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SAMARKAND STATE UNIVERSITY OF VETERINARY MEDICINE , LIVESTOCK AND BIOTECHNOLOGIES

Faculty of Veterinary Diagnostics and Food Safety

"Veterinary and Sanitary Expertise"

Faculty of Veterinary Prevention and Treatment
608401 00- Veterinary Medicine Education Program
For students of group 411, 4th grade

" Veterinary and sanitary expertise"

the practical training on the topic of “ Laboratory testing of honey ”

open lesson

Development

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“ Laboratory testing of honey ”
Teaching technology of practical training .

Time : 2 hours	*Number of students: 15*
Training session format	Laboratory exercise
Training plan	1. Determination of the invert sugar content of A sal 2. Determination of diastase enzyme activity
Lesson Objective: Conduct laboratory tests on various honey samples to determine	
Pedagogical tasks: - consolidate the concepts of honey in students' minds; - taking samples from suspected honey ; - determining the freshness of honey samples through laboratory tests ;	*Learning outcomes :* Students: - they will gain an understanding of honey , acquire knowledge such as sampling, performing reactions, and determining density ; - They will learn organoleptic and laboratory methods for determining the high quality of honey.
Teaching methods	Laboratory exercises, small group work , brainstorming
Form of formation of education	Collective group
Educational tools	Lesson plan, video projector, handouts on the topic of the laboratory exercise : honey , laboratory equipment, reagents, instructions, developments.
Teaching methods	Auditorium equipped with special technical equipment
Monitoring and evaluation	Oral survey: quick – survey , test .

Technological map of practical training

Work stages and time	Activity content	
	Educator	Learner
Stage 1. Access to training materials (10 min.)	1.1. Greeting , checking attendance , checking students' readiness for class. 1.2. The essence of the topic, its purpose, and the expected results of the training session are announced.	He listens , he writes .
2 – a garden . Home (6 0 min .)	2.1. Attracting student attention and knowledge Quick Q&A to determine levels (Brainstorming Method Appendix 1) 2.2. The teacher explains the lesson plan using visual aids. (Appendix 2 using the cluster method) 2.3. Emphasizes that students should pay attention to and write down the main concepts of the topic. 2.4. Divide the group into small groups and assign each group a task. (Method of working in small groups, Appendix 3) 2.5. The teacher explains and demonstrates how to determine the density of milk by taking samples of milk . 2.6. The teacher supervises the work being done by the groups and provides instructions.	2.1. Hears . In turn says the topics . He thinks , he answers . 2.2. Discusses the content of diagrams and tables . Asks questions and notes key points . 2.3. He remembers, he writes .
Stage 3 . Final (10 min .)	3.1. Concludes the topic , draws students' attention to the importance of the work done in their future professional activities. 3.2. Evaluates the group's work; 3.3. Gives homework assignments and introduces assessment criteria.	They conduct self- and peer evaluations. They ask questions . They write the assignment.

Learning elements : Mastering milk sampling methods, quickly determining the freshness of milk by determining its density .

Basic concepts on the topic : Hydrometer, pycnometer, flask, cylinder, laboratory scales

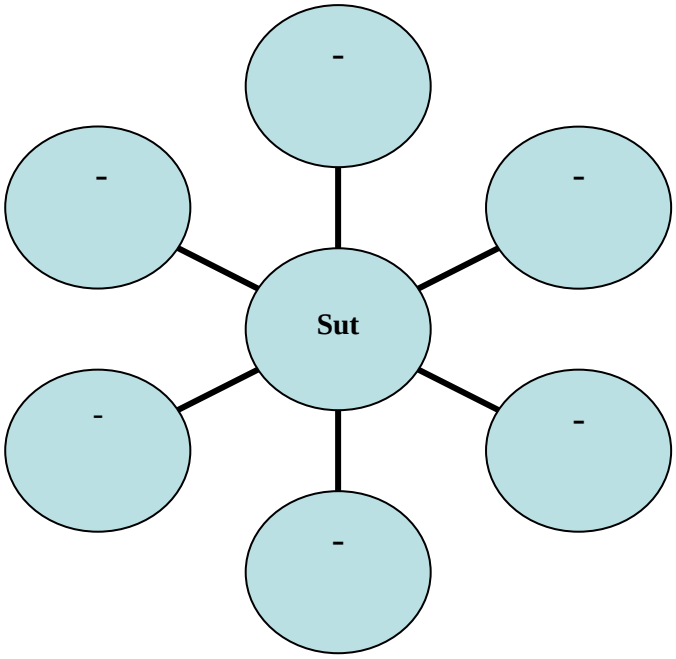
Appendix 1

Brainstorming method

1. What is diastasis ?
2. What is invert sugar.
3. Laboratory testing of honey .

Appendix 2

Cluster method



Appendix 3

" WORKING IN SMALL GROUPS . "

Working in small groups ensures student engagement in class, gives everyone the right to participate in discussions, provides an opportunity to learn from each other in the classroom , and teaches them to value the opinions of others.

Determining the density of milk .

Honey is a food product produced by bees from the nectar of flowers. The owner of honey brought to the market for sale must have a certificate or veterinary certificate (form No. 2). This veterinary certificate contains general information about honey, and if bee colonies have been treated with antibiotics, it is sent to the laboratory to determine the presence of drug residues in such honey.

Average sampling. Honey for sale on the market is brought in wooden barrels, flasks, stainless steel, glass, enameled containers.

A sample is taken from different parts of the same container. The average sample taken from many containers should characterize the quality of the honey as a whole. Before sampling liquid honey, the honey is thoroughly mixed, then the sample is taken. A “sipper” is used to sample crystallized honey.

According to the regulatory program of veterinary and sanitary expertise, a sample is taken from each individually tested honey 100 gif it is intended to determine the water content of the honey 200 g.

Organoleptic testing. Honey used for consumption is tested for various purposes: to determine whether it is obtained from the nectar of flowers or collected from plant sap and to determine whether it is adulterated. The organoleptic testing method determines the color, consistency, aroma and taste of honey.

Figures 31 – 32. *Checking honey for adulteration.*

Color. The color of honey varies depending on the nature of the coloring substances contained in the nectar of plants. In addition, the color of honey is affected by its origin, the time of collection, and other factors. When separated by color, honey can be clear white, cotton, raspberry, clear yellow, brown, and other colors.

Aroma. The aroma of honey is determined twice: before determining the taste and during determining the taste. The aroma of honey intensifies after honey is placed in the oral cavity. If the aroma of honey is not felt during the examination, the honey under examination must be heated. To do this, 40 ghoney is placed in a glass, around it, the mouth is tightly closed, and then heated in a water bath at 40-45 ° for 10 minutes, then the glass lid is removed and the degree of aroma of honey is determined. Determining the aroma of honey is an important

indicator in the organoleptic evaluation of honey. The aroma of honey can be weak, strong, delicate, pleasant and unpleasant.

Taste. All available honeys have a sweet, pleasant taste. Honey with a sour, bitter taste is not allowed to be sold.

Consistency. If the consistency of honey is liquid, it indicates that it contains a lot of water and is not yet ripe. Harvested honey is liquid for the first 3-10 weeks, and then crystallizes and hardens.

Identifying impurities in honey. Honey may contain dead bees or parts of their bodies, larvae, pollen, flowers, and various other things. In addition to these, there are also impurities that are visible or invisible to the naked eye. Visible impurities are identified in two ways:

1. 50 ghoney is completely dissolved in 50 ml. of hot water. The resulting solution is transferred to a colorless cylinder, where various impurities rise to the surface of the solution or sink to the bottom of the cylinder.
2. 1 cm2 is placed on the glass ' and 50 ml of honey is poured onto it. Then the glass is placed in a 60 º drying cabinet. In this case, the honey on the mesh should pass without residue into the glass below.

Mechanical impurities that are not visible to the eye are detected using a microscope. If the honey being sold contains dead bees or parts of their bodies, larvae, and other impurities, they are cleaned and added to the next batch of honey, and then sold.

Identifying signs of fermentation. Unripe honey contains 22 percent water, which facilitates the growth of yeast cells, which are constantly present in the honey.

As a result of the stirring, air bubbles are released from the entire surface of the honey, which gives it its unique aroma.

Honey that has begun to ferment is not available for sale.

Laboratory testing. Preparation of working solution for honey testing.

For most laboratory tests, a 1:2 honey solution is prepared. To do this, 60 ghoney is weighed into a large flask and 120 ml of warm distilled water with a temperature of 30-40 $^{\circ}$ C is added to it. Then the honey is shaken until completely dissolved, then cooled to 15 $^{\circ}$ C. In production, the solution prepared in this way for laboratory tests is called **"honey solution"** . To determine the amount of biochemical tests, a 0.25-10 percent honey solution is prepared and the dry matter of honey is taken into account in the calculation. The amount of honey solution of a given concentration relative to its dry matter is calculated using the following formula.

$$X = \frac{M \cdot V}{S}$$, where

X is the amount of honey solution (ml) relative to dry matter.
M is the mass of the sample obtained (g).
V is the amount of dry matter in honey (percentage).
S is the concentration of the given honey (percentage).

$X_1 = X - M$, where

X_1 – the amount of water (ml) used to prepare a honey solution of a given concentration.

X is the amount of honey solution (ml) calculated relative to the dry matter of a given concentration.

M is the mass weighed on the scale (g).

Example: if the mass of the honey being extracted 6 gis 20 percent water, a 10 percent solution should be prepared from it. This means that the dry matter content of the honey being tested is 80 percent (100 – 20 = 80).

The total amount of 10 percent honey solution obtained is as follows.

$$\frac{6 \cdot 80}{10} = 48 \text{ ml.}$$

That is, 6 gto prepare a 10 percent honey solution from honey, 42 ml of water must be taken (48 – 6 = 42).

Determination of water content. Honey sold on the market is allowed to be sold if it contains up to 21 percent water. A high water content in honey indicates that it is immature or that a sugar solution has been added. Such honey is not allowed to be sold, as it quickly begins to curdle. The water content of honey can be determined using the following methods.

Determination of water in honey using a hydrometer. This method is based on the change in specific gravity depending on the amount of water in the honey, and if there is a lot of water, the specific gravity of honey will be low. A honey solution prepared in a ratio of 1:2 is placed in a cylinder and its specific gravity is determined. The specific gravity of honey in an aqueous solution should not be less than 1.100. Based on the specific gravity and according to the K.Windish table, the dry residue in the honey solution, and then the percentage of water is calculated relative to undissolved honey.

K.Windish table for determining the dry residue in honey solution (1:2) (percentage)

Comparative weight	Dry residue	Comparative weight	Dry residue	Comparative weight	Dry residue
1,101	23.91	1,109	25.64	1,117	27.35
1,102	24.13	1,110	25.85	1,118	27.56
1,103	24.34	1,111	26.07	1,119	27.77
1,104	24.56	1,112	26.28	1,120	27.98
1,105	24.78	1,113	26.50	1,121	28.19
1,106	24.99	1,114	26.71	1,222	28.40
1,107	25.21	1,115	26.92	1,123	28.61
1,108	25.42	1,116	27.13	1,124	28.68
				1,125	29.03

Determination of water using a refractometer. This method is based on the change in refraction, that is, light rays have a certain degree of refraction and reflection depending on the dry matter and water content of honey. The more dry matter honey contains, the higher its refractive index.

When the moisture content of honey is 21 percent, the refractive index is not lower than 1:480. A drop of the honey being tested is dripped onto the lower prism of the refractometer with a glass rod, then the prisms are brought into contact with each other. The boundaries of the light and dark zones are joined together using a screw. The instrument's reading is determined using a scale. After repeating the determination three times, the arithmetic average value is calculated.

The water content of honey is determined based on the table (Table 35). The following factors affect the accuracy of the determined indicators.

1. For the refractometer to function properly, that is, before using the refractometer, the refractometer must be brought into working condition based on the program.
2. should be 20 $^{o\,C.\,If}$ it is above 20 $^{o\,C,}$ 0.00023 is added for every 1 $^{o\,C.}$ If it is below 20 $^{o\,C,}$ 0.00023 is subtracted for every 1 $^{o\,C.}$
3. If the honey has solidified into crystals, it is placed in a test tube, sealed with a stopper, heated to 50 $^{\circ C\,,\,and\,then}$ cooled to 20 $^{\circ C\,.}$
4. The presence of various additional impurities in honey.

Determination of the acidity of honey. Natural honey contains a small amount of organic (formic, malic, citric, malic, lactic, etc.) and inorganic (chloric, phosphoric) acids. The standard expression for total acidity is 100 gthe amount of 0.1 N caustic soda used in titration of honey.

between the water content of honey and the refractive index, expressed as a percentage.

Refractive index at 20 ^{o}	Water quantity	Refractive index at 20 ^{o}	Water quantity	Refractive index at 20 ^{o}	Water quantity
1.5044	13.0	1.4940	17.0	1.4840	21.0
1.5038	13.2	1.4935	17.2	1.4835	21.2
1.5033	13.4	1.4930	17.4	1.4830	21.4
1.5028	13.6	1.4925	17.6	1.4825	21.6
1.5023	13.8	1.4920	17.8	1.4820	21.8
1.5028	14.0	1.4915	18.0	1.4815	22.0
1.5012	14.2	1.4910	18.2	1.4810	22.2
1.5007	14.4	1.4905	18.4	1.4805	22.4
1.5002	14.6	1.4900	18.6	1.4800	22.6
1.4997	14.8	1.4895	18.8	1.4795	22.8
1.4992	15.0	1.4890	19.0	1.4790	23.0
1.4987	15.2	1.4885	19.2	1.4785	23.2
1.4982	15.4	1.4880	19.4	1.4780	23.4
1.4976	15.6	1.4875	19.6	1.4775	23.6
1.4971	15.8	1.4870	19.8	1.4770	23.8
1.4966	16.0	1.4865	20.0	1.4765	24.0

Determination procedure. 100 ml of a 10% honey solution is taken into a flask, 3-5 drops of a 1% alcoholic solution of phenolphthalein are added (1 gphenolphthalein is dissolved in 70 ml of 96% alcohol and 29 ml of distilled water are added to it) and titrated with 0.1 N caustic soda solution until a weak red color is formed. The resulting red color should not disappear within 10 seconds. The titration is carried out twice. The result obtained from the double titration should not exceed ± 0.05. The acidity of honey is calculated from the amount of organic acids formic and malic acids per milliliter of alkali used for titration. The formula is used to determine the percentage of acidity.

$$\text{Formic acid, } X = \frac{a \cdot 0.0046 \cdot 100}{10}$$

$$\text{For malic acid, } X = \frac{a \cdot 0.0067 \cdot 100}{10}, \text{ where}$$

X – acid content in percent

a – (0.0046) is the amount of citric acid (g).

0.0067- the amount of malic acid in 1 ml of 0.1 N sodium hydroxide solution (equivalent weight (g).

10 – amount of honey taken for titration (g).

The acidity of honey is expressed in degrees and 10 gis equal to the amount of 0.1 N caustic soda used to titrate honey multiplied by 10. The acidity of good quality honey in terms of formic acid is 0.03-0.21, and in terms of malic acid is 0.04-0.33. An increase in the acidity of honey indicates the beginning of the fermentation process, a decrease in acidity indicates that the honey has been adulterated.

Identification of honey collected from plant sap. Honey collected from sap produced by bees on plant leaves and stems during dry years, especially during the hottest periods (the second half of June), and sometimes in spring and early autumn, i.e., from the sap produced by "tla", is somewhat different from natural honey in its nature, but it is included in natural honey.

This honey contains more dextrin starch, sucrose, nitrogenous and mineral substances, and less invert sugar than honey collected from plant nectar. Such honey is allowed to be sold, but its containers must be labeled with a blue label ("Plant juice honey").

Organoleptic examination. Honey, collected from the sweet liquid secreted by the plant's leaf sap **,** is clear yellow to dark brown in color. The smell is unpleasant, and the aroma may be weak or absent. The taste is characteristic and bitter.

Questions

1. **How to determine the amount of invert sugar in honey**
2. **How to determine the amount of diastase in honey**
3. **How is honey tested in a laboratory?**

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