

Results of grapes storage studies

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Abstract. The article presents the main results on the influence of grapes on the human body, the influence of various drugs on the quality of grape storage and the where grapes are grown. The research methods, results of storage and their analysis of Rizamat and Khusaini grape varieties collected in private farms of the Akdarya region are presented. The main indicators are determined (average weight of a bunch, weight of berries, ridges, skins and number of berries), weight loss, scree, waste and general losses after three months of storage in special storage facilities are also determined. The research results showed that the Husaini grape variety has a bunch weight higher than that of the Rizamat variety by 6.8%. For high-quality storage of grapes at home, the refrigerator temperature should be within $0\pm 1^{\circ}\text{C}$ and air humidity 90-93%. In addition, the use of SO_2 during storage affects the natural loss of weight and fall of grapes. Storing grapes grown at home is relevant today, but requires further research.

1 Introduction

Providing quality food to the population of Uzbekistan is one of the main goals, which involves comprehensive research in the field of improving technologies for storing and processing fruits and vegetables [1. 2]. Currently, according to the Ministry of Agriculture, in 2021, 150% more were created than in 2020 and increased by 50.8 thousand hectares. According to scientists in Uzbekistan in 2022, the total area of vineyards is 181.0 thousand hectares [3].

Today, 12 table and five industrial grape varieties are grown in Uzbekistan. Of these, table varieties are "Husayni", "Rizamat Ota", "Toyfi", "Surkhak", "Kelin Barmok", "Korazhanzhal", "Ok Kishmish", "Kora Kishmish", "Kishmish Botir", "Kishmish Vir" and "Kishmish Sagdiana." [4].

It is known that fresh consumption of table grapes is limited, as a rule, to two to three months. This period can be increased by properly storing grapes in special conditions. At the same time, the main task is to preserve the nutritional and biological value of table grapes

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with minimal losses at various stages: cultivation, harvesting, packaging, transportation, storage, processing, etc. [5-9].

Many scientists believe that grapes are rich in vitamins, anthocyanins, carotenoids, and some antioxidants [10, 11]. In addition, they believe that these substances can effectively remove free radicals from the body and slow down the aging process. Additionally, grapes contain many bioactive ingredients that may reduce the risk of heart disease, diabetes, and cancer [12–14].

A study was conducted on the effect of ascorbic and citric acid when stored in the refrigerator on color, enzymes, phytochemical and textural properties. However, it should be taken into account that the use of ascorbic and citric acid significantly suppressed the activity of polyphenol oxidase, ascorbic acid oxidase, and polymethylesterase and preserved the structural integrity of the grapes during 21 days of storage [15, 16].

Silva-Vera, in its work, proposes to use brassinosteroid during storage in the refrigerator to improve the quality of fruits and the shelf life of Rish Baba grapes [17].

However, the use of such drugs on grapes grown in Uzbekistan has not been fully studied to date. Thus, grapes should be considered an integral part of the system, which includes the following factors: climate, variety, agrotechnological measures, and storage technology. Soil, grape variety, and growing area play an important role in obtaining high-quality products. However, it is quite difficult to determine the influence of each of the factors of biotic and abiotic origin. In this regard, we made an attempt to determine the relationship between the mechanical characteristics of grapes and their organoleptic characteristics before and after storage.

2 Methods and materials

The research was carried out in the Akdarya district of the Samakand region in the period 2021–2022.

To conduct the experiment, late-ripening grape varieties Rizamat and Khusaini, grown at home, were used as the object of study.

Fruits intended for storage were collected in dry weather when they still had dense pulp but had already acquired the color characteristic of this variety. Fruits that had reached removable maturity and were typical in color and shape were selected for storage.

The mechanical composition of the bunches of the studied grape varieties was determined according to the method of Professor N. N. Prostoserdov. First, the average weight of the bunch, the weight of berries, ridges, and skins, and the number of berries were determined. Then, based on these data, the structure, composition, and structure of the grape bunches of the studied varieties were compared.

The quality indicators of the study objects were assessed in accordance with GOST 32786-2014.

The sizes of grape berries were measured using a digital caliper for 100 pieces. To determine the average mass of the bunch, electronic scales were used with an error of the zero setting device of ± 0.25 e, according to GOST 29329-92.

Fresh grapes were packaged with a net weight of no more than 8 kg without pressure in boxes made of wood, according to GO ST 10131, GO ST 17812, and GO ST 20463.

3 Results and discussions

It is quite possible to ensure that people can consume grapes all year if they use various storage methods. The population's demand increases year after year. If you do not develop storage technologies and storage infrastructure, then in the near future the prices for these

products will increase. In addition, you will have to increase the costs of fertilizers and pest control.

Analysis of studies on grape storage showed that, despite all their content, they do not allow answering many questions related to this problem. Therefore, solving this problem is only possible if it is organized efficiently.

According to the request, organoleptic and mechanical parameters were determined in two table grape varieties.

All bunches of grapes selected for research were intact, with characteristics typical of a commercial variety, undamaged, healthy, and without excessive external moisture.

The berries of all varieties held well on the ridge; they were ripe, fresh, elastic, normally developed, and without defects in shape or color or sunburn on the skin. In the Husaini and Rizamat varieties, the berries were evenly distributed on the ridge. The color of the berries of the Rizamat variety was pinkish-purple, while the Husaini variety was pinkish-yellow.

The smell and taste were typical for the respective varieties, without any foreign smell or taste.

Further research was aimed at determining the mechanical characteristics of table grapes of the Husaini and Rizamat varieties.

Before and after the storage of grapes, each bunch of grapes was weighed using electronic scales and placed in a special chamber (Figure 1).



Fig. 1. Determination of middle massy grape vines sort of Husayni and Rizamat.

The results of studies of mechanical and organoleptic indicators are shown in Figures 2-3.

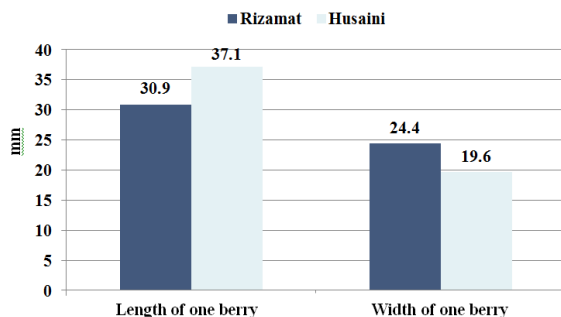


Fig. 2. Grape berry sizes (average for 2021–2022).

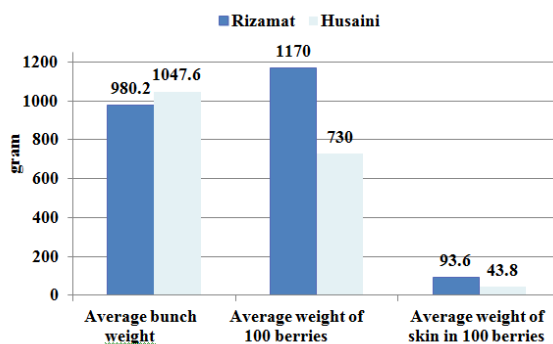


Fig. 3. Mass characteristics of grapes (average for 2021–2022).

From Figure 2, it can be seen that the sizes of the studied grape berries differ from each other. If the length of the berries of the Husayni grape exceeded those of the Rizamat grape variety, then they were inferior in width.

Figure 3 shows that the average weight of a bunch of Rizamat grapes was 980.2 grams; this figure for the Husaini variety exceeds it by 6.8% and amounts to 1047.6 grams. The average weight of 100 berries of the Husaini variety is greater than that of the Rizamat variety. The average weight of skin per 100 berries is also greater in the Rizamat variety.

After 3 months of storage, the organoleptic characteristics of the grapes, stored in a mini refrigerator at a temperature of 0 ± 1 °C and a relative humidity of 90–93%, were typical for varieties stored for storage. The berries remained firm and juicy.

Table 1 presents data illustrating the amount of grape loss (percentage of yield of standard products, weight loss, scree, waste) of different varieties after storage for 3 months (average for 2021–2022).

Table 1. Change in grape yield and loss after storage for three months (average for 2021-2022).

Sort	Grape quality indicators, %									
	mass		loss standard		scree		waste		total losses	
	counter	experience	counter	experience	counter	experience	counter	experience	counter	experience
Husaini	84.3 ±0.87	91.3 ±0.59	12.3 ±0.42	7.4 ±0.67	3.4 ±0.28	1.3	0.0	0.0	15.7 ±0.7	8.7 ±0.3
Rizamat	72.4 ±1.7	78.7 ±1.64	15.7 ±0.97	13.9 ±0.8	11.9 ±0.74	7.4 ±0.53	0.0	0.0	27.6 ±0.89	21.3 ±0.78

Table 1 shows that storing grapes using SO₂ has a positive effect on product yield and reduces losses. Thus, the grape yield of the Rizamat variety when using SO₂ increased by 11.9% and the total losses decreased by 6.3%; for the Husaini variety, the grape yield increased by 3.4% and the total losses decreased by 7.0%.

In addition, it was found that SO₂ treatment, depending on the variety, affects the natural loss of weight and scattering of grapes differently. Thus, in the Rizamat variety, the natural loss of weight had no significant effect, where it decreased by 1.8%, while in the Husaini varieties, this figure decreased by 5.0%.

4 Conclusion

The proposed storage method will solve the problem of reducing product losses during storage and significantly increase the shelf life of fruits without losing their freshness and high nutritional qualities.

It has been established that for storing grapes, it is necessary to select well-ripened, loose bunches with a strong ridge and large berries covered with a waxy coating. The attachment of the berries to the stalks should be strong, the skin should be without cracks, and the pulp should be dense. Before storage, grapes must be treated with SO₂ for long-term storage.

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