

RESEARCH METHODS AND ANALYSIS USED TO DETERMINE FAKES IN FOOD (HONEY)

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Abstract

This work had the purpose to analyze the quality of five types of honey, methods and laboratory techniques to detect adulteration of foodstuff. After investigation and determinations, after an analysis of the results obtained it can be concluded that all five varieties were natural without added sweeteners or other food additives. It should be noted that honey used in the analysis was obtained from private local beekeepers in the county of Sibiu, without being bought from a supermarket network or food markets of the city.

Key words: honey, identification, quality, results, Sibiu, Romania

INTRODUCTION

In its natural form, honey is rich in minerals, vitamins, enzymes, amino acids and carbohydrates. However prepared, cooked, loses many of these nutrients, they transformed into cells of toxic, harmful to the human body. Therefore, honey should be consumed exactly as 'cooked' by bees, without other interventions or additions. Plant flowers pollinated by bees and butterflies [7-11] insects around, they generally live strong colors and scents [14].

Unfortunately, in the market of Romania nearly half of the sold is counterfeit or enhanced with other additives causing enough inconvenience to consumer health [5]. Market in Romania accounts for 20,000 tons of honey annually.

A recent journalistic approach revealed that 10 jars of honey, chosen randomly from several supermarkets [10], contained adulterated or inferior quality honey than the normal one, shown on the label.

In laboratory [6] tests, it has been found that the honey containing glucose in the supermarket industry, sugar molasses, corn powder, coloring and gelatin [13]. Only traces of pollen, although on all the jars it was mentioned "natural honey" of linden, locust, polyfloral, sunflower[11]

First, natural honey has a specific flavor and provides a smooth sensation when swallowed. It also has natural impurities: pollen, micro wax and propolis sometimes. It has a fine texture, ooze and does not foam.

Instead, counterfeit honey has a stench or has no flavor. It can be separated into layers and is clear - no impurities. Spread the bread lightly and not least, fake foam product. The forgers and claims cost. Serious beekeepers sell honey in a jar of 500 grams at the price of Lei 10-12 lei and sold fake honey for Lei 15. The sellers tell the clients that the proof that their honey is natural is its cleanness and the lack of impurities.

MATERIALS AND METHODS

To detect adulteration of honey in the laboratory (Photo 1.), there were used five types of honey supplied from various local producers [1,2,12].

Several methods of analysis [6] were used for the detection of counterfeit, working method and the results are presented in the work ahead:

- Identification of Hidroximetil furfural (Hmf) using Fiehe method;
- Identification of sugar syrup added in honey;
- Determination of electrical conductivity of honey;

-Determination of using Gothe diastase index.

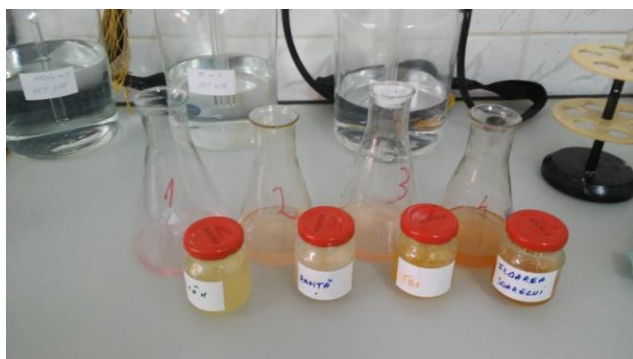


Photo 1. Preparing samples for analysis honey (orig.)

RESULTS AND DISCUSSIONS

Hidroksimetil furfurol is an intermediate product resulting from the degradation of hexoses heat treated with an acid. Following fakes artificial sucrose, glucose and fructose releasing results degrade HMF (Photo 2).



Photo 2. HMF identification method Fiehe (orig.)

Hidroksimetil furfurol formed with resorcinol, in a hydrochloric acid medium, a deep red colored complex.

In a mortar it is put 5 g honey, and about 25 ml of diethyl ether and they are milled for five minutes, the ether evaporates to be completed, if necessary. The ether extract was put into a porcelain crucible and was evaporated at ambient temperature[3].

Over the residue there were added a few drops of the solution of resorcinol. In the presence of HMF, a red colour appears which is increasing over time. If a pink or orange colour appears and disappears within five minutes, this is not considered.

If it is crystallized, we must look carefully at the crystals in the honey meal.

But because the experiment was conducted

only on honey assortment of cornflowers, it has not taken the advantage of this feature.

After adding drops of resorcinol staining orange to red coloration but disappeared after 5 minutes which certifies that in the honey, it has been added sugar syrup, honey is a natural product.

Identification of sugar added syrup in honey

To 5 ml of 20% aqueous solution of honey, 2.5 g of lead acetate and 22.5 of methyl alcohol. If the addition of sugar syrup abundant sediment appears a yellowish white (Fig.3.).



Photo 3. Identification of sugar added syrup in honey (orig.)

The result showed the absence of sugar in honey syrup which led to the conclusion that honey is natural, and in its composition there are only specific ingredients.

It is essential that the bees themselves to procure the nectar of flowers and then to convert sucrose into glucose and fructose nectar.

Some beekeepers in order to get high profit, used to add sugar syrup, but this is an improper action for a professional.

This natural honey must not have more than 20% water, as bees 'capacity' to fill the combs cells develop only if the water evaporated in this proportion. Also, "saccharification" is another criterion that certifies the originality

of honey and it is important to know that sugared honey is not damaged.

Determination of electrical conductivity of honey

The electrical conductivity of honey (Photo 4) is directly related to the concentration of inorganic salts, organic acids and proteins.

This parameter shows high variability depending on the floral origin and considered the best to differentiate between different floral origin honey.

Electrical conductance [4] honey lies between 280-523 $\mu\text{S} \cdot \text{cm}^{-1}$. Electrical conductivity of honey ends with a conductivity at 20% solution in ultra pure water and was measured at 200°C.



Photo 4. Determination of electrical conductivity of honey (orig.)

Table 1. Determining conductivity results

Honey tye	Electrical conductivity $\mu\text{S} \cdot \text{cm}^{-1}$
Corn flowers honey	415
Rape honey	192
Sunflower honey	488
Acacia honey	180
Lime honey	378

Determination of using diastase Gothe index.

In the natural honey, there are several enzymes. Amylase is the enzyme with the highest resistance to thermal treatment, which is the last to be destroyed.

Based on this characteristic, amylase can be used as a general assessment test (enzyme or Diastase index) for the quality of natural honey (Photo).

Sugared honey must be subjected to heat treatment max. 45°C, otherwise Diastase index can reach very low values, even 0. The same remarks for adulterated honey.

Diastase index is defined as the number of ml of a 1% solution of starch, which was converted to dextrin for one hour at a temperature of 45°C and pH optimum, the amylase contained in 1 g of honey.

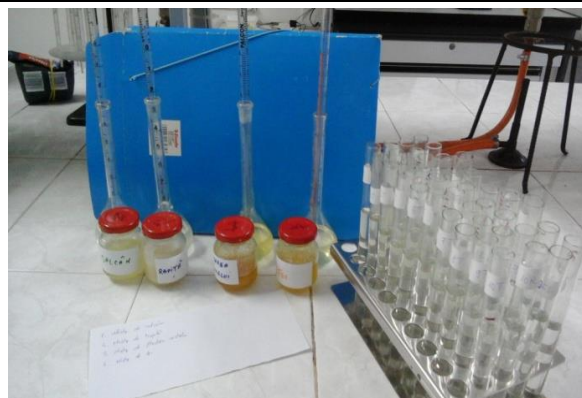


Photo.5. Determination of using index diastase Gothe (orig.)

A honey well stirred solution is placed in test tubes (numbered 1-10) in decreasing amounts, according to Table 1. Pipette 0.5 ml of each tube of acetic acid and 0.5 ml of sodium chloride. Further, in water content of each volume of 11 ml tubes, they are homogenized.

In each tube it is added 5 ml starch solution 1%, the it is homogenized again by repeatedly turning their content and then the tubes are inserted into a suitable stand in thermostat set at 45°C. The water from thermostat exceeds 1 cm or 2 cm liquid level in the test tube. From this moment they are timed for 1 hour.



Photo 6. Diastase index result in honey Rape (orig.)

After the mentioned time expired, the tubes were immediately cooled into ice water to stop the activity of amylase, and then they are arranged in an increasing order in the state. To each tube it is added a drop of iodine solution and mixed by inversion [3].

The tubes with the lowest content of honey, the starch hydrolyzation was not entirely, a blue color has appeared. The tubes where the starch was completely hydrolyzed, there were a range of colours: white, yellow, orange, red tic, purple, violet.

To determine the index Diastase, there were weighed about 5-6 g of honey from the five

analyzed varieties. The weighing was done using the analytical balance for 4 decimal places: Lime honey 5.0781 g, Acacia honey 5,0745 g, Rape honey 5.0355 g, Polyfloral honey 5.0377 g and Sunflower honey 5.0993 g.

The weakening the amylase activity (below the set) or its destruction (irreversible inactivation) can be found in many situations: warming honey brutal led to the inactivation of enzymes; the honey of several years old and kept at medium temperature, honey from the bees intensively fed with sugar syrup (Diastase index has a low value); adulterated honey, especially with artificially inverted sugar syrup.

However, there are situations when a very high value of Diastase index is wrong. One of these is recorded for the fermentative alteration, when most of amylase is developed by yeast fermentation. In this case Diastase index tends to 50 or even exceeds this level.

Another situation occurs when honey is adulterated with added malt extracts or sweet syrups prepared by enzymatic hydrolysis of starch.

CONCLUSIONS

Through this work there were highlighted the natural qualities of the 5 types of honey analyzed (sunflower, polyfloral, rape, acacia, lime), produced by bees without the artificial intervention of the beekeeper.

It is known that some beekeepers give the bees a kind of sugar syrup processed into a low-quality honey.

From these analyzes it was concluded that the bees have collected nectar from flowers and then turned nectar sucrose into glucose and fructose. All sorts of the analyzed honey types led to the conclusion that the honey was natural, even organic, because all the honey types had a water content below 20%. This was due to bees 'capacity' to fill the cells and put honey into combs only after the water evaporated until this proportion.

Candied or crystallization process is quite naturally and does not represent a deterioration of honey. Moreover, honey adulterated is not sugared. It's just a matter of taste, the choice between fluid and crystallized honey. Some Nordic nations even prefer to consume only crystallized honey because they find tastier and is safe natural.

On the other hand, sugared honey can be "solved", that is, it can be brought back to a fluid state by

boiling in a saucepan jar with water. But unfortunately, such honey-crystallized lose some of its properties.

Natural honey crystallizes very quickly. The only honey type which does not crystallize is acacia honey.

The crystallization starts kidnapped from the honeycomb.

Linden, polyfloral, berries honey crystallizes in a few weeks from harvest and storage.

Then, it comes acacia honey or false honey, enriched with honey syrup sugar/glucose in a certain percentage or even honey syrup made from sugar/glucose 100%.

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