COLOR EVALUATION OF QUALITY OF FROZEN APPLE SLICES

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The freezing followed by low-temperature storage is one of the most effective ways of preserving plants with minimal losses and maximum preservation of nutritional and taste properties. This technique compared with sterilization is low-cost, featured with compact and convenience packaging and with the increased level of consumption food. The freezing also allows to preserve organoleptic properties and nutritional value of crop production.

The purpose of this work is to improve the consumer properties of quick-frozen apples.

It is known that the formation of frozen products' quality depends on the quality of raw materials and on the production process stages. The nutritional value of frozen fruits and vegetables slightly differs from that of the raw material as there are no changes in quality in case of rapid freezing but some loss of nutrients occurs during freezing and after heating as the content of vitamins, especially vitamin C, and polyphenolic substances decrease.

Complicated multistage biochemical reactions occurring during the breach of plant cells cause browning of apples. Therefore, stabilization of the oxidation processes is an actual problem for the improvement of such organoleptic characteristics as color, taste, smell and for the creation of the apple products with the content of bioactive substances.

Among the studied 10 varieties of apples Ligol and Antonovka apples were selected. These samples were selected for their organoleptic characteristics and calculation of their sugar-acid index (15,93 and 14,22 respectively).

The pigment complex of the selected samples was also studied. The color of fruit and vegetables is specified by pigment complex, which includes plastid pigments (chlorophyll and carotenes) as well as non-plastid ones. It is known that the anthocyanins, flavonols, chalcones and aurones determine the color of apples. However, the formation of color is also affected by such colorless substances as leucoanthocyanines and catechines as they easily form the highly reactive intermediates such as semi-quinone radical or ortho-quinones.

It is established that the content of leucoanthocyanines ranges from 255,2 mg% to 337,9 mg%, catechines – from 168,1 mg% to 104,6 mg%, flavonols (as quercetin) – 10,5 mg% and 11,7 mg% for Ligol and Antonovka respectively.

The obtained results demonstrated that anthocyanines are absent because the fruit peel has light green color with yellow tone.

The color samples were evaluated by organoleptic method on a 5-point scale as well as by color characteristics calculated by means of CIE XYZ and color coordinates (x, y) techniques. The main wavelength (λ_d) responsible for the dominant tone of the samples was within 570,0 ... 573,4 nm where it could be described as the yellow-green color. The tone purity (T) was obtained as 12,2...15,5%, while brightness (P) – n as 51,7...59,5%.

It is theoretically proved and experimentally confirmed using color characteristics the apple color stabilization technique by means of inhibition effect of oxidation processes of potassium chloride and citric acid. It was studied the influence of preprocessing with the solutions containing the potassium chloride and citric acid on the color of the frozen apple samples. The results demonstrated that the pretreatment with theses solutions leads to the preservation of the original color of the frozen samples. The control samples are not shielded from the external and internal factors, so they actively darken over time.

This is due to the fact that during the heating the apple pieces are influenced by temperature, oxygen, air and light. According to the scoring there were drawn the profile charts which allow to establish the correspondence between the selected treatment conditions and quality of the obtained samples compared to fresh apple samples.

The organoleptic properties were validated by the obtained spectra and calculated color characteristics. These results demonstrated that the control samples (no treatment provided) completely lost their original color as the reflection coefficients didn't exceed 7% and the main wavelength was shifted to 615,0 nm as tone purity fell down to 33,9%.

The processed with a solution containing potassium chloride and citric acid samples had the main wavelength of 565,2...569,5 nm and brightness of 63,0%, while tone purity of 14,0%. These values are close to those of the fresh apple samples.

On the basis of the obtained experimental data, it is established the advisability of processing of apple samples with the freezing in the solutions of potassium chloride and citric acid. This allows to obtain the high-quality products with high organoleptic properties and to enhance the range of frozen fruits and vegetables.

It is established that the suitability of introduction into industry of developed plant color stabilization techniques helping to improve the quality criteria and providing high-level competitive ability.