

IMPROVING OF QUICK-FREEZING OF CHERRY

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Abstract

In this work discusses the difference between frozen and quick-frozen cherries. Comparison of quantitative data on carbohydrates and ascorbic acid during the storage period of frozen cherries. Graphic data are presented that confirm that losses of ascorbic acid and sugars are observed in samples of quick-frozen cherries. Experimental data show that when samples are stored at quick-frozen, they are more resistant to harmful microorganisms than in samples frozen in ordinary chambers.

Keywords: cherry, quick-freezing, freezing, carbohydrate, ascorbic acid.

1. Introduction

Currently, in Uzbekistan, among the exported fruits, the proportion of cherries is high. In 2018, Uzbekistan was among the four largest world exporters of cherries, second only to the countries in volume of export: Chile, the USA and Turkey. Surveys of market participants show that in 2018, about 45-50 thousand tons of cherries were exported from Uzbekistan, although even more are said in some market sources.

However, the problems of the cherry-growing business begin in the garden. This requires knowledge and a scientific approach. And the most difficult thing is that you have to break the tradition of manual packaging of products and ensure that at all stages the process was perfectly controlled. Given the low labor costs and its surplus, such investments seem often illogical. However, the human factor is very important to minimize if you want to be successful in the supply of cherries. What is bad in Uzbekistan is not enough advanced technology, as well as a very low potential for fruit processing. And this directly affects the price of exports.

The big problem is the cooling, storage and sorting of products. Such problems can lead to a reduction in fruit production if alternative solutions are not found. Uzbek gardeners suffer from this, often they will be forced to sell cherries at a low price, mainly small producers suffer.

One solution to these problems is to develop new technologies for freezing products that ensure quality during long-term storage. Freezing allows you to increase the shelf life and sale of agricultural products.

When freezing a product, you must first of all strive to preserve the organoleptic characteristics, as well as the natural product. For this, it is necessary to achieve maximum reversibility of the phenomena during the freezing process.

There are several types of freezing today: slow, fast and ultra-fast freezing (shock freezing). Recently, according to the results of preservation, product quality - shock freezing is leading. Shock freezing technology opens up completely new possibilities.

In this work, we compared the changes in the carbohydrate composition and ascorbic acid of frozen and quick-frozen cherries during storage.

2. Materials and Methods

For the experiment, we chose a sweet cherry variety «Revershon» 1 kg each. With a caliber of 2.2 cm. Dark red in color, with a round shape.

Cooling of the product occurs from +20°C to 0°C. In refrigerating chambers at 0° C and enhanced air circulation, fruits arriving at a temperature of 25° C were cooled to 0° C for 22 hours. The duration of cooling depends on the cooling method. Chilled cherries were kept in a 7% solution of ascorbic acid and 0.1% salt for about an hour. Pretreatment to preserve the natural color and flavor of frozen fruits during long-term storage and after defrosting, and to reduce losses of vitamin C.

Traditional freezing technology, implemented in the form of so-called low-temperature refrigeration chambers at a temperature in the chamber -18 °C. The freezing time in the refrigerating chambers is 2.5 hours. The freezing process has passed the front speed of the freezing area at normal (medium) – 1-5cm / h, and the freezing point in the center of the

product has reached to -6°C .

Tunnel-type shock freezing chambers are equipment that uses the principle of forced air-cooling of a product that moves continuously through the tunnel. This ensures a uniform distribution of cold air in a given volume. The freezing rate was 100 cm / h , a cryogenic superfast freezing that is carried out in cryogenic liquids (Freon).

The total quantity of carbohydrates in the cherries were determined by phenol sulfuric acid methods.

Vitamin C (ascorbic acid), were analyzed using the HPLC system (Agilent 1260 Infinity HPLC, USA) equipped with a UV Vis detector. Results were calculated on a dry weight basis.

3. Results and Discussion

The chilled «Revershon» cherries were kept in an 8% ascorbic acid solution for an hour. After swelling of the excess antioxidant solution, the cherries were sent for freezing. The freezing process can distinguish two temperature ranges in the center of the product: from 0 to -5°C ; from -5 to -18°C .

At the first stage, a transition from the liquid phase to the solid occurs at temperatures from 0 to -5°C . The work on heat removal from the product is very significant, but the temperature of the product practically did not decrease, and approximately 62% of the liquid fractions of cherries crystallized.

At the second stage, freezing occurred at product temperatures from -5 to -18°C . The temperature decrease again proceeded in proportion to the work performed by the chiller. The traditional technology of freezing is implemented in the form of the so-called low-temperature refrigerating chambers at a temperature in the chamber of -18°C . Freezing time in cold rooms was 2.5 hours. In the beginning, the process was faster than in the future. At a temperature of -15°C , about 78% of the water contained in cherries turned into ice.

With the quick-freezing method, the freezing speed of the cherry was 100 cm / h , cryogenic ultrafast freezing, which is carried out in cryogenic liquids (Freon). During rapid freezing, ice crystal formation did not occur; the effect of verification of water in the cell was observed.

Storage of frozen and quick-frozen cherries was carried out at a temperature of -18°C , in special low-temperature chambers with a relative humidity of $96 (\pm 1)\%$.

In the period 1,3,6,9,12 months, quantitative indicators of total carbohydrates and ascorbic acid were checked. Since the content of ascorbic acid in cherries is very high.

The big advantage of frozen fruits is their low vitamin loss compared to other types of canning. Losses and changes in the native forms of ascorbic acid in cherries frozen in an ordinary chamber reach during storage at -18°C , within 3 months it decreased by only 1.6%, within 6 months the mass fraction of vitamin C reached 4% %, after 9 months it increased by 9.4%, after 12 months it is 26.8%.

In samples of quick-frozen cherries, these indicators during storage at -18°C , decreased by only 0.7% within 3 months, during 6 months of loss the mass fraction of vitamin C reached 2.5%, and after 9 months increased by 6 , 9%, after 12 months is 16.7%. Experimental data shows that a change in the native form of ascorbic acid develops after 6 months of storage. Over the course of 12 months, ascorbic acid decreased in samples of quick-frozen cherries by 16.7%, and in cherries that were slowly frozen in an ordinary chamber, the loss of ascorbic acid within 12 months was achieved by 26.8% (Figure. 1.).

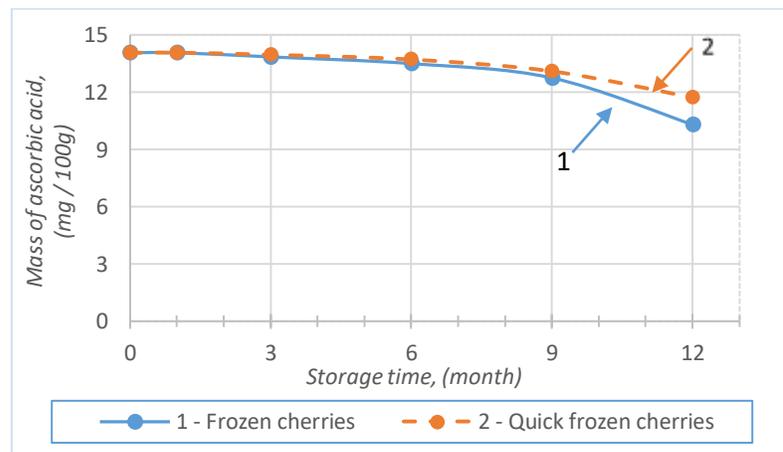


FIGURE 1:Reducing the native form of ascorbic acid in frozen cherry samples during storage

Losses of ascorbic acid in quick-frozen products are proportional to the storage time and increase during storage. The reasons for the undesirable decrease in ascorbic acid in frozen fruits are associated with a violation of the enzymatic process. Although during freezing, the activity of enzymes decreases quite sharply.

Figure 1 shows the dynamics of a decrease in vitamin C in samples of quick-frozen and frozen cherries in an ordinary chamber, during various periods of freezing.

Based on these graphs, it can be concluded that the smallest losses of vitamin C during long-term storage are observed in samples of quick-frozen cherries.

During storage, the carbohydrate composition of frozen cherries decreased. In cherries frozen in an ordinary chamber, the carbohydrate content decreased by 2.7% over 6 months, the mass fraction of sugars after 9 months increased by 5.4%, after 12 months by 10.7%.

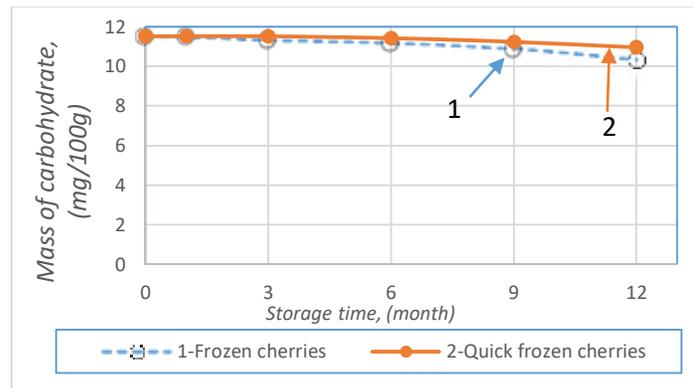


FIGURE 2: Comparison reduction of native form of carbohydrate composition in frozen cherry samples during storage

In cherries frozen during quick freezing, the carbohydrate content of the mass decreased by only 0.8% over the course of 6 months, the loss in the mass fraction of sugars increased by 2.3% after 9 months and 4.7% after 12 months.

Figure 2 shows the changes in the carbohydrate content in frozen samples of cherries with a quick-frozen method and frozen in a normal chamber. From the graphs it is clear that carbohydrates have the greatest losses in cherries frozen in an ordinary chamber, after 12 months they make up 10.7%. In samples of quick-frozen cherries, the loss of carbohydrates is 4.7%.

Graphic data show that the smallest sugar loss is observed in samples of quick-frozen cherries.

And also the results of the experiments showed that during long storage the level of dry soluble substances, sugars can decrease.

A decrease in carbohydrates during storage occurs mainly due to the respiration process, i.e. the formation of carbon dioxide and water under the influence of enzymes due to atmospheric oxygen and sweet cherries. During storage, the intensity of breathing decreases. The degree of respiration also depends on storage temperature and humidity.

4. Conclusion

The obtained experimental data state that in long-term storage in quick-frozen sweet cherries, resistance to harmful microorganisms is higher than in samples frozen in a normal chamber under the same storage conditions.

The results show that, compared to the qualitative characteristics of frozen and stored sweet cherries during the year, the cherries stored after quick freezing significantly exceed the stored sweet cherries after ordinary freezing. Natural conservation of carbohydrates and ascorbic acid in cherries stored after quick freezing above.

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5. References

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