



OPTIMIZATION OF PERSIMMON STORAGE AND PROCESSING PROCESSES

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Abstract: The article presents the results of a comparative assessment of the biochemical composition and technological properties of four persimmon varieties: Hiakume, Tamopan Large, Hachiya, and Denau Sugar. The mass fraction of dry matter, content of soluble solids, soluble sugars, vitamin C, carotenoids, and tannins, as well as flesh density and structure, were investigated. The obtained data made it possible to identify varietal differences affecting optimal parameters of post-harvest storage and processing. The research results provide a scientific basis for the development of optimized storage regimes and innovative persimmon processing technologies under the conditions of the Republic of Uzbekistan.

Keywords: persimmon, varietal characteristics, biochemical composition, Hiakume, Tamopan Large, Hachiya, Denau Sugar, vitamin C, tannins, technologies.

Introduction.

The Republic of Uzbekistan is one of the promising producers of persimmon, which is обусловлено favorable climatic conditions and growing demand for fresh and processed products. Despite its high nutritional value and export potential, significant post-harvest losses reduce the efficiency of persimmon production. According to the Resolution of the President of the Republic of Uzbekistan dated December 29, 2023, No. PP-436 "On measures for the further development of crop production, fruit growing, vegetable growing, and potato production for 2024–2026" [1], which provides for the modernization of advanced processing technologies, the study of optimization of persimmon storage and processing processes is of particular importance.

Purpose of the study.

To conduct a comprehensive analysis of the biochemical parameters of the persimmon varieties Hiakume, Tamopan Large, Hachiya, and Denau Sugar in order to determine their technological potential.

Object of the study.

The objects of the study were fruits of four persimmon varieties cultivated under the conditions of Uzbekistan: Hiakume, Tamopan Large, Hachiya, and Denau Sugar. Fruit sampling was carried out at the stage of technological maturity in accordance with industry standards and methodological recommendations for the post-harvest evaluation of fruit crops.

Hiakume variety.

A medium-fruited variety of oriental persimmon (*Diospyros kaki* L.) characterized by a dense flesh consistency, moderate sweetness, and low astringency. It is distinguished by stable flesh structure during storage and a moderate content of dry matter, which makes it a versatile variety suitable both for fresh consumption and for processing [2].

Tamopan Large variety.

A large-fruited variety with a distinctly round–flattened shape, dense fibrous flesh, and a low level of soluble tannins. It is characterized by increased resistance to mechanical damage and transportation stress. The variety is suitable for long-term refrigerated storage.

Hachiya variety.

An astringent variety with a high content of soluble tannins at the early stages of ripening. The fruits have a conical shape and a dense skin. It is characterized by the need for full softening or technological processing to reduce astringency. The fruits are distinguished by a high level of phenolic compounds.

Denau Sugar variety.

A local variety notable for its exceptionally high content of soluble sugars and dry matter. It has medium flesh firmness, a thin peel, and a pronounced sweetness. It is optimal for drying, the production of fruit leather, and natural concentrates [3].

Assessment of technological maturity.

The assessment of technological maturity was carried out using a comprehensive method based on physiological and biochemical criteria as well as organoleptic characteristics, in accordance with methodological requirements for post-harvest analysis of fruit crops.

The following indicators were evaluated: peel color, determined according to the standards of GOST ISO 18453-2019 “Fruit color evaluation. Methods of visual and instrumental colorimetry.” The transition from the green–yellow to the orange–red spectrum was considered a criterion for the onset of maturity.

Fruit firmness.

Fruit firmness was measured using a penetrometer with an 8 mm probe. According to the requirements of GOST 28561-2019 “Fruit and vegetable products. Determination of firmness,” a decrease in firmness by 30–40% from the initial level was considered an indicator of the onset of technological maturity.

Dry matter content (°Brix).

Dry matter content was determined using a digital refractometer with an accuracy of $\pm 0.1\%$ according to GOST ISO 2173-2020 “Fruits and vegetables. Determination of the mass fraction of soluble solids.” For varieties with high sugar content, values above 16–18% were considered sufficient for technological maturity.

Astringency assessment.

Astringency was evaluated based on the concentration of soluble tannins using a spectrometric method in accordance with GOST 19885-74 “Plant products. Methods for the determination of tannins.” Fruits with soluble tannin levels $\leq 0.05\text{--}0.10\%$ were considered mature.

Biochemical analysis methods.

Dry matter content was determined by the refractometric method in accordance with GOST ISO 2173-2020 “Processed fruit and vegetable products. Refractometric method for the determination of soluble solids.” The values were expressed as percentages.

Soluble sugars.

Soluble sugars were determined by two methods, including the Bertrand method in accordance with GOST 8756.13-87 “Processed fruit and vegetable products. Methods for the determination of sugars.”

Vitamin C.



Vitamin C content was determined by the titrimetric method using 2,6-dichlorophenolindophenol in accordance with GOST 24556-89 "Processed fruit and vegetable products. Methods for the determination of vitamin C. Processed fruit products. Methods for the determination of ascorbic acid."

Titrateable acidity.

Titrateable acidity was determined in accordance with GOST 25555.0-82 "Processed fruit and vegetable products. Methods for the determination of titrateable acidity."

Carotenoids.

Carotenoid content was determined according to GOST 8756.22-80 "Method for the determination of carotenoids."

Tannins.

Tannin content was determined using the photometric method in accordance with GOST 19885-74.

Flesh density and structure.

Flesh density and structure were determined according to GOST 33823-2016 "Fruit and vegetable products. Methods for the determination of physical characteristics."

Results and Discussion

Table 1. Biochemical composition of fruits at the stage of technological maturity

Indicator	Hiakume	Tamopan Large	Hachiya	Denau Sugar
Dry matter, %	18.4	17.9	19.6	23.2
Sugars, %	14.2	13.5	15.1	19.4
Tannins, %	0.32	0.48	0.63	1.21
Vitamin C, mg/100 g	38	42	35	40
Pectin, %	0.82	0.96	1.12	1.88

The conducted analysis confirmed a clearly expressed varietal differentiation of persimmon. The *Denau Sugar* variety showed the highest values of soluble sugars and dry matter content. These results are consistent with technological observations, as increased sugar content contributes to higher drying efficiency and reduced processing losses.

The *Hachiya* variety exhibited the maximum tannin content among the studied varieties. *Hiakume* and *Tamopan Large* demonstrated stability of their biochemical profiles under identical growing and storage conditions.

Physiological and technological properties. According to penetrometric data, the *Tamopan Large* and *Hiakume* varieties showed the highest flesh firmness at harvest, confirming their resistance to mechanical damage. This characteristic allows for long-term storage under refrigerated conditions. The *Hachiya* variety showed a rapid decline in freshness, which limits its storage ability.

The *Denau Sugar* variety exhibited the lowest mass loss during storage, which can be explained by its high dry matter content.

Conclusions.

The conducted studies demonstrated that optimization of persimmon storage and processing processes is impossible without taking varietal differences into account. The developed approach makes it possible to reduce production losses and increase the yield of finished products.

References:

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