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ECONOMIC AND TECHNOLOGICAL INDICATORS OF APPLES SUITABLE FOR STORAGE

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Annotatsiya Ushbu maqolada yetishtirilayotgan olma mevalarini saqlash bo'yicha texnologik ko'rsatkichlar, jumladan quruq modda miqdori, qattqlik darajasi va mevalarning o'lchamlari tahlil qilindi. Ushbu tajribalar yordamida olma navlarining uzoq muddat saqlanish imkoniyatlari o'rganildi. Shuningdek, olma mevalarini saqlashga joylashtirishdan oldin ularning pishganlik darajasini aniq belgilash bo'yicha 2023-2024 yillar davomida o'tkazilgan tajribalar natijalari yoritildi.

Аннотация. В данной статье были изучены технологические параметры хранения выращиваемых яблок, включая содержание сухого вещества, уровень твёрдости и размеры плодов. Проведённые эксперименты позволили исследовать возможность длительного хранения различных сортов яблок. Кроме того, представлены результаты экспериментов, проведённых в 2023–2024 годах, по точному определению степени зрелости яблок перед их размещением на хранение.

Abstract. This article examines the technological parameters for storing cultivated apples, including dry matter content, firmness level, and fruit size analysis. The experiments conducted explored the long-term storage potential of different apple varieties. Additionally, the results of experiments conducted in 2023–2024 on accurately determining the ripeness stage of apples before storage placement are presented.

Kalit so'zlar: olma, saqlash, qattqlik, tovar tahlili, payvandtag, omborxonona, havoning nisbiy namligi, penitrometr, refraktometr, titrimetrik

Ключевые слова: яблоко, хранение, твердость, товарный анализ, подвой, склад, относительная влажность воздуха, пенетрометр, рефрактометр, титриметрия

Keywords: apple, storage, firmness, product analysis, rootstock, warehouse, relative air humidity, penetrometer, refractometer, titrimetric analysis

INTRODUCTION

About 90-95% of apple orchards in the world's leading apple growing and exporting countries are grown in intensive orchards based on low-growing grafts. In most apple-growing countries, consistent research is being conducted to create new, high-quality and marketable apple varieties, to increase yield, and to improve fruit quality and shelf life, in order to take an important place in the very competitive world apple market.

Since apples cannot be stored for a long time under normal conditions, their marketable properties and shelf life depend on the pomological variety and the amount of dry matter in the chemical composition. The main factors that determine the storage quality of apples are the air temperature, relative humidity and gas environment of the warehouse. The technology of storage in a controlled gas environment extends the shelf life of fruit up to 1.5-2 times. In addition, apples stored in a controlled gas environment retain more sugar, organic acids and vitamins than apples stored under normal conditions. [3]

It is aimed to select those that are resistant to long-term storage among the varieties of apples grown in the central regions of Uzbekistan and to determine effective measures based on the study of their technological characteristics. [2]

As part of the research, the task of analyzing the technological and biochemical composition of the selected apple varieties and testing non-traditional preliminary processing methods for apple storage was determined. [1]

Research objects and methods. The Red Delicious, Golden Delicious, Renet Simirenko, Scarlet (Steamored) varieties included in the state register in Uzbekistan, as well as the introduced Green Smith, Gala, Pink Lady, Fuji, Modi and Jeromin varieties were selected for research. Apple fields belonging to "Tashkent fruit and vegetable" LLC, located in Kibrai district, Tashkent region, were selected as the object of research. [4]

The following methods were used to determine the optimal ripening level and biochemical parameters of apples during storage: penetrometer, refractometer, titrimetric and photometric analysis. Titratable acids were determined according to GOST ISO 750-2013, the hardness of apple core was evaluated using a penetrometer FT-372, and yield of product varieties was measured according to GOST R 54697-11. [7]

Discussion of the obtained results. Its technological features are important in the preservation of apples. In particular, the degree of hardness, the size of the fruit and the amount of dry matter in the content are the factors that directly affect the shelf life (Table 1).

Table 1

Indicators of technical maturity of apple fruits (2022-2024)

T/R	Varieties	Dry matter content, %				Hardness, average	Diameter, mm, average	Contains fibers, %	Productivity, t/ga
		2022	2023	2024	Average				
1	Red Delishes	12,3	12,8	13,4	12,8	7,3	78,2	2,1	34,2
2	Golden Delishes	12,5	12,8	14,8	13,3	6,9	72,0	2,2	33,5
3	Renet Semirenko	10,2	11,3	12,1	11,2	7,4	73,0	2,0	28,4
4	Skarlet	12,1	12,9	13,3	12,7	7,2	77,0	2,3	24,1
5	Grinni Smit	10,6	11,4	12,6	11,5	7,6	78,0	2,4	23,7
6	Gala	11,9	13,2	13,1	12,7	7,5	67,0	2,1	21,5
7	Pink Ledy	12,5	12,8	13,7	13,0	7,7	79,0	2,2	31,8
8	Fudji	13,6	14,0	14,8	14,0	7,5	82,0	2,5	34,2
9	Modi	11,9	13,4	13,6	12,9	7,4	70,0	2,3	29,6
10	Jeromin	12,2	12,4	13,1	12,5	7,5	71,0	2,0	19,6

Based on the information provided during the analysis, the technological and biochemical characteristics of each apple variety were thoroughly studied and the following results were obtained.

The amount of dry matter is one of the important indicators that determine the quality of apples, and its high content increases the sweetness, marketability and shelf life of apples. Based on the given data, the Fuji variety was distinguished by a high dry matter content (14.0%). The stability of the indicators of this variety in all years created the basis for its recognition as a high-quality product. Renet Semirenko was recorded at the lowest level of dry matter index (11.2%). It was observed that the sour taste of this variety may reduce its attractiveness in the commercial market.

The level of hardness is also one of the important indicators and is of great importance in determining the suitability of apples for storage. Pink Lady showed the highest level of hardness (7.7). This has shown that it is very resistant to storage and transportation processes. Gala and Fuji also have high strength values, and they stand out as varieties with a long shelf life. The low potency of Golden Delishes variety (6.9) revealed that it is prone to change more quickly.

The diameter indicator is important for the trade market. Large apples are more attractive to buyers. Fuji (82 mm) and Pink Lady (79 mm) were recognized as leaders in this indicator. Such indicators showed that they increase their marketability. Gala was recorded as a small diameter (67 mm) variety. It turned out that the small size of this variety can affect the level of demand in its sales points.

The analysis of the amount of fiber in the composition made it possible to determine the dietary value of apples. The high fiber content makes them among the useful products. Fuji and Greenie Smith cultivars had the highest fiber content (2.5% and 2.4%), which were found to be important for consumption. Renet Semirenko and Jeromin were observed to have a low index with a fiber content of 2.0%. This limits their health benefits.

Productivity is the most important economic indicator for farmers. As a result of the analysis of productivity indicators, it was found that Red Delishes and Fuji varieties yielded 34.2 tons per hectare and reached the highest indicators. This determined their usefulness and economic efficiency for farmers. The Jeromin variety had the lowest yield with 19.6 tons. It was found that cultivation of this variety may require additional agrotechnical measures.

According to the results of the analysis, Pink Lady and Fuji varieties were distinguished by quality indicators such as high dry matter content, large diameter and fiber content. They were seen as varieties in high demand in the market. And Red Delishes is the leader in terms of productivity, and it was found that it plays an important role in ensuring economic efficiency for farmers. Although Golden Delishes and Scarlet varieties belong to the category of high-quality apples, their sensitivity to storage was observed.

It has become known that the marketability of varieties with low performance can be increased when additional research and technological developments are applied. This is especially true of the Jeromin and Renet Semirenko varieties. When storage and processing processes are applied to them under special conditions, their economic and consumption aspects can be improved.

In short, the results of the analysis can serve as a guide for farmers and researchers in the selection of certain apple varieties and can be used to improve their quality. Thus, based on the

results of the research, it was possible to develop specific recommendations for the selection of varieties, improvement of their agrotechnical and technological aspects.

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