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ECOLOGICAL CONDITIONS: SCIENTIFIC BASIS OF THE INFLUENCE ECOLOGICAL CONDITIONS ON THE QUALITY INDICATORS OF HONEY

Kuldasheva Farida Kholjigitovna
Doctor of agricultural science, associate professor of «International school of finance technology and science, Uzbekistan

Abstract
This article identifies and scientifically substantiates the influence of the ecological environment of the Parkent, Kibray and Olmalik districts of the Tashkent region on the quality and physical properties of honey.

Keywords Ecological environment, acidity, density, humidity, diastase, organoleptic, anthropogenic factor.

INTRODUCTION

It observed that the number of species and families of bees in farms engaged in beekeeping has decreased in recent years (FAO, 2024) . Biodiversity of scientists' bee families, productivity and scarcity of nectar bearing plant species (BAU 2022) , also studies the impact of environmental changes on the emergence of new infectious and parasitic infections (FAO, 2022) .

In the conditions of the Republic of Uzbekistan honey productivity and adaptability to our climatic conditions of various imported bee families, our scientists Turaev O.S., Nikadambaev X.K., Maxmadiyarov M.O., and Eshdavlatov O.Z reflected in scientific research works.

However, the influence of the ecological environment of our republic on the quality indicators of honey has not sufficiently studied in the conducted researches. Therefore, conducting research on the influence of the ecological environment on the quality indicators of honey is of great scientific and practical importance.

METHODOLOGY

The quality indicators of honey are its physical properties, such indicators are the number of diastase, acidity, density, water content of honey, sugar and dry matter content, and were checked based on the requirements of GOST 19792-2001 "Natural honey. Technical conditions" .

For this, 15 samples of honey from different regions of Tashkent region studied. Honey from mountainous Parkent district at an altitude of 1800 meters above sea level, and samples of honey from ecological areas of Qibray and Almalyk districts studied.

RESULTS

Pure honey is rich in minerals and carbohydrates. Natural honey has a level of biological activity and is quickly absorbed by the human body [1,2]. The biologically active property of honey depends on the activity of diastase enzyme in it. The diastase enzyme in honey breaks down at high temperature for a certain period and produces the amylase enzyme [2]. It proven that the faster the diastase enzyme breaks down and produces the amylase

enzyme, the higher the quality of such honey. Therefore, the number of diastase is one of the main enzymes determining the quality indicators of honey [1,3]. The measurement of diastase number measured in the GOETHE unit according to the indicators of modern GOST requirements.

In our research work, we studied the influence of ecological environment on the quality indicators of honey collected from different ecological regions of Tashkent region. For this purpose, we collected 5 honey samples from each experimental group accepted for the CIS countries and according to GOST requirements. The families of bees in the II experimental group located in the Parkent district of the Tashkent region, located at an altitude of 1800 meters above sea level, collected flowers from nectar-bearing plants typical of mountain and sub-mountain climatic conditions.

The bee families of experimental group I collected flowers from the agricultural plants planted in the agricultural fields of Kibray district, and sometimes they fed with 50% sugar syrup for a short period. Bee families in experimental group III constantly fed with sugary juice because they are located in the territory of Olmalik city and the amount of nectar-bearing plants in the territory of the city is low.

When determining the physical properties of honey, we checked the diastase number of honey, the total acidity of honey, and the density of honey based on the GOST standard adopted for the CIS countries [3,5]. We proved that the physical properties of honey are influenced by the environmental environment, especially temperature and humidity, by determining the diastase number of honey, the total acidity level of honey, and the density of honey.

Diastase (amylase) content of honey When honey is heated above 500C and stored for a long time (more than one year), the activity of diastase is partially or completely lost. According to data, adulteration of honey leads to a decrease in enzymes [5]. Determination of diastase activity is based on the property of this enzyme to break down starch into amyladextrin [5,6]. This quantitative indicator is determined by the number of diastase (Goethe unit), which is the decomposition of diastase (amylase) in 1 g of honey (on the basis of dry matter) at a temperature of 40±10C for one hour [7,8].

Table 1 below shows the diastase activity of honey collected from different ecological regions.

Table - 1

Diastase activity of honey

Indicators	GOST 19792-2001	Experimental groups		
		I experimental group	II experimental group	III experimental group
Quantity of diastase	at least 5,0 Goethe	8,0**	21,0***	3,9**

** - P>0,99; *** - P> 0,999

According to the data in Table 1 above, taking into account that the quality of the honey product is determined by the amount of diastase number, it can be said that the amount of diastase number of the honey sample of experimental group I is 8.0 Goethe units, and the amount of diastase number of the honey sample of experimental group II is 21.0 Goethe units and it found that the amount of diastase number of the honey sample in experimental group III was 3.9 Goethe units.

The amount of diastase in the sample of honey from experimental group II is 30.0% higher than the amount of diastase in the sample of honey from experimental group I, and the amount of diastase in the sample of honey from experimental group III is 34.1% higher, which indicates that the quality indicators of the honey sample collected from an ecologically clean area are high. (R>0.999). It can be seen that the amount of diastase number in the honey sample of experimental groups I and II met the requirements of GOST, but the amount of diastase in the honey sample of experimental group III did not meet the requirement of GOST.

The general acidity of honey depends on the presence of various acids in it - malic, amber, formic, citric acids, salts - residues of phosphorus salts and proteins [9,10]. Acids are found in honey in the form of free and bound radicals, they are synthesized as a result of enzymatic breakdown and oxidation of sugar, passing into honey from nectar, lychee, pollen and salivary glands of worker bees [10,11].

Complex chemical, physical and enzymatic processes take place during ripening and storage of honey [5]. During the initial honey collection period, honey contains mainly acids that passed along with the nectar [11]. After that, organic acids collected because of enzymatic decomposition of sugar in honey [12]. The general indicator of the change in the acidity of honey measured in the pH unit. In this case, the hydrogen indicator provides the activity of hydrogen ions in the honey solution [12,13], [10, 16.].

We determined the total acidity of honey using the COMBO Ph & ORP WATERPROOF laboratory instrument. We measured 100 ml of a 10% honey solution in a chemical glass beaker and held the COMBO Ph&ORP WATERPROOF laboratory instrument in the honey solution for 10 seconds. The general acidity level of honey in honey samples collected from different ecological regions in Tashkent region presented in table 2 below.

Table - 2

The total acidity level of honey

Indicators	GOST 19792-2001	Experimental groups		
		I experimental group	I experimental group	I experimental group
Total acidity	Not more then 4,0 $см^3$	2,4 sm^{3**}	3,0 sm^{3**}	0,9 sm^{3**}

** - P>0,99; *** - P> 0,999

According to table 2 above, the total acidity level in the honey samples is 0.9 cm3 in experimental group III, 2.4 cm3 in experimental group I and 3.0 cm3 in experimental group II, or the total acidity level in experimental group III is 1.5 compared to experimental group I It found to be less than %, and 2.1% less compared to the II experimental group.

It found that the level of total acidity in experimental group II was higher by 0.6% compared to experimental group I and by 2.1% compared to experimental group III. The acidity level of honey samples taken from all experimental groups was between 0.9 cm3 and 3.0 cm3, and the average indicator of acidity level found to be 1.95 cm3.

Another aspect that represents the quality indicators of the honey product is the density of the honey [15]. The density of any substance is the

ratio of the volume occupied by this substance. According to the internationally accepted standards, the average density of honey is 1.4-1.5 kg/l. is [16].

If the density of honey is less than this indicator, it indicates high moisture in honey, and if it is higher than this indicator, it indicates that various additives, such as sugar, starch, flour, added to honey. The density of honey influenced by such factors as climate factors, honey ripening and harvesting time, the amount of water in honey, and the chemical composition of honey [17].

According to information, if cells filled with honey in frames are not covered with a wax layer, such honey is considered incomplete [12,15]. Because the fermentation process has not been completed in such honey, the beneficial properties of honey , i.e. vitamins B1, B2, B3, B6, microelements such as magnesium, potassium, iron are not synthesized 1,4 - 1.5 kg/l. corresponds to.

In a number of countries of the world, the average density of honey is a characteristic that determines the quality of honey, for example, it is 1.45 g/ml in Australia, 1.47 g/ml in Canada, and 1.41 g/ml in Russia [17].

For this purpose, in the study of the average density of honey in Tashkent region, we used an oriometer device that measures liquid density in laboratory conditions. For this, we prepared a 10% solution of honey samples collected from all experimental groups. We put a 10% solution of honey in a 1-liter glass container of the oriometer device and dropped the glass mercury part of the oriometer into the glass container. We measured the amount of water in honey with a refractometer, and the temperature of honey in room conditions with a thermometer designed for measuring the temperature of liquids.

Experienced beekeepers prefer to leave a honey product with a moisture content of 15-17% for their own needs. However, honey with 20-21% moisture considered a sign of poor quality. Honey moisture content of 18-19% or an average of 18.5% accepted for mass consumption and sale of honey worldwide [16].

The average density of honey collected from different ecological regions of Tashkent region presented in table 3 below.

Table - 3

Average honey density, kg/l and water content, %

Experimental groups					
I experimental group	Average density, kg/l				
	1,422	1,423	1,425	1,422	1,426
	Average temperature of honey, t^0				
	$19,9^0C$	$19,8^0C$	$19,7^0C$	$19,1^0C$	$18,7^0C$
I experimental group	Average density, kg/l				
	1,429	1,426	1,426	1,422	1,429
	Average temperature of honey, t^0				
	$18,0^0C$	$18,6^0C$	$18,7^0C$	$19,5^0C$	$18,0^0C$
III experimental group	Average density, kg/l				
	1,409	1,415	1,409	1,415	1,416
	Average temperature of honey, t^0				
	$20,0^0C$	$19,9^0C$	$20,0^0C$	$19,8^0C$	$19,7^0C$

According to table 3, it can be seen that the average density indicators of honey samples from all experimental groups were different. It found that the average density of honey in experimental group II met the requirements of international GOST.

According to the data in Table 3 above, the average water content in the honey samples of experimental group I at an average temperature of 20.10C is 19.1%, and the average density is 1.423 kg/l, while in experimental group II the average amount of water at an average temperature of 18.60C is 18.3 %, and the average density is 1.426 kg/l, and in the III experimental group, the average density is 1.412 kg/l in the case where the average amount of water is 20.7% at an average temperature of 20.50C.

It found that the average density of honey in experimental group II is higher by 0.003% compared to honey samples in experimental group I, and by 0.014% compared to honey samples in experimental group III. The average water content of honey and honey in experiment group II experiment I. It was found that the average water content of honey in group III is 0.5% less than the average water content of honey in experimental group III. These data indicate that the average density and moisture content of honey in experimental group II meets the requirements of international GOST, which in turn means that the quality indicators of honey are high.

CONCLUSION

The amount of diastase, acidity level, and density, which determine the quality of honey products, studied in different ecological regions. Among them, the Goethe unit, which determines the diastase number of honey, is located in the mountain and sub-mountain region by 30.0% compared to experimental groups III and I in experimental group II and 34, It was found to be 1% higher.

The main indicator representing the quality indicators of the honey product, the high amount of diastase number, density and acidity level was observed in bee families of experimental group I (mountain region) (21.0 units). The lowest indicator of diastase count was found in bee families of experimental group III (urban area), and it was found that these bee families were constantly fed with sugar syrup.

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