screwed lids. There were no signs of packaging damage. The packaging of all tested samples was not contaminated. The packaging of the samples was colorfully artistically designed, the colors are bright. All labels had clear drawings and inscriptions. In addition, the labels on the packages of all studied samples are made in color schemes that do not make it difficult to read.

Labeling of samples of consumer packaging of natural honey taken for the study included design, text on the label and special characters. The marking of the studied samples was clear and legible and stood out against a contrasting background. The text is unambiguous and readable. The data are presented in Table 1 [1, 4].

2. After examining the condition of the packaging and the labeling content of the studied samples of natural honey, an organoleptic analysis of the images was performed, the data are presented in Table 2.

Table 2. Results of organoleptic analysis of natural honey samples

The name of the indicator	Characteristics of samples			
	Characteristics according to GOST 19792-2017	Natural lime honey with various herbs	Honey is natural mixed herb	Natural flower honey
Appearance (consistency)	Liquid, partially or completely crystallized	Liquid		
Aroma	Pleasant, from weak to strong, odorless	Pleasant, strongly pronounced, odorless, corresponds to the sample	Pleasant, not very pronounced, odorless, corresponds to the sample	Pleasant, strongly pronounced, odorless, corresponds to the sample
Taste	Sweet, pleasant, without foreign taste	Sweet, pleasant, without foreign taste, corresponds to the sample		
Signs of fermentation	Not allowed	Not detected		

From the physico-chemical indicators of the quality of natural honey, the water content in honey was determined by the refractometric method and the diastase number by the Gothe method. The results are presented in Table 3 [1].

Table 3. Physico-chemical quality indicators of natural honey samples

The name of the indicator	Characteristics of samples			
	Characteristics according to GOST 19792-2017	Natural lime honey with various herbs	Honey is natural mixed herb	Natural flower honey
Mass fraction of moisture, %	No more 20	15,9	16,7	16,2
Diastase number, units Gote	Nevertheless 8	28,0	31,4	29,7

For sale to the consumer, it is allowed to produce natural honey with a moisture content of not more than 21 %. An increased content of the mass fraction of water can be contained in unripe honey diluted with water or liquid sugar syrup [16]. Such honey is not allowed for sale, as it quickly undergoes fermentation.

The diastase number of honey or enzymatic activity is an indicator of the ability of enzymes to break down starch, which determines the naturalness and degree of «maturity» of the product [16]. In other words, the diastase number is the main indicator of the naturalness and maturity of honey. The higher this indicator, the better, more natural and better honey.

According to the studied physical and chemical parameters, all three samples meet the requirements of GOST 19792-2017 «Natural honey. Specifications».

3. After determining the quality indicators of natural honey samples, the competitiveness of each sample was calculated.

As a result of this work, a point scale was developed, in which the score «5 points» – excellent, «4 points» – good, «3 points» – satisfactory, «2 points» – unsatisfactory, the characteristics of the ratings are presented below.

– «5 points» – the sign meets the requirements of regulatory documents, without deviations;

– «4 points» – a sign that meets the quality requirements has minor deviations;

– «3 points» – the sample does not meet the quality requirements for the two studied features;

– «2 points» – the sample has visible defects, does not meet the requirements of regulatory documents.

An expert commission of 5 people was created to determine the consumer properties of each sample (weight coefficient) and conduct a scoring of the selected samples. As part of determining the quality and competitiveness of the studied samples of natural honey, a scoring was carried out. The results of the scoring of the studied samples of natural honey are presented in Table 4.

Table 4. The results of the score evaluation of the studied samples of natural honey

The name of the indicator	Name of the sample of natural honey		
	Natural lime honey with various herbs	Honey is natural mixed herb	Natural flower honey
Appearance (consistency)	25	22	23
Smell	25	24	21
Taste	25	25	25
Signs of fermentation	23	19	25
Physical and chemical indicators	25	25	25
Packaging, labeling	25	25	23
Total	148	140	142

Based on Table 4, we can conclude that natural linden honey with herbs is the best in quality, which is confirmed by the results of the scoring of the studied samples.

As part of determining the competitiveness of the studied samples of natural honey, weight coefficients for each property were determined. The results of determining the weight coefficients are presented in table 5.

Table 5. The results of determining the weight coefficients

The name of the indicator	Assessment of the weight of experts (in points)					The sum of the significance estimates	Weighting factor
	1	2	3	4	5		
Appearance (consistency)	5	5	5	5	5	25	0,33
Smell	2	4	4	3	4	17	0,23
Taste	4	2	3	4	3	16	0,21
Signs of fermentation	3	3	2	2	2	12	0,16
Packaging, labeling, physical and chemical indicators	1	1	1	1	1	5	0,07
Total:							1,00

Using formula 2, we calculate group indicators of competitiveness (competitiveness index):

– Natural linden honey with herbs:

$$1,0 \times 0,33 + 1,0 \times 0,23 + 1,0 \times 0,21 + 0,92 \times 0,16 + 1,0 \times 0,07 = 0,987;$$

– Natural herbal honey:

$$0,88 \times 0,33 + 0,96 \times 0,23 + 1,0 \times 0,21 + 0,76 \times 0,16 + 0 \times 0,07 = 0,843;$$

– Natural flower honey:

$$0,92 \times 0,33 + 0,84 \times 0,23 + 1 \times 0,21 + 1 \times 0,16 + 0 \times 0,07 = 0,867.$$

It follows from the calculations that the highest competitiveness index has natural linden honey with herbs (0,987).

If the indicator is greater than one, then the level of competitiveness of the product is greater than that of a competitor; if the indicator is less than one, this indicates the opposite.

To calculate the relative level of competitiveness of the studied samples of natural honey, we take sample № 1 (natural linden honey with herbs) as a base sample. The results obtained are presented in Table 6.

Table 6 – Assessment of the competitiveness of the studied samples

Name of the sample	Price in rubles / 100 g, C <sub>j</sub>	Group competitiveness indicator, Im.n. <sub>j</sub>	The level of competitiveness, K	Integral indicator, K <sub>и</sub>
Natural lime honey with various herbs	150	0,987	1,138	0,0011
Honey is natural mixed herb	120	0,843	0,945	0,0014
Natural flower honey	145	0,867	0,972	0,0013

Based on the data obtained in Table 6, it can be concluded that sample № 1 (natural linden honey with herbs, manufacturer – CHERNETSOV-TRADE COMPANY LLC) is the most competitive in relation to other samples.

**Conclusions.** This paper considers a variant of determining the level of competitiveness in terms of consumer indicators, taking into account the economic indicator (price of goods).

As a result of this work, it was found that the most competitive sample of natural honey among those studied is natural linden honey with herbs, the manufacturer is CHERNETSOV-TRADE COMPANY LLC.

I would like to note the measures to increase the competitiveness of the other studied samples of natural honey:

- search and consolidation of new sales markets;
- expansion of the range of the product category under consideration.

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