EFFECT OF ENVIRONMENTALLY FRIENDLY BIOLOGICALLY ACTIVE PRESERVATIVES IN THE STORAGE OF POMEGRANATE FRUITS

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https://doi.org/10.5281/zenodo.8194809

Abstract: The article presents the results of studying the effect of chitosan and its complexes with edible organic acids on the natural and disease-induced reduction, weight and composition of pomegranate fruits.

It has been shown that these drugs lead to an increase in the volume of agricultural products, improve their quality, and have a positive effect on achieving the stability of the ecological situation in the world.

Key words: pomegranate, chitosan, glycyrrhizic acid, acetic acid, amber acid, aspergillus niger, moniliosis**.**

Introduction

Pomegranate fruits are an important component of the human diet. However, it is of great importance to preserve these fruits and provide the population without interruption throughout the year.

Today, the volume of pomegranate cultivation in the world is 35.01 million. tons. India (251,175 thousand tons), China (232,760 thousand tons), Iran (183,595 thousand tons), Azerbaijan (133,861 thousand tons), Turkey (97,128 thousand tons) are leading in this regard. According to the information of the Republican Customs Committee, the volume of pomegranate cultivation in Uzbekistan is increasing every year. In 2021, 82,900 tons of pomegranates were grown in the country, of which 19,400 tons were exported. In 2022, this figure will be 19.8 million. exported 21.6 thousand tons of pomegranates to Russia, Kazakhstan, Tajikistan, Kyrgyzstan, Belarus and Korea.

In the field of pomegranate storage technology, the importance of environmentally friendly preparations in the process of storing pomegranate fruits in refrigerated warehouses has been studied by many researchers in the world. These studies are mainly devoted to the selection of optimal varieties for pomegranate storage environment, its packaging and storage. In addition, a number of scientific researches and research works have been conducted in our country on the technology of pomegranate preservation in different ways. However, scientific research on the effect of agrobiological and technological properties on the shelf life of pomegranate is insufficient. Therefore, it is important to study the dependence of agrobiological and technological properties of pomegranate on storage properties, as well as scientific justification of optimal technological parameters in the storage process.

In addition, various complex compounds of chitosan are used in the fight against disease-causing pests and natural reduction during storage of "Ak-dona", "Achiq-dona", "Kazake-anor", "Kizil uluchshenny", "Tuya tish" varieties of pomegranate grown in our republic.

Materials and Methods

It is important to properly organize the technologies of picking fruit and vegetable products before storage, transporting them to cold storages, and placing them in the storage warehouse.

During our experiments, scientific research was carried out with the help of preparations made from environmentally safe natural biologically active substances. A method for isolation of pure cultures of moniliosis-causing fungi. Samples of infected flowers, leaves and fruits of plants are used to isolate pure cultures of the causative agent of moniliosis of fruit trees. For this purpose, the surface of infected samples of the examined plant is disinfected. A 2% solution of potassium permanganate is used for disinfection. Flowers and leaves are kept in this solution for 3 minutes, fruits for 5 minutes.

Therefore, it is observed that the productivity of fruit trees with seeds will decrease due to a number of diseases in the following years. One such disease is moniliosis. Due to moniliosis disease, a large part of the seed fruit crop has died, and up to 100% of the seed fruit crop has been lost. Moniliosis disease is more harmful than other diseases of fruit trees with seeds, including parsy disease, and when the fruits are infected with moniliosis burn and moniliosis rot, they become completely unfit for consumption. Moniliosis disease of seed-bearing trees causes 20-25% of fruits to be lost not only during the growth period, but also during the storage period.

Figure 1. *Aspergillus niger*, the causative agent of moniliosis, grown in a Petri dish

In the regions of Namangan, Fergana and Andijan, the process of pomegranate harvesting and storage was studied.

Here are the following:

- *Pomegranate cooling without preliminary processing;*
- *Pomegranate pre-processing and cooling;*
- *Environmentally safe natural biologically active preparations were used in the pomegranate preservation process.*

Agrobiological characteristics of pomegranate varieties "Ak-dona", "Achiq-dona", "Kazake-anor", "Kizil uluchshenny", "Tuya tish" grown in the Torakurgan and Chust districts of Namangan region and Kuva district of Fergana region were studied in the experiment, the varieties grown in field conditions quality indicators, harvest periods, pre-treatment methods for pomegranate fruits before storage, packaging materials, packaging containers and their placement methods, physico-chemical and other indicators of raw materials were comparatively studied depending on the varieties and cultivation region.

Research on the effect of mechanical properties of selected varieties on transportability and storage properties.

The experiments were conducted in Namangan, Fergana and Andijan regions. The level of ripeness of pomegranate varieties in cultivated areas, mechanical properties and technological characteristics of pomegranate were studied.

The mechanical properties of pomegranate seeds were studied according to the following parameters.

- *Squashing resistance of pomegranate fruit;*
- *Cracking resistance of pomegranate fruit;*
- *Resistance to spillage of pomegranate seeds.*

Results and Discussion

During our experiments, the development of a number of phytopathogenic fungi in fruits and damage to fruit flesh was studied in the control variant.

Saprophytic fungi: *Penicillium, Aspergillus, Mucor, Monilinia, Saccharomyces* have a great influence on the process of fruit storage. including *Penicillium*, *Aspergillus*, *Mucor* and other fungi develop even at low temperatures and play a major role in spoiling the quality of stored fruits. This type of fungus is transmitted to stored fruit from poorly sorted, damaged fruit. As a result, during long storage, volatile spores of fungi easily enter the tip of the fruit from the beaten, sliced fruit peel, beak or tail part of the fruit and cause rotting disease.

It has been studied that fruits with this disease cause great damage not only during the growth period, but also during the storage period. In the warehouse, it was found that their disease was caused by the contact of healthy fruits with infected ones.

The spread of conidia of *Aspergillus niger*, the causative agent of moniliosis by wind and insects, was studied experimentally in the field and in the laboratory. Therefore, it has been proven that insects play an important role in the etiology of this disease, especially in the unfavorable period for abiotic factors.

Figure 2. Pomegranate fruit infected with Aspergillus niger mold (control)

Figure 3. *Aspergillus niger* mold growing on pomegranate peel

In addition, high-quality storage processes of pomegranate varieties up to 150 days were observed. The conducted experiments showed that the amount of ascorbic acid in pomegranate and the amount of marketable product remaining after storage represent the quality of the process, and the amount of vitamin C also differed among the varieties. The most marketable products were observed in "Achiq-dona" and "Ak-dona" varieties, and 92.2% and 88.7% indicators were recorded, respectively. The highest rate was found in "Qizil anor", "Kazake-anor" and "Tuya tish" varieties, which were 84.1%, 84.8% and 84.4%, respectively.

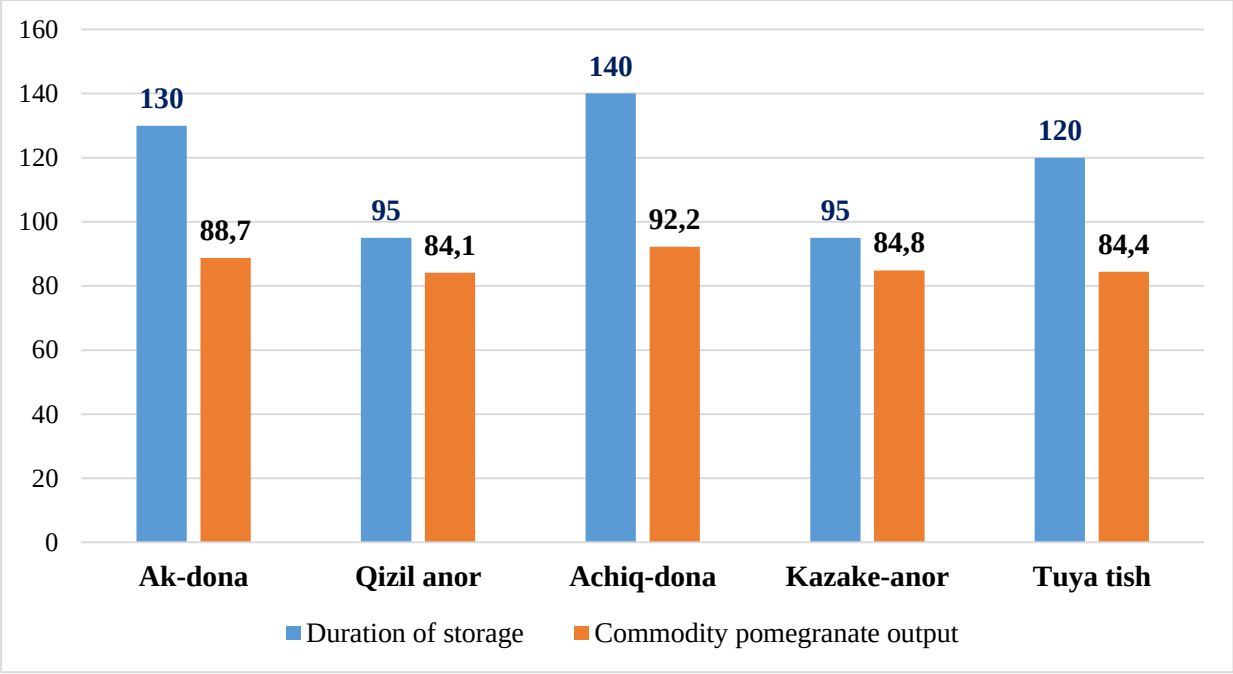

Figure 4. Amount of pomegranate remaining after storage.

A positive change in the natural reduction of sweet and sour pomegranate varieties compared to the control was observed in the experiments. Including "Chitosan-0.1% and acetic acid-0.1% (1:1)", "Chitosan-0.2% and acetic acid-0" from environmentally safe natural biologically active preparations for preserving sweet and sour varieties of pomegranate. ,1%

(1:1)", "Chitosan-0.2% and succinic acid-0.25% (1:1)", "Chitosan-0.2% and glycyrrhizic acid-0.1% (1: 1)" was used.

As a result of the conducted experiments, the preparations "Chitosan-0.2% and acetic acid-0.1% (1:1)" and "Chitosan-0.2% and glycyrrhizic acid-0.1% (1:1)" are the best indicator was observed and in the section of varieties - "Achiq-dona", "Qizil anor" and the lowest indicator was observed in "Ak-dona", "Kazake-anor" and "Tuya tish" varieties (Fig. 2-3).

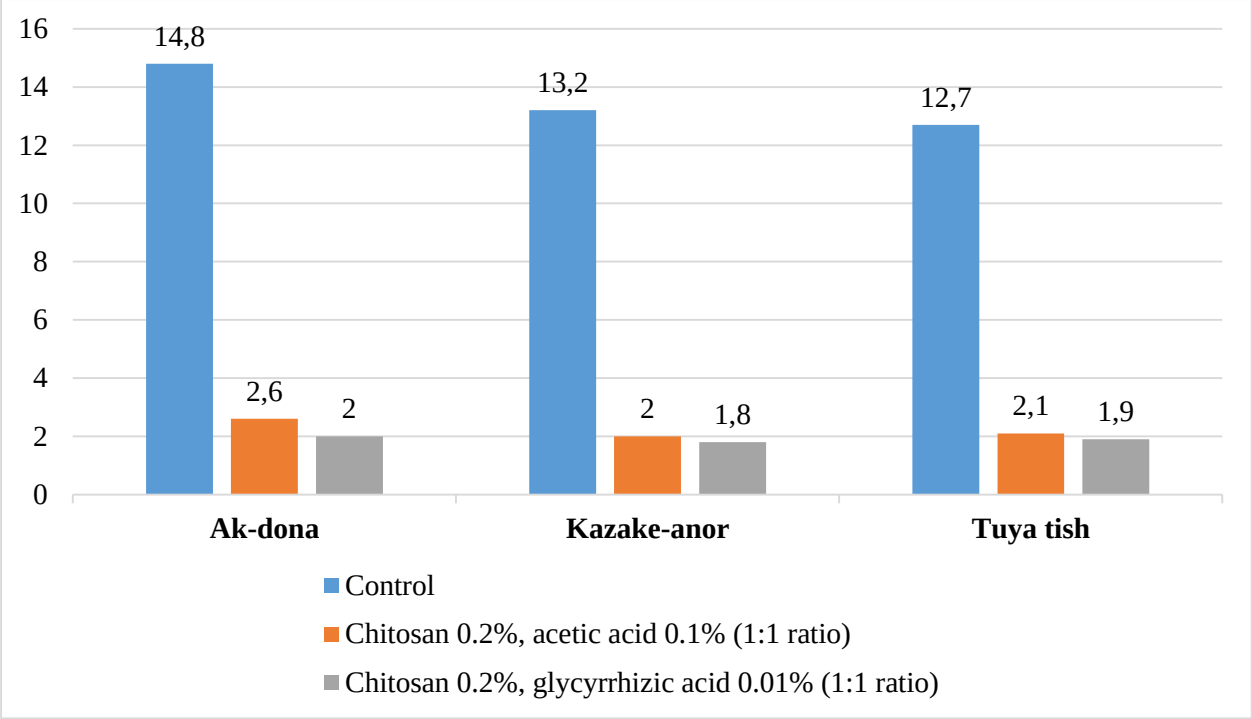

Figure 5. Effect of environmentally friendly preparations on weight reduction of sweet pomegranate varieties.

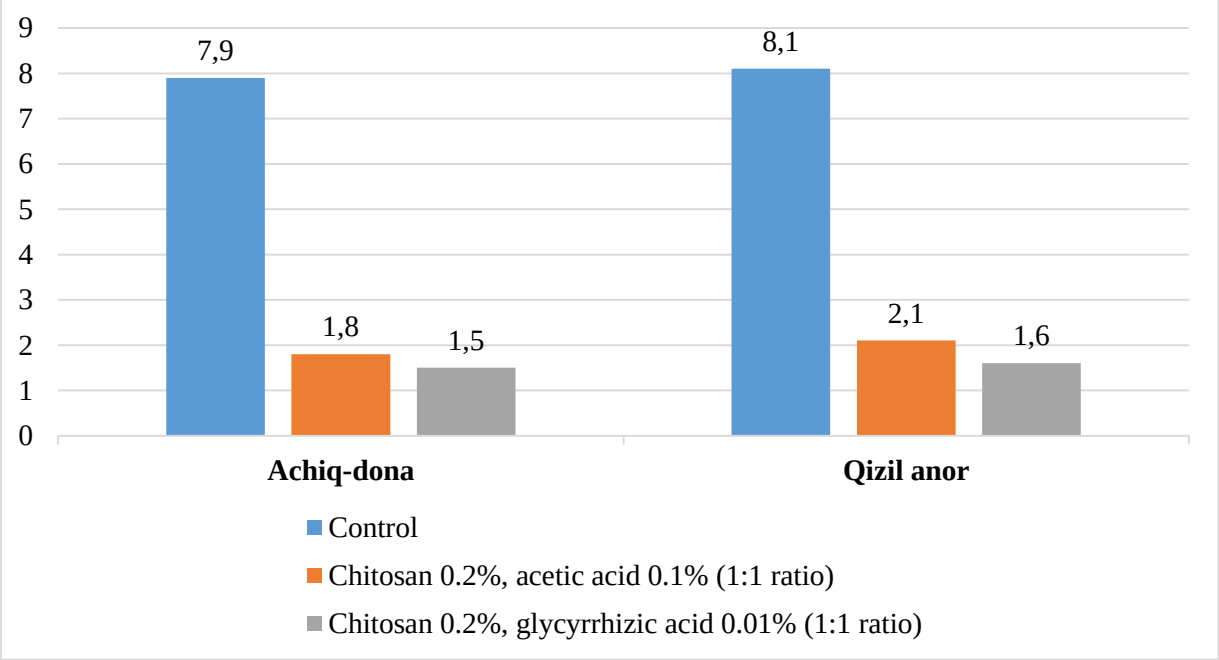

Figure 6. Effect of environmentally friendly preparations on weight loss of sour varieties of pomegranate.

Conclusion

The following results were obtained in the studies of pomegranate varieties "Ak-dona", "Achiq-dona", "Kazake-anor", "Kizil uluchshenny", "Tuya tish":

- It was found in the experiments that environmentally safe natural biologically active preparations based on chitosan and chitosan-glycyrrhizic acid and acetic acid showed their antiviral properties at a high level;

- The mold that grew on pomegranates and caused fruit rot was identified as Aspergillus niger, a genus of Aspergillus;

According to the results of the conducted experiments, ecologically safe natural biologically active preparations - samples of 0.1% chitosan prepared in 0.1% acetic acid, 0.2% acetic acid and 0.2% chitosan prepared in 0.01% glycyrrhizic acid It was observed that the "Achiq-dona" variety from the "Ak-dona", "Kazake-anor", "Kizil uluchshenny", "Tuya tish" varieties of pomegranates treated with it can be stored for a long time without losing its properties even at different room temperatures.

In the study of the antibacterial properties of environmentally safe natural biologically active substances, it was possible to obtain the characteristics of a chitosan polymer with a low molecular mass and low polydispersity. Mechanisms of action of their antibacterial properties during long-term storage of grain and seed fruits were studied in practice. The antibacterial activity of chitosan derivatives was scientifically studied by increasing the length of their carbon chain and increasing compared to the initial unmodified sample with a low degree of substitution with acyl residues.

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