

**FUNDAMENTALS OF STORAGE OF AGRICULTURAL PRODUCTS.**

Annotation: The most important problem is to reduce product losses. The country's food program provides for reducing losses and improving the quality of products through the widespread introduction of advanced production technologies, processing and storage of it, the use of advanced types of packaging and packaging materials, and the organization of transportation by specialized transport.

Key words: agricultural products, food, quality products.

Processes occurring in agricultural products during storage. When storing agricultural products, they undergo physical, chemical, biochemical and biological processes. Physical and physico-chemical processes include the sorption and desorption of water vapor, temperature changes, deformation and violation of the integrity of solid products, aging of proteins and colloids, the transition of soluble substances to a crystalline state. These processes reduce the organoleptic properties of the products and affect the intensity of spoilage caused by other factors.

Chemical processes include the oxidation of fats with the formation of bitter substances; sugar-vitamin reactions leading to the formation of dark - colored compounds-melanoids; the oxidation of vitamins; the formation of insoluble compounds. The rate of chemical change can be slowed down by lowering the storage temperature.

The biochemical processes are mainly due to the activity of the enzymes of the product (hydrolysis of organic substances, postmortem change, respiration, maturation, germination). Hydrolytic processes occur depending on the activity of enzymes, storage conditions. In living organisms, along with hydrolysis, there is a reverse process - the synthesis of organic compounds. In non-living objects-meat,

fish, eggs-mainly enzymatic hydrolysis occurs. The activity of the enzymes that cause hydrolysis can be reduced by using a low storage temperature.

Postmortem changes occur in the meat after the animal is slaughtered. Glycogen is converted into lactic acid, which accumulates extractive substances and the meat becomes tender, juicy and flavorful.

Respiration is the main redox process of living organisms. It is observed during the storage of grain, fruits, vegetables, eggs, and pre-slaughter animals. There are aerobic and anaerobic respiration.

In the process of aerobic respiration, organisms consume oxygen from the air, oxidize organic substances to form water and carbon dioxide. When breathing, the product's spare substances are consumed: fats, carbohydrates, and organic acids. This leads to a reduction in the mass of the product due to the loss of dry matter and moisture. With intensive breathing, the moisture in the product increases and germination begins, i.e., there are deep changes in the chemical composition, and mass loss increases significantly. The more intense the respiration process, the higher the loss of mass and quality of the product. The intensity of breathing depends on the temperature, humidity and gas composition of the air. With a decrease in the oxygen content in the air and an increase in the carbon dioxide content, anoxic - anaerobic respiration begins. In such conditions, ethyl alcohol and carbon dioxide are formed, and the vital processes are slowed down, the weight loss of the product is sharply reduced.

Maturation is mainly accompanied by the synthesis of complex organic compounds that accumulate in the spare tissues, or the dissolution of pectin substances, as a result of which the fruits acquire a softer consistency. The maturation process can be controlled by temperature, using gases (for example, carbon dioxide slows down maturation, ethylene accelerates it).

Biological processes are caused by the vital activity of microorganisms and insects and lead to a sharp decrease in the quality and even complete spoilage of products. The occurrence of biological processes is possible in case of violation of the sanitary condition of warehouses, containers, the presence of mechanical

damage on the products. The most common biological processes are fermentation, mold formation, and putrefaction.

Fermentation - anaerobic decomposition of various organic substances of the product under the action of microorganisms. Alcohol, carbon dioxide, lactic, acetic, and butyric acids accumulate as the products of the vital activity of microorganisms. The most common types of fermentation are alcoholic, lactic acid, butyric acid and acetic acid.

Alcoholic fermentation is used in the production of bread, beer, wine, kvass, alcohol; lactic acid-in the production of sauerkraut vegetables, cheese, rye bread, fermented milk products. Butyric acid and acetic acid fermentation can cause food spoilage.

Mold formation is the result of the development of mold fungi on the products. The development of mold is observed at high relative humidity. It breaks down the food substances of the product, gives them a moldy taste and smell. On the surface of the product, a fluffy "felt" coating and films of various colors are formed.

Putrefaction - decomposition of protein substances by microorganisms. It occurs when the storage conditions of agricultural products are violated. When rotting, ammonia, indole, and skatol are formed, which are toxic to humans, with a sharp unpleasant smell. Putrefactive microorganisms develop rapidly in a slightly alkaline environment at elevated temperatures.

Along with microorganisms, food spoilage is caused by insects and mouse-like rodents. They destroy the product, pollute the rest of it, and infect it with microorganisms.

During storage, the main factors that cause changes in the quality of products are: temperature, humidity, gas composition of the air, light, microorganisms, and product proximity.

Air temperature is an important storage condition, as it strongly affects the activity of enzymes, the speed of various processes. As the temperature increases,

the consistency of many products deteriorates, mass losses due to moisture evaporation increase, and aromatic substances evaporate.

When storing products, the optimal, most favorable temperatures are required (low plus and small minus, depending on the properties of the product). Sharp temperature changes leading to increased biochemical and chemical processes are unacceptable.

Humidity is the percentage of water in the air. During storage, the relative humidity of the air is determined - the percentage of the actual amount of water vapor in the air to the amount required for full saturation at a given temperature. The amount of relative moisture during storage depends on the properties of the product. High relative humidity is necessary for products with high water content of tissues - leafy vegetables, some fruits, and low-for products with low humidity (grain products, dried vegetables, sugar). Changes in the relative humidity of the air may cause undesirable changes in the quality of the product.

At the optimal storage temperature, the equilibrium humidity is established (the equilibrium of the water vapor pressure in the air and on the surface of the product).

To determine the humidity of the air in warehouses, a psychrometer is used, which has two thermometers located in one frame. One of them is dry and the other is wet. Thermometers show different temperatures. The greater the difference in the thermometer readings, the drier the room air.

Gas exchange has a significant impact on biochemical and biological processes. When storing products in an unregulated environment, the composition of the air includes (in %): nitrogen-78; oxygen-21; carbon dioxide-0.03. Air oxygen causes the oxidation of fats, essential oils, reduces the content of vitamins, changes the organoleptic properties of the product. To improve the safety of products, reduce the oxygen content and increase it. carbon dioxide content.

In the practice of storage, the regulation of the composition of the air, its purity, as well as temperature and humidity is carried out with the help of

ventilation. The most progressive is active ventilation. It allows you to significantly increase the storage load and reduce losses.

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