American Journal of Biology and Natural Sciences
https://biojournals.us/index.php/AJBNS
**ISSN: 2997-7185**

# Chemical Composition of Apple Fruits and Organization of their Storage

**Sharipov Sulton Yangiboevich**
TSAU associate professor

**Received:** 2024, 15, Mar
**Accepted:** 2025, 21, Apr
**Published:** 2025, 16, May



**Annotation:** In the article, the chemical composition of apple fruits and organization of their storage. The types and importance of beneficial elements in apple fruits that are important for human health, as well as the goals and objectives of the research, were determined, Information is given on the organization of storage of late apple varieties "Starkrimson", "Renet Simirenko", "Golden delicacies" and "Boyken" in simple natural warehouses with refrigerators.

**Keywords:** Apples, varieties, chemical composition, quality indicators, biological, physiological, relative air humidity, room temperature.

**Introduction.** Apples are grown in a certain period of the year and are the main source of a number of substances necessary for human nutrition - vitamins, mineral powders, carbohydrates, organic acids, etc. The main task in storing apples is to preserve their physical and chemical composition, i.e. appearance, color, taste, nutritional value, and other properties. Therefore, organizing the storage and processing of fruits and grapes correctly and scientifically can solve the problem of providing the population with these products throughout the year.

In-depth study of the biological and physiological processes involved in the storage of apples and having a clear opinion on this matter is important in keeping the products in good quality. In order for apples to be stored in good quality, it is necessary to know what processes take place in them during storage and what factors of the external environment affect the course of these processes.

Reducing the natural weight loss of apples by just one percent during storage can increase production by tens of thousands of tons. Therefore, we need to pay more attention to fruit storage

and thoroughly study all the issues related to it. The ability of apples to be stored for a certain period of time without deterioration of quality and with minimal weight loss determines their storage stability. The ability of apples to resist damage by microorganisms is called their immunity. These two properties are closely related, and products that are not resistant to storage are usually quickly damaged by microorganisms. The storage stability of products is determined by the period of their storage under favorable conditions. The manifestation of the storage stability of apples and grapes in a certain zone and season, as well as in agrotechnical and technological regime, is called storage stability. Storage stability is usually determined by the percentage of weight loss of products during storage.

In general, the storage suitability of apples is their natural property. Therefore, the same variety can be stored differently under different conditions. The storage stability of apples depends on many factors. If the size, density, thickness of the skin, shape and integrity of the skin, color and other indicators of fruits within a variety are typical for a certain variety, then such fruits will store well. The limitations of the specific properties of fruits reduce their storage stability. Apple products are divided into three groups according to their main characteristics that determine their shelf life after harvesting: early, medium and late ripening varieties. Adaptation to the adverse conditions of the physiological rest period of the products is considered a genetically reinforced property in the process of phylogenesis.

Apples and Grapes are closely related to the variety, growing conditions and storage, and last for several months. The mechanism of physiological dormancy is due to the specific changes in cells and metabolism. During physiological dormancy, natural losses of products are very low, and their quality is almost unchanged.

**Research methods and materials**. It is clear from this that it is an important task to conduct not only the cultivation of fruits and vegetables, including apples, but also the post-harvest processes, that is, the timely harvesting, packaging, transportation and storage of the crop, based on scientifically based recommendations. Ongoing scientific research is being conducted to scientifically substantiate the optimal technological parameters for storing late-ripening varieties of apples grown in different regions of our republic in warehouses of various designs. The storage stability of apples depends on the duration of their post-harvest ripening period. Post-harvest ripening is the period of physiological and biochemical processes that occur in fruits after they are harvested, leading to the full formation of the seed, bud, and fruit pulp. The length of the ripening period after harvest determines the shelf life of the fruit. The longer the ripening period, the longer the shelf life.

The ripening period varies not only between different types of fruit, but also between different varieties. For example, early apples ripen faster than late apples, and late apples ripen faster than winter apples. Changes after the ripening period have a significant impact on the quality and shelf life of the fruit. In order to manage the maturation period, it is necessary to know what processes are going on in them and what factors of the external environment affect the progress of these processes. When fruits are stored, they do not accumulate valuable nutrients and flavoring substances, on the contrary, they decompose. After picking evening and winter apples, the above-mentioned substances accumulate for a certain time, and then decomposition begins. As the apples ripen, the amount of sugar in them increases, and the acid and flavoring substances decrease. In addition, the accumulation of aromatic substances increases. Sugar increases mainly due to the hydrolysis of starch in fruits, the breakdown of glucoside, pectin and hemicelluloses.

During ripening, the ratio of sucrose to monosaccharides changes; during storage, the amount of fructose increases, and the amount of glucose and sucrose decreases. As apples ripen, the sugar content decreases due to their respiration. The sweetness of apples is determined by the amount of fructose, although the amount of sucrose and glucose is higher than that of fructose, the fruit is not very sweet.

During the storage of apples, the acids contained in them break down faster than sugar, so the ratio

of sugar and acids changes. By the end of the shelf life, the fruits are very sweet, and then they become bland due to the loss of acids..

Pectin substances break down during storage to form soluble pectins, which leads to softening of the fruit. Softening of apples occurs from the center of the fruit to the periphery (outer part). The breakdown of pectin substances produces methyl alcohol, which darkens the fruit. Usually, pectin substances accumulate when the fruit is dried.

**Table 1. Amount of organic matter in apple varieties (in %)**

**(before storage 2022)y.**

| Apple varieties | Water quantity | Dry matter | Sugar | Pectin | Ascorbic acid | Slave | Energetic value kcal/kdj |
|---|---|---|---|---|---|---|---|
| Renet Simirenko | 86,9 | 9,1 | 8,9 | 0,8 | 0,8 | 0,7 | 45/191 |
| Golden Delicious | 86,5 | 13,5 | 13,1 | 0,8 | 0,9 | 0,7 | 45/191 |
| Starkrimson | 85,7 | 10,6 | 10,6 | 0,8 | 0,9 | 0,6 | 45/191 |
| Boyken | 85,0 | 11,3 | 11,6 | 0,8 | 0,8 | 0,7 | 45/191 |

During the storage period of fruits, flavoring substances are reduced, and aromatic substances are transformed into other substances (oxidized) under the action of enzymes. During this period, the amount of nitrogenous substances and vitamins in apples decreases. Vitamins in early-ripening apples disappear faster than in late-ripening fruits. Depletion of vitamins is activated when apples are stored at high temperature and air circulation.

Thus, during the ripening period of apples, hydrolytic processes prevail over synthetic processes. As a result, their quality deteriorates and becomes unusable. For this reason, as much as possible, the storage conditions of such apples should be improved, measures should be taken to evaporate water and slow down respiration. In order to stop the evaporation of water and keep the fruits without wilting, it is necessary to increase the humidity and lower the temperature in the fruit and vegetable warehouse. When storing apples, it is important to know their physical properties and to use these properties scientifically in storage. The physical properties of apples and their fruits are of great importance in their harvesting, picking, transportation, and storage.

Physical properties of apples include their water evaporation, transpiration, thermal properties, mechanical hardness, spillability, self-sorting, porosity, etc.

In the process of storage, the products evaporate a lot of water, sweat and as a result wither. The amount of evaporation depends on the type of fruit, variety, morphological damage and its chemical composition. The skin is thin, the waxy foam of the skin is soaked, the cell content is low in protein and colloidal substances, the fruit with low water retention properties and Grapes evaporate water quickly and wither. Wilted fruits spoil quickly and the core is not preserved.

The higher the air temperature, the lower the humidity, and the faster its movement in the warehouse, the higher the rate of evaporation. Small fruits lose water relatively faster than large fruits. The rate of evaporation also depends on the amount of water in the apple. If the apples are watered before picking, the picked fruits will be watery and will quickly evaporate the water content at the beginning of the storage period. Apples that have not been watered for a long time before picking also evaporate water quickly during storage and wilt. Apples evaporate water very quickly in the first days of storage, getting rid of the free water in the fruit. Then evaporation decreases, and as the fruit ripens, evaporation increases. When apples are packed tightly in a container or pile, without any air circulation, they start to sweat. The temperature inside the box or

pile is usually higher than the temperature in the warehouse. As a result, the fruits on the top or on the sides sweat. This causes them to spoil quickly. The moisture on their surface creates favorable conditions for the development of microorganisms.

Apples are cooled artificially - in refrigerators and naturally ventilated with the help of outside air. Ripening of apples and vegetables takes place from - 0.5 to - 3 $^0$C. The ripening temperature of apples depends on the amount of water they contain. The faster apples are cooled, the development of harmful microorganisms and biochemical processes slow down, as a result, the shelf life of the product increases and the shelf life decreases. During freezing, the water contained in fruits and vegetables freezes in different periods. First, free water, that is, water between the cells, and then the water contained in the cells. Apples in small containers and in bulk, small apples usually ripen quickly.

The degree of ripeness of apples is also of great importance for their storage. Apple varieties that are ripe for harvesting and have the property of ripening during subsequent storage will be stored much longer than apples that are ripe in the uneaten state. Fully formed, disease-free apples will be stored better and longer. Diseased, deformed, and damaged apples will not be stored for long.

To store apples, they are divided into large, medium, and small by weight and placed in storage containers. Small apples are stored for a short time because they are fully formed. Very large apples store for a shorter time than small ones, but somewhat better, because they contain a high water content and ripen quickly.

**Table 2. Organic matter content (in %) of apple varieties after storage (March 2022)**

| Apple varieties | Water quantity | Dry matter | Sugar | Pectin | Ascorbic acid | Slave | Energetic value kcal/kDj |
|---|---|---|---|---|---|---|---|
| Renet Simirenko | 83,6 | 11,8 | 12,1 | 1,2 | 1,2 | 0,6 | 45/191 |
| Golden Delicious | 84,6 | 14,2 | 14,4 | 1,4 | 1,3 | 0,5 | 45/191 |
| Starkrimson | 84,5 | 13,3 | 13,6 | 1,3 | 1,4 | 0,4 | 45/191 |
| Boyken | 84,3 | 12,0 | 12,9 | 1,1 | 1,2 | 0,7 | 45/191 |

The table shows that the Starkrimson and Golden Delicious varieties retain more organic matter than the Renet Simirenko and Boyken varieties.

The fruits are medium in size and typical for this variety, they have normal storage properties. For this reason, small apples are sold first, then large ones, and in the third step, large medium-sized apples are sold. In agar, the fruits of the first harvest of certain varieties of apples are stored better than others. During the storage of apples, it is necessary to create all the conditions that slow down the biochemical changes in the composition, reduce the weight loss as much as possible, and prevent the occurrence of various diseases.

**Conclusion**. In order to better preserve the quality indicators of apple products, the necessary temperature, air humidity and exchange in warehouses are the first conditions. In addition, for each variety, several of the above-mentioned mode factors should be created to a certain extent. If one of the above factors is violated, it will have a negative effect on the storage of apple products, and in turn, it will not be able to achieve economic efficiency in the storage of apple fruits..

**References.**

1. Features of the preparation, storage and transportation of agricultural products S.A. Salikhov, Z.S. Iskandarov, S.Ya. Sharipov. (monograph) Tashkent, 2018.
2. World apple production by country -AtlasBig.com. https://www.atlasbig.com.

3. Nutritional value, chemical composition and caloric content http://www.intelmeal.ru
4. Buriev Kh.Ch., Juraev R.J., Alimov O.A. “Storage and primary processing of fruits and vegetables”. Tashkent: “Mehnat”, 2002.
5. Aripov R., Sulaymonov I., Umurzakov E. "Technology of storage and processing of agricultural products". Tashkent: "Mehnat", 1991.
6. S.Y.Sharipov., A.Sh Azizov., Z.K.Vakkasov. Storage of apples in different methods in the valley region of Uzbekistan. IOP Conf. Series: Earth and Environmental Science. 1068 (2022) 012029.
7. Shuhrat Misirov., Sulton Sharipov. Methods of storing broccoli in different periods. E3S Web of Conferences 389, 03065 (2023) https://doi.org/10.1051/e3sconf/202338903065 UESF-2023.
8. www.tib.uz
9. http://nanotechweb.org
10. http://www.altairnano.com 3. ISO 16820 Sensory Analysis - Methodol