STABILITY AND QUALITY OF STRAWBERRY JAM LOW-SUCROSE

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Abstract
Quality of a product includes nutritional value, sensory quality and safety of. Currently, consumers prefer products with a high content of biologically active substances, similar to the natural taste. In this paper it is argued by experimental data and the scientific importance of a new process for obtaining strawberry jam low-sucrose and high content of biologically active substances. Jam with low-quality sucrose was assessed over time (3, 6 and 10 months), by: changing spectral optical density of the products tested (χ 210 – 750 nm), color change (Hunter method) and reducing oxidation-state change. By means of spectrum analysis we concluded that the brown color of gem is a result of oxidative degradation of polyphenolis and anthocyans. After 10 months of storage, the strawberry gem with 40 ... 45% saccharose has a better stability of antioxidants (polyphenols and anthocyans) with a lower content of brown substances. By analyzing the spectral composition of strawberries has been shown that evolution (depreciation) appearance of finished products, look brown color is due to degradation of anthocyanins, polyphenols and formation of brown compounds identified in UV spectral range, λ = 220 ... 270 nm. Prevent the formation of brown compounds can be achieved by lowering water activity (aw) or free water in the finished products. The survey reveals that although low-sugar jam occurred oxidative degradation of antioxidants, however even at 10 months storage product state was reduced.

Keywords: gem, strawberry, antioxidants, color

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1. INTRODUCTION

In recent years special attention is given to functional food. Consumers prefer products with a high content of bioactive substances close to the natural taste. These products are beneficial to health (Costin and Segal, 1999; Chrin, 2005). In this context interest strawberry jam developed after the process of obtaining products with a low gelificate sucrose (Sandulachi et al., 2008; Sandulachi et al., 2007).
As mentioned (Sandulachi et al., 2008; Sandulachi et al., 2007) strawberry jam low sucrose content of interest in terms of color stability and nutritive value during storage. Weaknesses of strawberry jam, Factory in Moldova are: increased content of sucrose brunifică and after a short period of storage (Sandulachi et al., 2007). The problem can be solved by developing new processes and technologies for manufacturing low-sucrose gelificate (Sandulachi et al., 2008). This paper considers the investigations concerning the stability and quality of strawberry jam made by different technological schemes quality of strawberry jam made by different technological schemes and recipes. It is argued by experimental data and the scientific importance of the process of obtaining new strawberry jam low-sucrose and high content of biologically active substances.

2. MATERIALS AND METHODS

Experimental research conducted with strawberry variety Victoria, which have prepared samples of jam after technology and standards in force and samples as technology developed at the UTM Department of conservation technology. These products have been preserved by heat pasteurization temperature and kept at 20 ± 5° C.
Physico-chemical indicators that soluble substance content, titratable acidity, active acidity were determined by standard methods. Assessment change the nutritional value of the jam samples was don by assessing the oxido-reducing condition index, which reflects the

sensitive compounds in the chemical composition of food. The principle of this method consists in assessing the state of oxido-reducing system of the sample analyzed with standard - acid solution L – hidroascor. Oxido-reducing condition was expressed by the index K, mg AA/g dry (Macari et al., 2005). Evaluation of sensory quality of strawberry products was performed by spectral analysis of optical density λ190 - 1100 nm, using spectrof DR-5000. The samples analyzed appreciated and changing fast red after Hunter method. Under this method the product is marked red in C and brown - with B.

3. RESULTS AND DISCUSSION

For scientific substantiation of new manufacturing technology of strawberry jam (Sandulachi et al., 2008; Sandulachi et al., 2007), parallel investigations were made in two version: version control under the technical normative documents in force; experimental version - after the technology developed. According to the traditional recipe of strawberry jam is fruit ratio mass parties: sucrose 1:1 (100kg + 100kg of fruit sucrose). After this recipe in laboratory samples were obtained witness - strawberry jam (control variant). Developed technology allows to obtain the ratio fruit recipes: sucrose 1: 0,40 ... 0,60 (Sandulachi et al., 2008). After this recipe in laboratory samples
were obtained witness - strawberry jam (experimental version).
Table 1 presents the physical chemical properties of jams investigated (experimental control variant and version).

Table 1. Physico-chemical properties of strawberry jams

Product analyzed	Fruits			Strawberry jam				
	HS, %	pH	Titratable acidity,%	Fruit Report: Sucrose	HS, %	*p*H	Titratable acidity,% %	Red by Hunter method
Strawberry jam (Control variant)	7,5	3,75	0,83	100 : 100	68,0	3,50	1,32	0,02
Strawberry jam (Experimental version 1).	7,0	3,75	0,83	100 : 48	44,0	3,90	1,16	0,12
Strawberry jam Experimental version 2)	7,0	3,75	0,83	100 : 49	46,0	3,58	1,28	0,11
Strawberry jam Experimental version 3)	6,5	3,36	1,2	100 :60	45,5	3,37	1,4	0,15

* Red in the products investigated was assessed after 1 year of storage

A key indicator is the color of the sensory quality of products. During storage in products such jam, strawberries Confiture of different color changes occur and the content of antioxidants. Change the color is one of the causes of lower level products these berries. Visual jam samples obtained under current technical normative documentation, after 1 year storage were brown.
Spectral analysis is not evidence of any extension of the density optical wavelength λ between 500 ... 540nm. This shows us that these products has been a maximum anthocyanin degradation. Note that the stability of the samples obtained after the technology was comparatively better developed. This was confirmed by the presence of quite significant extinction peak density optical wavelength λ between 500 ... 540 nm.
The data obtained was calculated by the method that considers indicators Hunter Fast red (C), brown (B) and C / B.
In Fig. 1 presents results for control and experimental variants jam after 1 year of storage. Reduce the appearance of red and

brown color of strawberries in pasteurized products during storage reflects the degradation of anthocyanins and total polyphenols. Following the red color disappears, but also appear brown compounds. Amend the ratio of red and brown**.** Change the color depends largely on the composition and consistency of product. It was found that the decrease in red in the jams with a low content of sucrose obtained under the proposed technology is slower than jam obtained under the current standards (witnessjam).

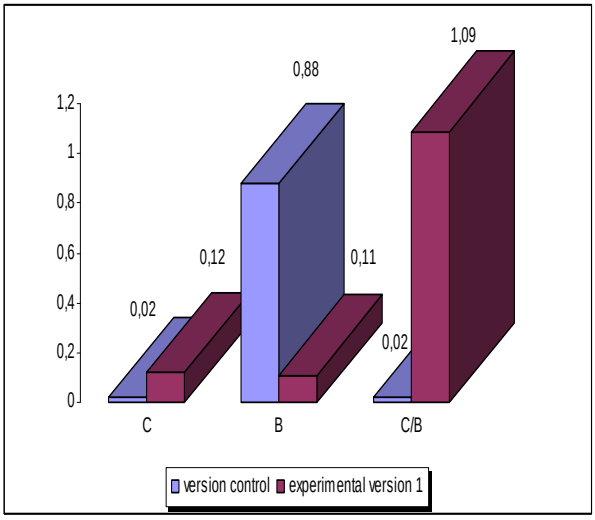

Fig. 1. Hunter indicators (red (C), brown (B) and C / B) of jams investigated (version control and experimental version 1), after 1 year storage

In Fig.2 is shown the optical density spectra change of an experimental samples during storage.

Spectral analysis of these products indicate a reduction of extinction while the optical density at λ500-540 nm and 290-310 nm in the range which also characterize the oxidative degradation of anthocyanins and total polyphenols in stored products.

It is interesting that in an experimental samples only after 10 months of storage there is a significant decrease in the extinction optical density wavelength range λ 500-540 nm.

Meanwhile extinction optical density range of 290-305 nm wavelength λ is quite presentable which also tells us that total polyphenol content in these samples is quite high.

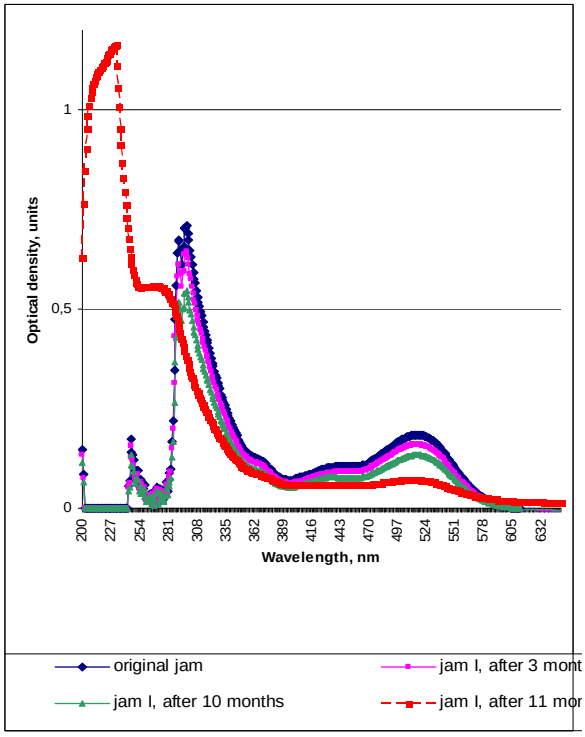

Fig. 2. Change in time of jams produced spectra

Note that after 11 months of storage in the spectra of these products to detect an optical density maximum extinction wavelength λ 230-270 nm. Perhaps this was due to the emergence of new chemical compounds amber that were formed by oxidative degradation of total polyphenols.

In Fig. 3 is shown the red color change (C), brown (B) and report these colors (C / B) while reducing the storage containing jam. Experimental results indicate a slow decrease of red, strawberry jam so low in sucrose content is quite stable. Only after 10 months storage of strawberry jam red decreased by 1.5 times, and brown increased 1,2 times.

Appreciated development gelificate antioxidants during storage products by reducing oxidation-state environment of food (SOR), expressed by the index K, mg AA / g dry. The experimental results are presented in Fig. 4.

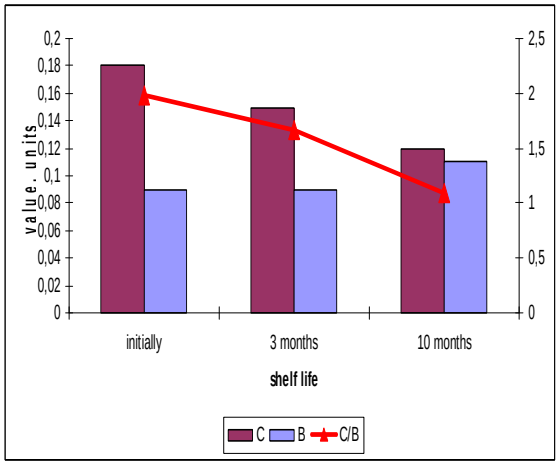

Fig. 3. Change the color of strawberry jam with a low sucrose

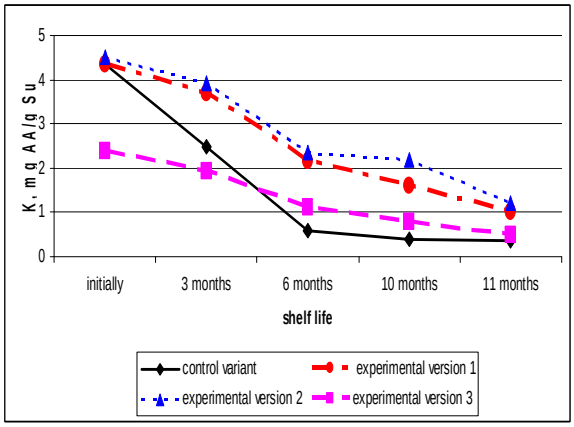

Fig. 4. The state of oxidation during storage, reducing strawberry jam

Experimental results show a reduction-oxidation status while reducing (experimental version 1), the value K = 4.4 mg AA / g dry(in the initial product), to the value K = 1.6 mg AA / g dry (in stored product 10 months), which also indicates a decrease in the SOR of 2.8 times. For (experimental version 2) K index value decreased from 4.5 mg AA / g SU (baseline) to 2.2 mg AA / g DM (after 10 months to keep the), which also shows a decrease in ROS 2 times.

For three experimental version of the K value decreased from 2.4 to 0.8 after 10 months of storage, so ROS decreased three times (referred to as Confiture was obtained from frozen strawberries). On the control variant was a more dramatic decrease in the K index, estimating the value of 0.4 mg AA / g DM in samples stored 10 months, indicating a decrease in ROS 10 times. The difference between the evolution of experimental samples to reduce ROS and witness version better reflects the stability of strawberry jam with a low sucrose content produced by the proposed technology. So it developed a new process for product type gelificate jam, Confiture of strawberries with increased content of antioxidants, low in sugars with a 40 ... 45%. Application of the proposed process allows the manufacture of products with a low-sucrose sweet harmonized with relevant biological value degree of stability and higher product quality partial dehydration of fruits. The stability of both color and nutrition products are depending on technology and compositions used.

4. CONCLUSIONS

• Based on experimental data obtained we can conclude: although there was oxidative degradation of antioxidants in strawberry jam low sucrose content, however this product antioxidants were reduced state.

• It was found that red strawberry jam made in the process developed was stable, pleasant and characteristic raw material.

• By analyzing the spectral composition of strawberries has been shown that evolution (depreciation) appearance of finished products, look brown color is due to degradation of anthocyanins, polyphenols and formation of brown compounds identified in UV spectral range, λ = 220 ... 270 nm. Prevent the formation of brown compounds can be achieved by lowering water activity (aw) or free water in the finished products.

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