

## PROSPECT OF TECHNOLOGY USING FOR FRUITS STORAGE BY FREEZING

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**Abstract:** The elaboration of technologies for food storage is one of the priority directions of development of the food-processing industry. A definite place among technologies of food storage is occupied by method of freezing with cold which in comparison with others methods keeps the properties of the product practically intact. It was established that during freezing and storage nutritive elements of fruits are isolated and losses are insignificant. The main objective of this study was the research of influence of cold treatment on horticultural products, especially preserving of biological value, comparing to other storage methods such as sterilization. Biological value and quality parameters of frozen fruits samples stored by researched method during all recommended period of storage and after defrost remain intact. It was proved that researched method of storage is efficient, easy to manage and ensure a high quality of product.

**Keywords:** quality, shelf life, vitamin potential, physico-chemical composition

### Introduction

Fruits are highly perishable horticultural products, it is needed maximum caution, while working with them. The necessity of using the fruits whole year lead us to invent new methods of fruit storage. Fruit preservation and transportation over long distances is much simpler when the fruit is dried, canned or frozen [1, 2]. Keeping frozen fruit is one of the safest and most widespread methods of storage. During the freezing process are kept all vitamins and nutrients. The losses during the fruit storage and after defrosting are insignificant. Thus fruit is keeping the original shape [1, 3].

The main objective of this work is to study the influence of refrigerant on horticultural therapy, determining the optimum conditions for achieving technological processes (refrigeration, freezing) to determine the appropriate freezing method of Moldavian fruits and to stimulate domestic producers to implement this method in Moldova.

### Methods and materials

The Freezing method we chose for the research was analyzed at the cannery "Kampol-fruit" (Lublin, Poland). The factory has special freezing installations as required for freezing and storing fruits. In order to optimize analysis and accurate assessment outcomes analyzed were chosen fruits like: strawberries and cherry. The technology of food storage method by freezing with cold of vegetables consists of following step:

- Acceptance of raw material - requires following steps. First all sensory and microbiological analyzes of the fruits must be done.
- Washing the fruits - The fruits are washed in large vats with care to avoid any mechanical damage of them.
- Conditioning - is the calibration and sorting operations. Removing substandard fruits. Calibration is done with a special machine, which is using vibration in a large site.

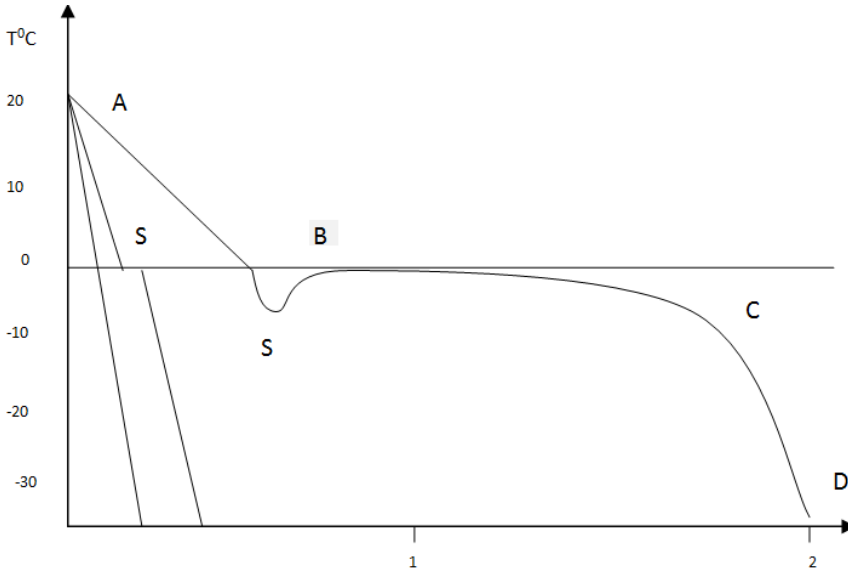
- Freezing – It is made at – 29 C
- Calibration
- Storage - The temperature -18C

The main object of this research was analysis of biological and nutritional value of freezing vegetables. These results were compared with other results, which were obtained by another method of storage as sterilization. After defrost of vegetables the organoleptic indices were analyzed.

### Results and discussions

In this research were analyzed different fruits at different regimes of freezing and storage. During the storage , in frozen type of the fruits were identified some vitamine changings (Table 1). Taking in cosncideration the fruit's perishable after the defrosting were noticed the weight lost of the fruits.

To freeze fruits were introduced in freezing aggregate with the air temperature - 35°C, 90% relative humidity and air recirculation coefficient is about 250 / h. As will be noted from the curve of Figure 1 lowering the temperature of the kinetic product takes place in three phases.



*Fig 1.* Kinetic curves of fruit freezing in function of time

- a). In the A-S phase starts the fruit freezing from ambient temperature up to -20 ° C, the water is converted into ice. When crystallization point S liberates a large amount of heat that raises the temperature suddenly to the point B, apparently freezing point.
- b). In phase B-C actual freezing occurs between -2 and -50C at this stage water is converted into ice crystals in a ratio of 60-75%.
- c). In Step C-D temperature continue to decrease until equilibrium temperature

d). In the same experience were analyzed the same fruits , processed only by thermal method, the data are presented in table 1.

**Table 1.** Biological value and quality parameters of fruits samples stored by different methods

The parameter name	Strawberry			Cherry		
	Fresh samples	Sterilized samples	Frozen samples	Fresh samples	Sterilized samples	Frozen samples
Protein, %	0.7	0.60	0.68	1.0	0.60	0.85
Lipids, %	0.30	0.30	0.30	0.30	0.30	0.30
Carbohydrates, %	4.9	21.80	5.	12.2	25.20	12.00
The energy value, kcal	32	92	30	50	86	49
Dietary fiber, g	2.0	1.70	1.85	1.6	1.0	1.35

Freezing speed has an influence on the final quality of frozen fruits, and in generally the shape and size of ice crystals forming depends on it too.

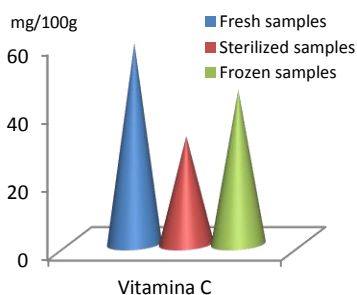
Dependi ng on the method of storage of fruit parameters (carbohydrates, proteins, etc.) changes.

From the obtained data we can observe the changings in carbohydrates products.In preserved fruits with sugar adding concentration of carbohydrates and sugars is higher than fresh frozen fruits.

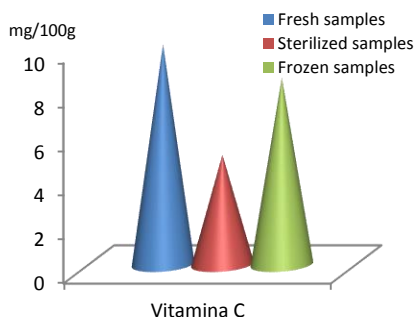
**Table 2.** Biological value and quality parameters of fruits samples stored by different methods

The parameter name	Strawberry			Cherry		
	Fresh samples	Sterilized samples	Frozen samples	Fresh samples	Sterilized samples	Frozen samples
K, mg	153	86	140	173	135	159
P, mg	24	12	20	15	10	14
Ca, mg	16	13	14	16	12	15
C vitamin, mg %	58.8	31.70	45.2	10	5	8.5
Fe, mg %	0.4	0.50	0.35	0.30	0.30	0.30
Mg, mg %	13	8	12	9	8.5	8.5

Vitamins are nutrients can be lost very easy druing the freezinf proceses But it must be emphasized that research results have shown that even the most soluble vitamins are retained druing the frozen substantially better than in all other food preservation processes. The researche shows that frozen foods suffer little loss of vitamin A, scalding favors maintaining this vitamin in vegetables. One of the most studied vitamins, vitamin C that is the most prone to changes. In fig. 4 and figure 5 is shown the concentration of vit. C (mg / 100g) following various storage processes of strawberries and cherries.



**Fig. 4.** The changing of vitamin C in strawberries through the using of different storage methods, mg / 100g



**Fig. 5.** The changing of vitamin C in strawberries through the use of different storage methods, mg / 100g

Vitamin C, is the most studied and very important for consumption, but is soluble in water, easily oxidizes. These losses vary depending on the time of freezing and method of freezing, and in average it is 50%.

The present study results show that nutrients losses of defrost vegetables samples are insignificant in comparison with another methods of storage.

Biological value and quality parameters of frozen vegetables samples stored by researched method during all recommended period of storage and after defrost remain intact. It was proved that researched method of storage is efficient, easy to manage and ensure a high quality of product.

### Conclusion

During the research were demonstrated:

- The cold treatment changes very little original taste of fresh fruits, in comparing with other preservation methods such as dehydration or heat treatment.
- The defrost fruits are richer with nutrients and fiber, because the juice from the cells released easier which increase micro nutrients.
- The products are healthy, tendergreen, nelnignifiante without molds and insect bites
- Vitamins and mineral sources are kept at a high level
- Organoleptic properties are suitable
- This method of fruit's storage has a potential of spreading on the territory of Moldova.

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