

USING HIGH TECHNOLOGIES FOR PROCESSING AND STORAGE VEGETABLES AND FRUITS

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Abstract

Preservation of vegetables and fruits depends not only from temperatures but even from relative air humidity. For these sorts of vegetables freshness can be kept only with a deep control of refrigerating temperatures and humidity. During this study we will try to reveal the influence of temperature and air humidity inside the storage place correlated with quality of the vegetables and fruits (tomatoes, apples, cucumber) preserved through white frost methods. All measurements have been done in laboratory conditions with environmental temperatures between 0- 4°C and relative air humidity $\varphi=95-98\%$. Results will prove that all preserved products stored in those conditions keep all their quality parameters during the time and all their characteristics remain the same like fresh products.

Keywords: *refrigeration, tomatoes, apples, low temperature.*

Introduction

Fruit and vegetables are both major food products in their own right and key ingredients in many processed foods (Croitor, 2002). Consumers increasingly require food products that preserve their nutritional value, retain a natural and fresh color, flavor and texture, and contain fewer additives such as preservatives (Niculita 1998, Jurgen 2002).

Eating fruits and vegetables has long been associated with health benefits, though some of the ways in which these foods enhance health have only become clear in recent decades. As an example, apples are an important source of A, B₁, B₂, glucose and fructose, also, cellulose and hemicelluloses, important amount of pectin, malic and citric acid and intervene in maintenance of the muscular tonus (Segal, 1980).

Tomatoes are an important source of vital antioxidants for human body that: A, C vitamins, lycopene which contionaries the cancer or other diseases. Also, tomatoes represent one of the principal culture from vegetable's garden, because the fruit it self is a food very valuable which contains nourishing substance (Segal, 1980).

The present work was undertaken to study the influence of low temperatures against tomatoes and apple preservation and storage.

Experimental

As raw material in this work tomatoes *Lycopersicum esculentum* Miller specie, obtained of oblige culture, for to be supply (deliver) at consumers in fresh tomatoes were used. We start to study tomatoes during growing period, without pesticides usage, using fertilizers, only.

Methods of preservation of tomatoes were refrigeration and freezing, for this purpose refrigerators and freezers were used. Method of analyze for tomatoes was establishing sensory characteristics, before and after freezing. Also, we established how affect rate of maturity time of preservation through refrigeration (Tofan, 2002).

Initial, before refrigeration, tomatoes showed, like in figure 1.



Figure 1. Tomatoes at harvest

Tomatoes are easy fattened, are complete, healthy, epidermis is intense red, without dirt, hits and without green collar a round peduncle , in section we saw a firm pulp, a well texture. Apple, Jonathan sort, *Malus communis* L, designated for use in fresh state at consumer. The apples used for preservation, are apples of winter, harvested in October month, from Neamt county.

Methods of preserve's apples are refrigeration. Method of analyze for apples used by us, was establishing sensory characteristics, in conditions of cellar and before and after refrigeration but for apple's preservation at room temperature room we realized a microbiological analysis.

In this conditions we followed how influence low temperature the period of preserve's apples.

Tomatoes are complete, healthy, are extra and first quality, after equatorial maxim diameter of 60-65 mm, weight of 76-125 gr. As is stipulated in "Collections of standards for vegetables and fruits volume I", apples have to be roundly lies, and their epidermis to be smooth, shining, easy greasy, without ridging and color is vivid, intense.

Results and Discussions

Tomatoes-color is a strong indicator which establish rate of maturity and quality but establish time of preservation, also. The conditions of preserve, temperature and relative humidity (ϕ), are presented in table 1.

Table 1. The influence of rate of maturity upon time of preservation

Rate maturity	Color	Temperature preserve (°C)	ϕ (%)	Preservation time (days)
I	20% pink-yellowish	12-15	85-90	18-20
II	50% pink-yellowish	10-12	85-90	14-18
III	all surface pink	8-10	85-90	10-14
IV	red intense	5-8	85-90	cca.10

Tomatoes harvest reds are firmly at pushing, if are preserved at 1-2°C and time of preserve is longer. Tomatoes red intense was freezing, time of six months, at temperature of (-20°C) and relative humidity of 85-90%.

Figure 2 presents for comparison the images of freezing tomato (A) and refrigerated tomato (B). To establish sensorial characteristics, we constituted a team of 5 persons that expressed opinion about color, texture, taste, and flavor in both cases. For these sensorial characteristics, a hedonic scale of 4 points was used (table 2).

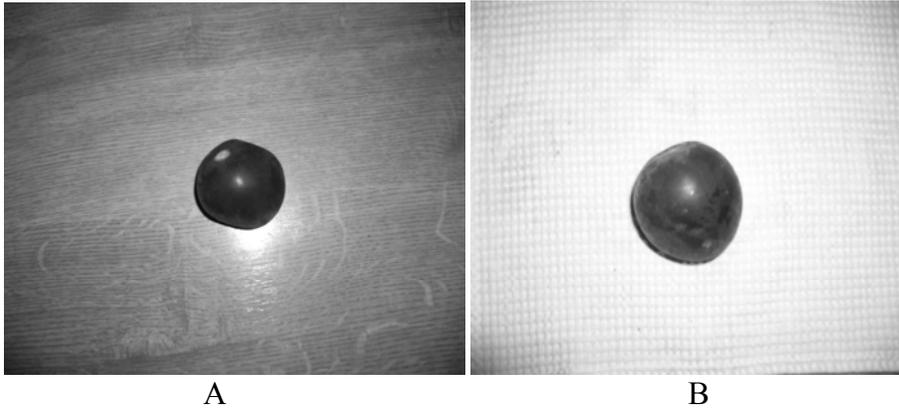


Figure 2. The images of freezing tomato (A) and refrigerate tomato (B)

Table 2. Hedonic scale used for freezing tomato

Scale	Sensorial characteristics			
	Color	Texture	Taste	Flavor
1	Pale	Soft	Tasteless	Flavorless
2	Colorful	Normal	Reduced	Reduced
3	Vivid	Firm less	Normal	Normal
4	Intense	Firm	Intense	Intense

Same steps were used for refrigerated tomatoes and was established that color and flavor had been kept in both cases but texture and taste was different which, as can be observed in figure 3. Final results are presents in table 3.



Figure 3. Section in freezing /refrigerated tomatoes

Table 3. The score of sensorial characteristics for freezing tomatoes

Sensorial characteristic	Score
Color	3.2
Texture	2.8
Taste	1.4
Flavor	2.2

Because the epidermis is damaged through easy brushing and thermal treatment before, the score for taste and flavor is less. This means that the freezing tomatoes can not be used for salad, but frequently are use in many assortments of mixed vegetables and various types at vegetables with meat (Mihalca, 2003).

Also, the sensorial characteristics of the canned apples, refrigerated at 3-4°C, and at a relative humidity of 95% were studied. A hedonic scale of 4 points (table 4) was used to appreciate the authenticity, shape, size, color and exterior aspect, uniformity and freshness of canned apples. The sensorial characteristics of apples kept in cellar for 7days, 15days, 30 days, up to six month were appreciated by 5 persons.

Freshness is appreciated after turgescence, after vivid aspect of the fruits. Presence of peduncle indicated freshness, because a lost peduncle favors losing of the juiciness, harm of the pulp integrity, and quickly degradation of the fruits. The main results of the sensorial appreciation are presented in table 5.

Table 4. The hedonic scale used for apples preserves in cellar

Scale	State of epidermis	State of the pulp	Taste of the pulp	Consistence of the pulp
1	Pale	without juiciness	brackish	mellow
2	Colorful	insufficient juiciness	tasteless	mealy
3	Vivid	moderate juiciness	astringent	firm
4	Intense	juiciness	sweet-acidulated	hard

Table 5. The sensorial characteristics for apple canned at 3-4°C, φ-95%, and duration of 7days up to 6 months

Diameter/weight	60-65 mm/ 76-125 g
Form	roundly with coast and easy crests
Peduncle	located in peduncles cavity
Epidermis (color is vivid, intense, yellow, cover with faded red-orange with width and red-rubious stripe, regularly interrupted	<ul style="list-style-type: none"> - color of background which put one's complete fruit is yellow-orange - covering color is red with areas of intense red - superpose color is intense, likeness of various stripes over covering color.
Pulp, the more important for quality -with consistence - taste	<ul style="list-style-type: none"> - white, with infiltration under epidermis - juiciness - dense, firm, and fine - sweet - acidulated, well harmonized, easy astringent

Bitter components can be developed in various tomatoes and apples under certain storage conditions or when infected with certain pathogens. Apples storage in conditions of cellar deteriorated by *Penicillium*, mummifies (figure 4).



Figure 4. Apples mummified in cellar deteriorated by *Penicillium*

Conclusions

It can be observed that apples and tomatoes preserves very well at low temperature. High temperature is stimulating respiration and breathing having results in quickly depreciation of tomatoes and apples.

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