Laboratory lesson: 7

Topic: Detection of adulteration in honey

Purpose of the work: To teach students how to determine the quality of honey.

Required raw materials and equipment: Iodine tincture, pipette, honey solution, glass flask, 5% tannin solution, measuring flasks, water bath, thermometer.

Determining the quality of honey is considered to be of a certain importance. There is a significant difference between different types of honey — properly matured and pure honey, if stored correctly, can last for hundreds or even thousands of years without spoiling. Typically, honey that is released for consumption undergoes thorough laboratory analysis, and only after it is deemed suitable, a certificate is issued and permission is granted for sale and use.

The chemical composition and nutritional value of honey are very diverse and largely depend on climatic conditions, the season, the type of plants from which the nectar was collected, and other factors. It has been identified that modern honey contains around 300 different substances. About 100 of these are found in all types of honey. The main components of honey are sugar substances, which can constitute up to 80% of its content. The main sugars in honey are glucose and fructose, which together make up 80–90% of the total sugar content. Many studies show that glucose content in honey ranges from 22% to 41%, while fructose ranges from 27% to 44%.

In addition, honey contains 2–7% sucrose, 0.3–0.5% proteins, 0.3% organic acids, 0.3–0.6% ash, and also vitamins such as B1, B2, B3, B6, C, K, and E.

Procedure

Detection of flour or starch added to honey

In many cases, honey is adulterated by adding starch or flour. To determine whether honey has been adulterated in this way, dissolve 2–3 milligrams of honey in distilled water, boil the solution, and then allow it to cool. After cooling, add a few drops of iodine solution (prepared from 1 gram of crystallized iodine, 2 grams of potassium iodide, and 300 milligrams of distilled water), and observe the reaction. If a bluish color appears, it indicates the presence of starch or flour in the honey.

If flour or starch is added to honey, it may take on a crystal-like appearance similar to that of natural honey. This can be detected easily: take 2–5 ml of honey and place it in a glass container. Using a pipette, add a few drops of iodine tincture and observe the result. If the color of the honey changes to bluish, this indicates the presence of starch or flour.

Detection of sugar syrup added to honey

To identify whether sugar syrup has been added to honey, add 5–10 drops of a 5% silver nitrate ($AgNO_3$) solution to 2–3 milligrams of honey dissolved in distilled water. If a whitish turbidity forms and a precipitate appears, it suggests that sugar syrup has been added to the honey.

Sometimes, honey is also adulterated by adding starch syrup. To detect the presence of starch syrup, add a few drops of 10% barium chloride ($BaCl_2$) solution to 2–3 milligrams of honey dissolved in distilled water. The formation of a precipitate indicates that the honey is not pure.

To detect the adulteration of honey with sugar, a small amount of silver nitrate (lapis) is added to a 5–10% aqueous solution of honey. The formation of a white precipitate in the solution indicates the presence of added sugar in the honey.

Sometimes, honey is also adulterated by adding various insoluble substances. For example, corn flour and potato flour are among such substances. To detect this type of adulteration, dissolve one tablespoon of honey in distilled water in a 0.5-liter jar. In this case, pure honey will dissolve completely in water, while the adulterants will either float to the surface or settle at the bottom as sediment.

Detection of Gelatin Added to Honey

If gelatin is added to honey, it becomes thick and appears similar to natural honey. To detect this, take 5 ml of a diluted honey solution (1:2 ratio with water) and add 5–10 drops of a 5% tannin solution. Observe the reaction. The appearance of white, thread-like precipitates indicates the presence of gelatin in the honey.

Typically, clear, transparent, and colorless honey is derived from white acacia or white clover. If the honey has an amber hue, it is likely from sunflower. If it is dark

amber, it may come from buckwheat, and if it is light amber, it could be from purple flowers such as alfalfa.

Determining the Scent of Natural Honey

Natural honey is typically collected from various types of flowers. It has a pleasant, floral aroma, and in most cases, it carries the distinctive scent of the flower from which the nectar was gathered. To detect the scent of honey more clearly, a small sample can be gently heated.

For this, take a 30-gram sample of the tested honey and place it in a sealable glass container. Close the lid tightly and place the container into a water bath heated to about 40–45°C for 10 minutes. After heating, open the container and smell the honey. The type of flower from which the honey was collected can often be identified by its aroma.

For example, monofloral honey — honey collected from the nectar of a specific plant species — will emit the scent of that particular plant, and its composition will not include nectar from other flowers.

Fresh natural honey is typically liquid and slightly viscous. When poured from a spoon, it flows in thick streams, forming long, stretched drops. Usually, after 1–2 months, natural honey begins to crystallize and becomes solid.

Record the laboratory results conducted above in a table.

Organoleptic evaluation of honey quality.

№	Appearance	Color	Taste	Smel	Consistency
1					
2					
3					
4					

Questions:

1. What materials do we use to extract starch?
2. What types of starch do we know?
3. How is the naturalness and quality of honey determined by organoleptic methods?
4. What is the difference between natural honey and artificial honey?

5. How is the scent of natural honey identified?