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Investigation of Continuous Quality Indicators in Storage of Pomegranate Fruits

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Abstract:

In this article, the storage period and quality indicators of pomegranate fruits after processing and storage with the help of biologically active substances, chitosan and its complexes formed with consumer organic acids, and various diseases, storage temperature, scientifically based information on changes in relative humidity of the air is presented.

Keywords: pomegranate, “Ак-дона”, “Казаке-анар”, “Ачиқ-дона”, “Кзыл улучшенный”, “Tuya tish”, quality indicators of pomegranate fruit, biologically active substances.

Introduction. In recent years, special attention has been paid in our country to radically increase the volume of production of food products, their assortment and export potential. In the 3rd direction of the Development Strategy for the further development of the Republic of Uzbekistan for the years 2022-2026, which was developed based on the principle of “Strategy of Actions - Towards a Development Strategy”, “...farmers through intensive development of agriculture on a scientific basis" and to increase farmers’ income by at least 2 times, to bring the annual growth of agriculture to at least 5%” are specified separately. It serves to a certain extent the implementation of the tasks specified in these decrees and decisions and other regulatory legal documents.

Varieties	Storage periods																	
	September			October			November			December			January			February		
	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
“Казаке-анар”		+	+	+	+	+	+	+	+	+	+							
“Кзыл улучшенный”		+	+	+	+	+	+	+	+	+	+							
“Tuya tish”		+	+	+	+	+	+	+	+	+	+	+	+	+				
“Ак-дона”		+	+	+	+	+	+	+	+	+	+	+	+	+	+			
“Ачик-дона”		+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		

Figure 1. Shelf life of fruits of pomegranate varieties

Based on the research and the obtained results, when comparing the data given in Table 1, the “Ачиқ-дона” and “Ак-дона” varieties have the most marketable pomegranates, and in turn, the least weight loss, waste and total yield. It was observed that there were losses.

Selected pomegranate varieties “Ак-дона”, “Казаке-анар”, “Ачиқ-дона”, “Кзыл улучшенный”, “Tuya tish”, ecologically safe natural biologically active substances used before storing their fruits

“Chitosan-0.1% and acetic acid-0.1% (1:1)”, “Chitosan-0.2% and acetic acid-0.1% (1:1)”, “Chitosan-0.2% and succinic acid-0, 25% (1:1)”, “Chitosan-0.2% and glycyrrhizic acid-0.1% (1:1)” and additional protection products, farms, the optimal storage periods were determined in modern refrigerated warehouses. The longest storage duration was recorded for “Ак-дона” and “Ачиқ-дона” varieties, in which the yield of pomegranate was 88% and 89.1%, and the total loss was 16.2% and 20.0%, respectively, can be stored for 5-6 months. “Казаке-анар”, “Кзыл улучшенный” varieties can be stored for up to 5 months with the yield of pomegranates being 83.2% and 83.6% and the total loss being 25.0% and 24.5%, respectively. “Tuya tish” variety can be stored for 4.5-5 months. Correspondingly, the output of pomegranates is 87.7%, total losses are 20.1%.

Thus, it became known that the duration of storage during pomegranate storage depends on the biological characteristics of the variety. The quantity of remaining pomegranates, weight loss, total loss, storage and the terms of realization differed from each other. The varieties “Казаке-анар” and “Ачиқ-дона” showed the most storage characteristics.

Research results. Experiments in Namangan, Fergana and Andijan regions, farmers, peasants and homestead farms specializing in pomegranate cultivation and clusters of pomegranate varieties “Ак-дона”, “Казаке-анар”, “Ачиқ-дона”, “Кзыл улучшенный” and “Tuya tish” the period of fruit harvesting and the processes leading to storage, the degree of ripeness of the fruit and the amount of dry matter in the fruit were studied.

During the implementation of these experiments, the effect of the amount of dry matter on the level of ripeness of the fruit juice of pomegranate varieties “Ак-дона”, “Казаке-анар”, “Ачиқ-дона”, “Кзыл улучшенный” and “Tuya tish” was studied. The dependence of the amount of dry matter in the juice of pomegranate varieties on the level of maturity is one of the important indicators for storage. To harvest the pomegranate fruit, the optimum indicator for storage was determined when the dry matter content of the fruit reaches 15-16%.

In addition, as a result of harvesting pomegranate fruits before the temperature reaches 20-21 °C, the direct effect on the quality of fruits during storage was studied. Evaluation of organoleptic criteria after long-term storage of pomegranate varieties such as “Ак-дона”, “Казаке-анар”, “Ачиқ-дона”, “Кзыл улучшенный” and “Tuya tish” grown in Namangan, Fergana and Andijan regions. Based on the method of Shirokov, it was conducted according to the method improved by professors of the Department of “Preservation and Processing of Agricultural Products” of Tashkent State Agrarian University. Criteria for determining the quality indicators of pomegranates of different varieties after long-term storage E.P. The evaluation of consumer suitability qualities was calculated according to Shirokov’s method.

An indicator was calculated that determines the level of manifestation of quality changes in the criteria of organoleptic evaluation of freshly cut or stored products for certain periods.

In the conducted researches, promising pomegranate varieties for export not only in our Republic but also “Ак-дона”, “Казаке-анар”, “Ачиқ-дона”, “Кзыл улучшенный”, “Tuya tish” were studied. The organoleptic properties of these pomegranate varieties were evaluated according to the following quality indicators characterizing pomegranate fruits: external appearance (color, shape), taste (sweet, sour, bitter), disease-spreading pests (fungus, bacteria, virus) of stored pomegranate was evaluated according to the degree of cracking, skin (thick, thin), aroma (smell).

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Their appearance, shape, color, aroma, taste, and flesh density have changed depending on the duration of storage methods of pomegranate fruits, such as seeded, seedless, seeded, and seeded fruits.

Also, the quality indicators of pomegranate fruits in storage warehouses are affected by various fungi and physiological diseases, changes in the composition of the gas environment in storage warehouses with changes in storage temperature, relative air humidity, placing low-quality fruits for storage and timely delivery of products. non-exit and other factors affect.

When storing different types of pomegranate fruits in modern warehouses, lowering the temperature in them, placing the fruits in chambers for cooling, it is necessary to: have the right shape, not be damaged, not cracked, not cut, and not have signs of diseases and pests. In addition, for low-temperature cooling, fruits should have the ability to retain moisture. All this can later affect the organoleptic evaluation of the fruit.

In the conducted studies, evaluation of the organoleptic parameters of the fruits of pomegranate varieties “Ак-дона”, “Казаке-анар”, “Ачик-дона”, “Кзыл улучшенный”, “Tuya tish” was carried out in test samples at room temperature after a certain period of storage in cooling warehouses. was carried out.

After harvesting, pomegranate fruits are stored for a long time in refrigerated warehouses at temperatures of +1 + 5 °C. It is recommended to use a 5-point system to assess the quality of pomegranate fruits before storage, during storage and after storage. Taste evaluation was performed on freshly picked or post-refrigeration test samples at room temperature.

According to the organoleptic evaluation method adopted by Ye.P.Shirokov, it is based on the following criteria: each quality indicator is evaluated out of 5 points. Then the determined data is multiplied by the coefficient of significance of the estimated indicator, taking into account its value in the general assessment of pomegranate fruit quality, the sum of products is required not to exceed 10 points.

The introduction of the coefficient of importance of organoleptic indicators of products allows to objectively evaluate each quality indicator of pomegranate fruits according to its value.

A general assessment of the quality and taste of pomegranate fruits before and during storage was carried out, while tasting the juice of the pomegranate fruit at the time of best ripening. Scale of organoleptic evaluation of pomegranate varieties of different varieties before and after storage in refrigerated warehouses according to Ye.P. Shirokov method (see Table 1).

Table 1. The organoleptic evaluation scale of the quality of pomegranate fruits after storage according to Ye.P. Shirokov’s method

№	Quality indicators of pomegranate fruit	Significance coefficient	Points	Description of the quality level
1.	Appearance	3	5	The botanic variety has preserved its appearance, the muzzle is completely preserved
			4	The color and shape characteristic of the botanical variety have been preserved, the beak has been preserved

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			3	It is significantly different from the typical indicator of the botanical variety, the muzzle is slightly damaged
			2	The external appearance is completely different from the indicator characteristic of the botanical variety, the pomegranate fruits have lost their turgor state, the nose is damaged
			1	The external appearance does not have the characteristics of the botanical variety, the pomegranate fruits have lost their turgor state, the nose is completely damaged.
2.	**The taste**	**3**	5	It's botanical, sweet, and very pleasant.
			4	Botanically appropriate, slightly different from sweet, pleasant.
			3	Substantially different from the sweetness of the botanical variety, moderately pleasant.
			2	It is significantly different from the sweetness that corresponds to the botanical variety, less pleasant.
			1	Not suitable for the sweetness of the botanical variety. You don't like it.
3.	**Infestation with disease-spreading pests**	**3**	5	It is completely free from fungus and diseases
			4	5-10% fungus appears in pomegranate fruits
			3	15-25% fungus appears in pomegranate fruits
			2	30-55% fungus appears in pomegranate fruits
			1	Pomegranate fruits are almost completely covered with fungal spores and are not suitable for consumption.
4.	**Crack level**	**3**	5	There is no cracking on the surface of pomegranate fruits
			4	5-15% cracking of pomegranate fruits is observed
			3	Pomegranate fruits are 15-30% cracked
			2	Pomegranate fruits are 30-60% cracked
			1	Almost all pomegranate fruits have cracks on their surface
5.	**Skin**	**2**	5	The thickness of the skin corresponds to the standards of the botanical variety, 5 mm
			4	The thickness of the peel corresponds to the botanical variety, 4 mm
			3	The thickness varies slightly depending on the botanical variety, 3 mm
			2	The thickness varies according to the botanical variety, 2 mm
			1	The thickness does not correspond to the botanical variety, 1 mm
6.	**Aroma**	**2**	5	The smell is completely in accordance with the standards of the botanical variety, free of foreign odors caused by spoilage and nausea.
			4	The smell is very pleasant according to the standards of

				the botanical variety
			3	The smell is different from the smell of the botanical variety, it is pleasant.
			2	The smell is significantly different from the smell corresponding to the botanical variety, less pleasant
			1	The smell is not typical of a botanical variety. You don't like it. It has different foreign smells

Long-term stored pomegranate varieties Ye.P. According to Shirokov's method of organoleptic evaluation, it was carried out in the following order: quality indicators of pomegranate samples are evaluated in a 5-point system. The results evaluated in the criteria established in pomegranate varieties are multiplied by the coefficient of significance of the indicator, taking into account its value in the general evaluation of fruit quality, the sum of products does not exceed 10 degrees.

Pomegranate fruits of different varieties are divided into different levels of sweetness based on the taste of pomegranate varieties, that is, fresh cut, stored, with various types of processing, in the general evaluation criteria of fruit quality, taste, size and appearance attractiveness of appearance, smell, etc. is carried out taking into account and the general indicators of the quality of the selected variety samples were reflected.

The process of measuring the general temperatures of pomegranate varieties before and after storage in refrigerated warehouses was carried out according to the international standard GOST 30204-95.

According to the requirements of this accepted standard, refrigerated warehouses are used to control temperature changes in the technology of storing pomegranate varieties. In this case, it was used in cooling warehouses and low-temperature chambers, in field conditions, in specialized instruments for temperature measurement, as well as in laboratory instrument equipment, when necessary, in pre-cooling chambers, food refrigerating chambers or home refrigerators.

Conclusion. The introduction of criteria for organoleptic assessment of pomegranate varieties stored for a long time in modern refrigerated warehouses made it possible to objectively assess the specific individual quality indicators of each pomegranate variety.

Evaluation of the taste and overall quality of the fruits of pomegranate varieties was carried out after the pomegranate fruits had been stored in refrigerated warehouses for a certain period of time. Among the preparations used for the researched pomegranate varieties, the best indicators are "Chitosan-0.2% and acetic acid-0.1% (1:1)" and "Chitosan-0.2% and glycyrrhizic acid-0.1 % (1:1)", that is, compared to the control, "Ачиқ-дона" was stored for 140 days, "Aq-dona" for 130 days, and "Казаке-анар" for 125 days, and for use on farms a scientific conclusion was obtained.

In addition, the mechanical properties of pomegranate have a direct impact on its shelf life. These properties are indicators such as the thickness of the skin of the pomegranate grain, the level of resistance to crushing and cracking. The researched varieties differ from each other in terms of pomegranate fruit and 100 pomegranate seeds mass, structure and amount of seeds, hard skin of flesh. The largest pomegranate fruits appeared in the "Ак-дона" pomegranate variety - 560 g, and the smallest pomegranate fruits in the "Ачиқ-дона" variety - 409 g;

According to the results of the conducted research, it is necessary to properly organize the collection of pomegranate fruits for storage and carry out until the temperature reaches 20-21℃; choose "Chitosan-0.2% and acetic acid-0.1% (1:1)" and "Chitosan-0.2% and glycyrrhizic acid-

0.1% (1:1)" for pomegranate preservation; lowering the temperature of the product to +4℃ by carrying out preliminary cooling processes in a short time (20-24 hours); It is recommended to release the product for consumption as it was determined in the experiments that the effective working life of ecologically safe natural biological active substances in pomegranate storage is from 130 to 150 days.

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