1-Practical lesson: Methods for Assessing the Quality of Consumer Goods

The quality of food products is determined using two methods:

1. **Organoleptic method**
2. **Laboratory (experimental) method**

The organoleptic method plays a significant role in assessing the quality of food products. With this method, aspects such as taste, smell, color, consistency, and appearance are evaluated using human sensory organs.

The advantage of the organoleptic method lies in the fact that it does not require high costs, chemical reagents, or equipment, and allows for a quick conclusion about the product's quality. However, its drawback is its subjectivity.

Subjectivity here means that people's sensory perception does not develop to the same extent in everyone. Therefore, different individuals may give different evaluations of the same product's quality. Moreover, the organoleptic method does not allow for expressing quality indicators in numerical values, nor does it provide comprehensive information about the product’s overall quality.

For example, it is very difficult to determine the biological value or safety of a product using this method. However, when quality assessment is conducted with the help of highly qualified and experienced tasters, the margin of error is significantly reduced.

It should also be noted that our sensory organs can quickly detect certain specific and pleasant taste characteristics of a product that are difficult or impossible to determine using other testing methods. For instance, due to the difficulty in identifying complex aromatic substances in products such as tea, coffee, and wine, the organoleptic method remains the only method for determining their quality and type.

In the organoleptic evaluation of food products, taste perception is one of the main indicators that determine their quality.

The primary organ responsible for sensing taste in the human body is the tongue. The effect of food on the sensory organs during consumption was first explained by academician I. P. Pavlov.

Taste buds are located in the mucous membrane of the tongue and the oral cavity, and they are stimulated by solutions of substances that provoke taste sensations. It is estimated that there are over 9,000 taste buds on the tongue, most of which are located at the tip, with the rest on the sides and the back part of the tongue.

There are basically four simple taste types: sweet, salty, sour, and bitter. Other tastes and flavor sensations are combinations of these basic tastes, such as: bitter-salty, sweet-sour, sour-sweet, sweet-bitter, and so on.

The taste and flavor of food products depend on the nature of the product, its chemical composition, and the temperature at which it is tasted.

The substances that give a sweet taste to food products are mainly sugars, polyhydric alcohols (such as glycerin), and others. Many alkaloids (like caffeine, theobromine, quinine) and glycosides (like amygdalin, solanine) have a bitter taste. The sour taste is caused by organic acids (malic, citric, lactic) and mineral acids (sulfates, chlorides).

The smell of food products also greatly affects their quality. All food products have some degree of odor. By their smell, one can determine the type of product, whether it is spoiled or not, and its cleanliness. The main organ responsible for detecting smell is the nose. The smell is transmitted to the brain by the mucous membrane in the nose, which is covered with epithelial tissue.

There are many more odor-producing substances than taste-producing ones. Although there is still no scientifically standardized classification of smells, in practice, they can be grouped as follows: fragrant smell, fruity smell, floral smell, pungent smell, fodder-like smell, sour/spoiled smell, and others.

The sensitivity of the olfactory (smell) organs, like that of the taste organs, depends on various factors such as temperature, the concentration of odor-producing substances, the relative humidity and cleanliness of the room where the evaluation is conducted, and the individual consuming the product.

Compared to taste organs, the olfactory organs have a higher sensitivity. For instance, a person can detect the smell of vanillin when its concentration in 1 cubic meter of air is just 0.2 mg, or skatole at 0.4 mg. A mixture of different aromatic compounds in

products can produce a single, complex smell—for example, the distinctive aromas of wine, cognac, coffee, tea, and cheese.

When evaluating food product quality using the organoleptic method—and according to standard requirements—the indicators of taste and smell are always recorded and described together.

In addition, organoleptic indicators that are assessed through this method also include **color, appearance**, and **consistency** of the product. These characteristics are evaluated using the senses of **sight, hearing,** and **touch**.

The **eye**, being the human visual organ, is used to assess the **appearance, size, color, shape**, **arrangement in containers**, **clarity**, and other similar features of food products.

The **consistency, texture**, and **temperature** of food products are evaluated through **sensory receptors located on the fingertips and in the mucous membrane of the mouth**. By touching a product with the hand, one can determine whether it is hard or soft; or, when consumed, the **tip of the tongue** can instantly sense the temperature of the product.

In some cases, the **quality of a food product** can also be judged by **tapping its surface with an object and listening to the sound produced**.

Currently, significant efforts are being made to improve and enhance the accuracy of the **organoleptic method**. There are several approaches to organoleptic evaluation of products, among which the most widely used are the **point-based evaluation** method and the **comparative evaluation** method.

Point-Based Evaluation Method

The quality of food products is usually assessed using 5-point, 10-point, 30-point, or 100-point scales. When evaluating product quality using a point system, the total score is distributed among various quality indicators.

The advantage of evaluating food products with a point-based method lies in the ability to assign a specific point deduction for each defect or shortcoming in the product. The deducted points are subtracted from the maximum possible score for that indicator. Then, based on a special table from the standard, the exact number of points to deduct is determined.

This method simplifies the work of the evaluation commission and, to some extent, increases the accuracy of quality assessments.

Point-based evaluation is usually based on comparing the tested food product to standard reference samples (etalon products). If there is no reference sample available, then the characteristics of the tested product are compared with the specifications written in the relevant normative-technical documentation for that product.

Sociological Evaluation Method

In addition to the above, there is also a **sociological method** for evaluating product quality.

Sociological Method

The **sociological method** refers to determining the quality indicators of food products based on **consumer opinions**. Consumer demands are studied during food product exhibitions, through **customer conferences**, and by **distributing surveys or questionnaires**.

Expert Method

Nowadays, the **expert method** is also widely used in determining product quality. The expert method involves evaluation based on the opinions of an **expert commission**, consisting of **no fewer than 7 highly qualified specialists** (such as commodity experts, designers, or tasters).

Experimental Method

The **experimental method** is extensively used to determine the **chemical composition**, **physical**, **microbiological**, and **technological properties** of products. This method is further divided into:

- **Physical and physico-chemical methods**
- **Chemical methods**
- **Microbiological methods**
- **Commodity-technological methods**

The advantage of the experimental method is that results are expressed **numerically** and with **high precision**.

Its disadvantages include the **time-consuming** nature of testing, as well as the **requirement for reagents and specially equipped laboratories**.

Physical and Physico-Chemical Methods of Testing

These methods are used to determine the **specific gravity**, **viscosity**, **melting, solidification, and boiling points**, and **optical properties** of food products.

The **specific gravity** and **density** of a product can be measured using devices such as the **areometer**, **pycnometer**, and **hydrostatic scales**. Based on the specific gravity, one can make preliminary judgments about the product's **chemical composition and quality**.

The **melting and solidification points of fats** can provide information about their **nature, purity**, and, to some extent, the **types of fatty acids** they contain. These temperatures are determined by measuring the point at which the fat changes from a solid to a liquid state or vice versa, using a thermometer.

Optical Properties of Food Products

The **optical properties** of food products are determined using the following methods:

- **Polarimetry**
- **Refractometry**
- **Photocolorimetry**
- **Luminescence**
- **Chromatography**

Polarimetry Method

This method is based on the ability of certain optically active substances in solution to change the direction of light wave vibrations.

For example, using a **saccharometer** (a type of polarimeter), one can determine the **percentage of sucrose** in sugar solutions and identify the **types of sugar compounds** present.

Refractometry Method

This method is used to determine the **percentage of fat, water, alcohol, sugar**, and other **dry substances** in food products. It is based on the **change in the direction of light** as it passes from one medium to another or on calculating the **refractive index**.

For example, using a **refractometer**, one can:

- Determine the **water content** in **honey**
- Measure the **dry matter content** in **juices**
- Assess the **purity** and **freshness** of **oils and fats** by evaluating their refractive indices.

Photocolorimetry and Spectrometry Methods

The **photocolorimetry** and **spectrometry** methods are based on a substance's ability to selectively absorb light. Using these methods, the amount of color-giving substances in colored solutions can be determined.

In laboratories, photoelectrocalorimeters such as **FEK-M, FEK-52, FEK-64, FEK-56**, and others are used for photocolorimetry. For spectrometry, more complex devices such as **SF-4, SF-4A, SF-10** spectrophotometers and other models are employed.

These methods can be used to determine:

- The amount of **anthocyanins** in grape wines and grapes,
- The amount of **caffeine** in tea and coffee,
- The amount of **theobromine** in cocoa,
- The amount of **color-giving substances** in fruits and vegetables.

Luminescence Method

The luminescence method allows for the determination of the amounts of **protein, fat, and vitamins** in food products, as well as detecting whether fish and meat products are spoiled or fresh, and identifying diseases in potatoes and vegetables.

This method is based on the property of many substances to emit visible light in various colors when exposed to ultraviolet light.

Chromatography Method

Chromatography is one of the most convenient methods for separating and identifying substances within complex compounds.

Using this method, it is possible to study:

- The **chemical composition** of food products,
- Changes that occur during storage,

- The amount of **odor- and color-giving substances**,
- The amount of **amino acids** in proteins.

Chemical Method of Testing

This method is used to determine the **amount of substances** present in food products that affect their quality indicators. Based on these measurements, it is possible to understand the changes that may occur during the storage and transportation of food products.

The methods for determining the **chemical indicators** that define product quality are specified in special standards.

Microbiological Method of Testing

This method is used to determine the degree of contamination of food products with microorganisms. If the quantity of microorganisms in food products exceeds the standard level or if pathogenic bacteria are present, it indicates poor hygiene conditions in storage areas and non-compliance with sanitary regulations during storage and transportation.

Microbiological control over food products is conducted primarily by **Sanitary-Epidemiological Stations (SES)**, which are the main institutions responsible for organizing and implementing sanitary and anti-epidemic measures in public sectors.

Commodity-Technology Method of Testing

This method is used to determine whether food and agricultural products are suitable or unsuitable for processing or long-term storage. For example, to find out whether certain fruit varieties are suitable for making jams, small samples are first prepared in the laboratory, and based on these, a conclusion is drawn.

Determining Quality Indicators

The quantitative values of quality indicators are determined by methods such as:

- **Measurement** (in the laboratory),
- **Recording**,
- **Calculation**,
- **Organoleptic evaluation**,
- **Sociological methods**,

- **Expert evaluation**.
- **Measurement method** is carried out using various instruments, reagents, and other technical tools.
- **Recording method** is based on tracking and accounting for a specific object or expense (for example, how many times a television breaks down within a given period, or the number of defects in a batch of products).
- **Calculation method** involves estimating a particular quality indicator using theoretical and empirical relationships with other quality indicators. For example, the strength of steel based on its tensile strength is calculated.
- **Organoleptic method** uses human sensory organs to determine specific quality indicators of a product (through sight, hearing, smell, touch, taste, etc.). Usually, quality indicators in this method are expressed in scores.

Sociological Method of Quality Assessment

In the sociological method, the quality of a product is evaluated based on consumer opinions and feedback. Such assessments are conducted through oral surveys among consumers, distribution of questionnaires, and organizing various exhibitions.

Expert Method of Quality Assessment

The expert method is mainly used to evaluate how well products meet aesthetic and ergonomic requirements. This method is similar to the organoleptic method but involves professional experts or expert groups, making the evaluation more objective.

Understanding Quality Assessment

Quality assessment means determining how well a product meets consumer needs. However, quantifying these needs precisely is quite difficult in practice. Therefore, the **quality level** is established.

The **quality level (Sd)** is the ratio of the quality of the evaluated product (U) to the quality of the reference (standard) product (Un):

Sd=UUnS_d = \frac{U}{U_n}Sd=UnU

Here, the reference product's quality is assumed to fully satisfy the need. Assessing the quality level is important for quality planning and shaping product evaluation.

Reference (Standard) Product Quality

The quality of the reference product continuously changes due to scientific and technical progress and changes in consumer needs.

Other Methods for Quality Level Assessment

Besides the method described above, there are differential methods, complex methods, and mixed methods.

Quality Control of Products

Quality control determines the degree to which product quality indicators comply with normative technical requirements and standards. Standards and technical specifications define:

- Functional and ergonomic indicators of the product,
- Reliability and safety requirements,
- Appearance standards,
- Product variety,
- Labeling, packaging, and placement,
- Conditions for transportation and storage.

Product Varieties (Product Types)

- Product varieties are products that differ from each other by one or more quality indicators.
- For example, porcelain items can be classified into varieties based on indicators such as color clarity, processing level, and decoration quality.
- Technically complex products are usually not divided into varieties but are classified as either suitable or unsuitable products.

Product Quality Control

- Product quality control is primarily carried out within the enterprise by the technical control department (TCD).
- The control process consists of the following stages:
  - **Incoming inspection** — checking the quality of raw materials and components.
  - **Operational control** — monitoring compliance with technological requirements during the production process.

o **Acceptance control** — acceptance and labeling of finished products according to quality indicators.

● Product quality is also controlled by authorized state institutions, wholesale buyers, intermediaries, and retail trade enterprises.

● The variety of control types prevents defective products from reaching consumers.

Product Quality Management

● Quality management refers to the processes involved in defining, ensuring, and maintaining product quality from creation through usage and consumption.

● Nowadays, the concept of a quality management system exists, which means managing the entire production and economic activities of an enterprise to achieve quality.

● In modern conditions, certification of the quality system is an important factor in concluding contracts with consumers and gaining a competitive advantage in the market.

Development of Quality Management Systems

● Since the 1970s and 1980s, there has been a shift from quality control systems to quality management systems (TQM – Total Quality Management).

● During this period, several international quality systems emerged, among which the ISO 9000 system (introduced in 1987) became the most important and leading one.

● ISO is the International Organization for Standardization, established in 1947 in Geneva.

Uzbekistan and ISO 9000

● For independent Uzbekistan, obtaining the ISO 9000 standard certificate has become important for industrial enterprises, banks, insurance companies, and others.

● Currently, on average, 10-25 products and services annually obtain this certification.