

HALF-FINISHED FROZEN PRODUCTS OF HIGH DONENESS

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Abstract

Widening the assortment of frozen fruit and berries eaten is one of the ways to improve the diet. The purpose of the investigation is to state which fruits and berries can be preserved by freezing. The quality of production is of great importance in the application of new technologies in catering enterprises. Food quality and safety issues depend on the quality of raw foodstuffs and half-finished products. Desserts prepared from fruit and berries were investigated. The amount of vitamin C was used as an index of quality during freezing and storage. The nutritive value of biologically active substances is retained while the organoleptic indices worsen very little. The objective characterization of the physical properties of products allowed one to evaluate quality and to incorporate this information into the technological regimes of the treatment.

Key words: berries, freezing, storage, vitamin C, dessert, half-finished products

1. INTRODUCTION

The great significance of fruits and berries in the human diet is determined by the physiologically active matter in them. Practically it is not possible to preserve berries for a long time therefore it is necessary to consider their processing.

Research shows that freezing is one of the best methods of fruit and berry preservation. In fruit and berry processing frozen fruits and berries as raw materials are increasingly being used. Therefore research into the freezing impact on the quality of further food processing is essential. Up to now relatively few investigations have been carried out on the impact of freezing on the quality of the further processing fruits and berries (Aboltins et al. 2007).

In the experiment with black currants, it was found that vitamin C in them is more stable than in other fruits. To a certain extent this can be explained by the antioxidant nature of flavors in berries. The decrease of loss is mainly insured by quick cooling, the quick freezing of the product, stable storage and a lowered thawing temperature. During the first 6 hours after thawing up to 30% of vitamin C is lost. (Kampuse, 2003).

The subject of the research work is to determine impact of freezing on the quality of processed products of rhubarb, gooseberries and apples. The aim of the research is the quality evaluation of processed products, which are made of fresh and frozen fruits and berries.

During frozen storage berries maintain their typical sensory properties, nutritional value and their texture better, than after other types of processing (Ancos et al., 2000). The most important changes after frozen storage is the loss of water-soluble vitamin (ascorbic acid, pantothenic acid) (Fellows, 1996).

However, only small portions of berries are consumed unprocessed after frozen storage, mostly they are further processed in different products, and even further processing in catering technologies. Food quality and safety issues is another aspect of the quality in raw stuffs and half – finished products.

2. MATERIALS AND METHODS

The study was done at the Latvia University of Agriculture and the Latvia State Institute of Fruit-Growing.

Fresh and frozen fruit and berries ,grown in Latvia, were investigated. We used air freezing.

Fresh berries were analysed after harvesting, whereas frozen berries from the same harvesting date were analysed after 3 and 6 month storage at – 18°C. Puree from the same berries was made also immediately after harvesting (Hegedusic et al. 1998).

The technology of the mousse making was the following: berry sorting, extrusion of puree (mechanically through sieve), adding sugar (30%) and homogenising, putting into middle vessels (500 g), freezing at -18°C and -35°C , stored 3 and 6 month at – 18±2°C. Perspective cultivars for Latvia were studied.

The content of ascorbic acid was determined by titration with 0.05-M iodine solution (Davrov , 1950). The content of ascorbic acid mg per 100 g of berries was calculated with the following equation:

$$C = 400 \cdot \frac{V_{sample}}{V_{st}}, \quad \text{where}$$

V_{sample} - volume of the iodine solution titrated in a sample ;

V_{st} - volume of the iodine solution titrated in a standard solution.

Multivariate ANOVA without replications was performed to test the significance of the influence of freezing. To make the comparison between fresh and frozen berries and purees, the content of sugar in the products was determined.

3. RESULTS AND DISCUSSION

The amount of ascorbic acid in frozen mousse was significantly lower than in fresh and frozen berries (Fig. 1). The highest amount of vitamin C was in mousse of apple mass (3,6 mg%), but the lowest in gooseberries. The average losses of ascorbic acid in frozen apple mousse compared to fresh were 7,6 mg %, but in ready mass 3,7 mg %. At this means that more ascorbic acid is retained when frozen fruits are kept as whole products and not processed in mousse.

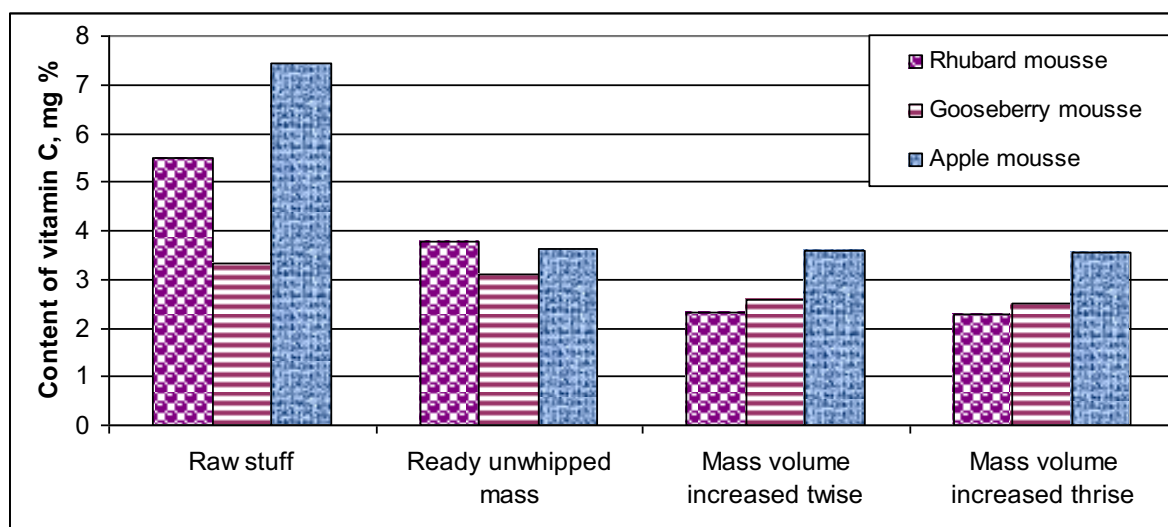
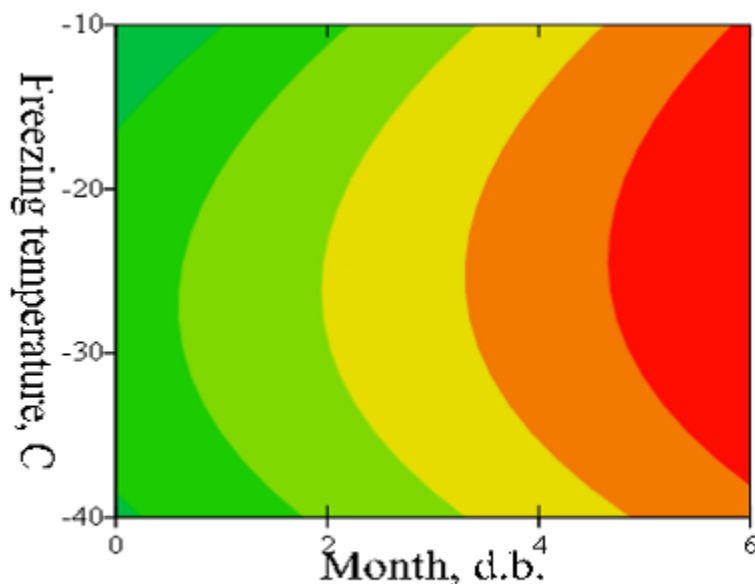


Fig.1. The content of vitamin C in fresh, thermally processed foamed fruit and berries and mousse.

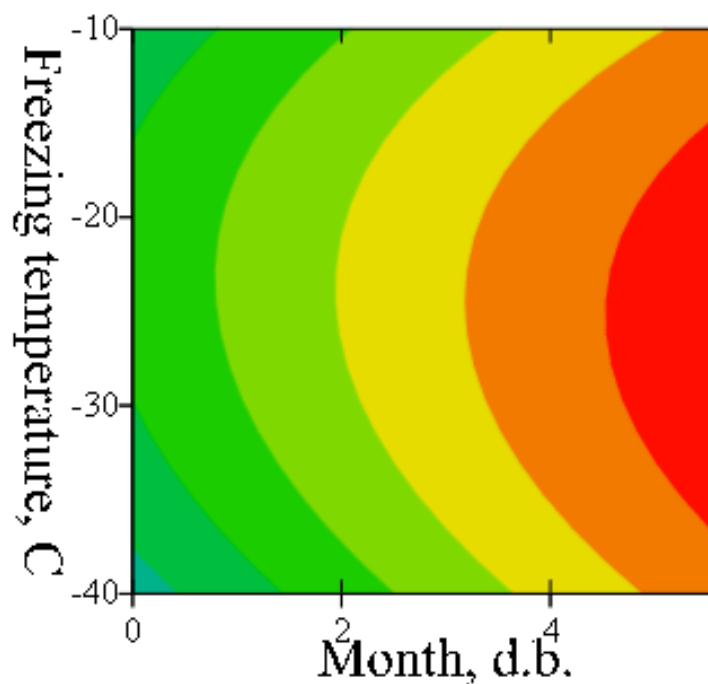
The least ascorbic acid change, comparing berries and mousse, was found in gooseberries (the content of ascorbic acid in fresh berries was 21,8 % higher than in mousse). That means that ascorbic acid in these berries is the most stable while under the influence of the technologies of catering. Experimental data (fig.1) show, the least changes of vitamin C during mousse processing in gooseberries, and the greatest in apples in which the content of vitamin C during processing was reduced almost 2 times (i.e. from 7.44 to 3.59), but during repeated processing did not decrease any more.



G1, (X, Y, Z)

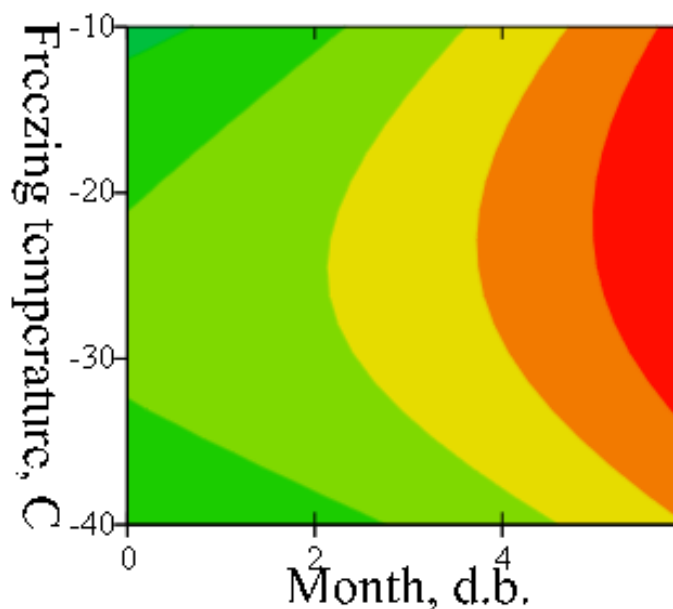
Fig.2 Influence of the freezing temperature and storage time on preservation during gooseberry production

To increase the storage time of production and not cause serious qualitative changes, it is necessary to determine the important question: how the freezing temperature and storage time influences preservation of the product. For the qualitative aspect using losses of vitamin C as the basis of measurement found that changes of vitamin C in gooseberries, rhubarbs and apples the prepared mousse depended on storage time and temperatures. These measurements are shown in a contour plot (fig2.-fig.4).



G1,(X,Y,Z)

Fig.3. Influence of the freezing temperature and storage time on the preservation of apple production



G1,(X,Y,Z)

Fig.4. Influence of the freezing temperature and storage time on the preservation of rhubarb production

By mathematical processing of experimental data correlation has been obtained between loss of vitamin C in mousse depending on the storage time of the mousse t (months) and storage temperature T (°C). Thus loss of vitamin C (%) in apple mousse during storage is characterised by correlation

$$z = 1.5 \cdot t - 0.05 \cdot t^2 - 0.51 \cdot T - 0.01 \cdot T^2 - 0.012 \cdot t \cdot T + 1.06, \text{ where}$$

t - storage time (month)

T - storage temperature (°C)

z - losses of vitamin C (%)

The experimental data show that loss of vitamin C after 6 months at the storage temperature -18°C and -35°C reach 15.2% and 14,6% respectively.

Loss of vitamin C (%) in gooseberry mousse may be expressed by

$$z = 1.64 \cdot t - 0.0036 \cdot t^2 - 0.46 \cdot T - 0.0084 \cdot T^2 + 0.011 \cdot t \cdot T + 0.96$$

and in rhubarb mousse

$$z = 0.87 \cdot t - 0.096 \cdot t^2 - 0.46 \cdot T - 0.0086 \cdot T^2 + 0.017 \cdot t \cdot T + 0.956$$

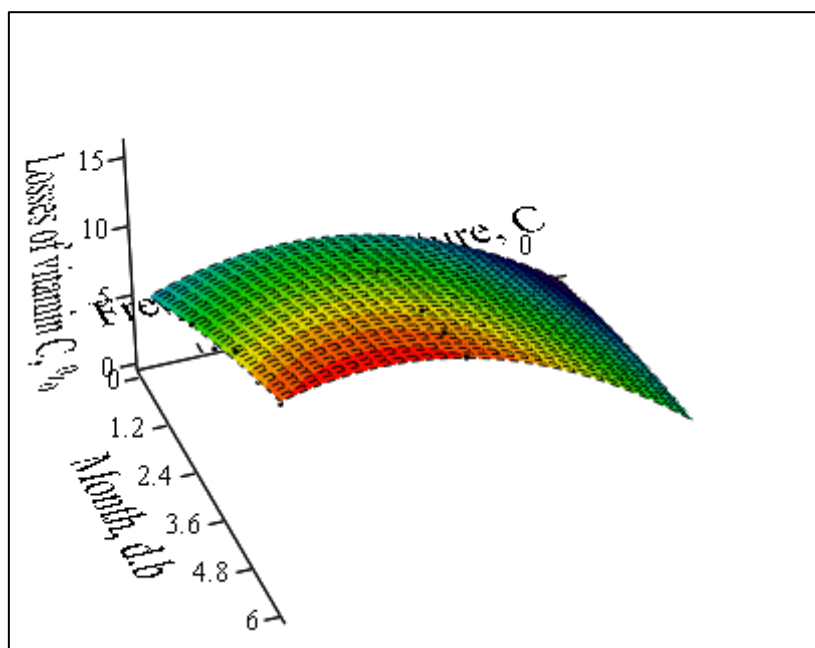
It should be remarked that determination coefficient η^2 is not less than 0.97.

Apparently the least loss of vitamin C are found at storage temperatures between -26 on -21°C, that can be connected with the transformation of most part of water into ice and lessening of the temperature of the frozen product at this temperature limit occurs the radical changes of product quality.

Analyzing the obtained measurements it is apparent, that storage time plays an important role in the lessening of the content of vitamin C. The interconnection of storage time and the temperature of storage where in rhubarbs and a gooseberry it is positive (i.e. goes down the level of vitamin C), but in apples, though and it is a little, it is negative.

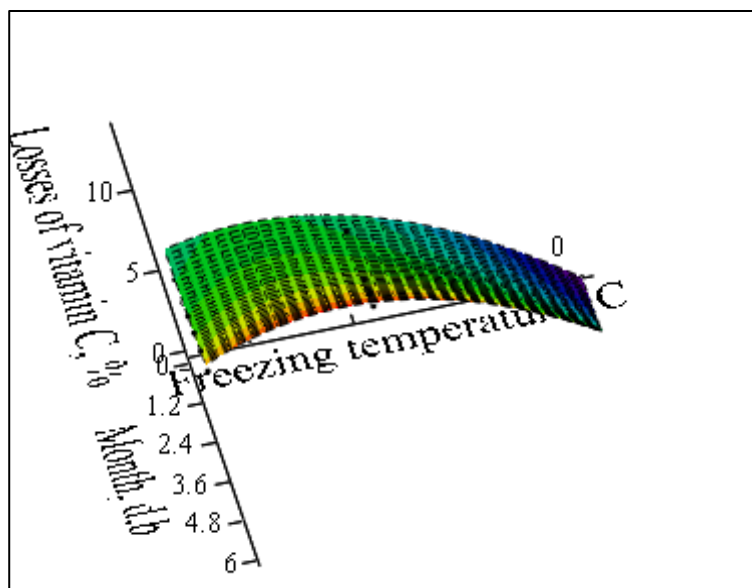
The contour plot shows the correlation between storage temperature T, storage time t and the loss of vitamin C in berries. The amount of loss depends on the temperature of storage. The duration of storage doesn't considerably influence loss of vitamin C does only at lower temperature.

Interpretation of graphical correlation is shown in Pictures 5-6.



G, (X, Y, Z)

Fig.5 The storage temperature and storage time influence of vitamin C losses in apple mousses



G, (X,Y,Z)

Fig.6 The storage temperature and storage time influence of vitamin C losses in rhubarb mousses

The content of vitamin C is used as an index of quality as it is unstable concerning the influence of surrounding factors. The high content of vitamin C in berries is a prerequisite for obtaining high quality frozen products.

4. CONCLUSIONS

1. Freezing and frozen storage do not significantly influence the content of acids berries and mousse.
2. Frozen mousse contained significantly less vitamin C than fresh and frozen berries. This means that more ascorbic acid is retained when frozen currants are kept as whole berries and not processed in mousse.
3. The Freezing temperature of mousse (-18°C and -35°C) affect significantly affect the quality of the product duration of freezing.
4. The least losses of vitamin C are found at storage temperatures between -26 on -21°C , that can be connected with the transformation of the most part of water in ice and the downturn of temperature of the frozen product for a limit when occur the most pronounced changes of product quality.

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