

COMPARATIVE STUDY REGARDING THE EFFECTIVENESS OF THE PRESERVATION OF FOOD PRODUCT QUALITY USING DIFFERENT USUAL PRESERVATION TECHNIQUES

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Abstract

The research follows the increase of preservation period of food products in the conditions of keeping at maximum of sensorial, physical-chemical, microbiological, histological and nutrient qualities.

It have been made studies of the following preservation techniques:

- *preservation of food products using cool;*
- *preservation of food products using UV light;*
- *preservation of food products using vacuum;*
- *food's preservation using mixed techniques.*

The conclusion's of the studies shows the superiority of the preservation through mixed procedures, which have the following advantages:

- *allow to apply some gentler preservation treatments, which also allow to maintain the product's quality to a high level;*
- *increase the stability and safety of food products for human health.*

Keywords: preservation, UV light, irradiation, mixed procedure, vacuum, chilling, freezing

1. INTRODUCTION

One of the essential condition of the human existence and the main characteristics of life is represented by food. Through food products the human body receives the necessary material in order to elaborate its own substances, the energy necessary for synthesis and deployment of vital phenomena, and the factors which are rushing the biochemical transformations in the human body.

The feed assures the growth, the physical and intellectual development of human body, increase the work capacity and the defense power by rapport with the agents harmful for health, due to the increase of the general reaction of the human body.

Even generally it can observed their favorable action, in certain conditions the food product can become a harmful cause for health, following the spoilage caused by different microorganism which are polluting the food products and also determine lost of a part from their nutrient value.

From these reasons, one of the main concerns of the alimentary industry experts is to keep the physical characteristics and the chemical composition, which is the base for nutrient value of food and especially for the assurance of food product sanitization. This is an essential condition for using the food in feeding the people.

Development of all the economic activity sectors produced a considerable increase of the pollution factors for the environment and in the same time the danger of infection of food products with substances potential harmfully for human health. In parallel it have been developed the production technologies for food products.

2. PURPOSE AND OBJECTIVE OF THE RESEARCH

The purpose of this research is to distingue, through a comparative study, the preservation techniques which are assuring preservation in

conditions of maxim effectiveness, keeping the initial quality of preserved processed products. The following objectives have been proposed:

- study of the food product preservation using cool;
- study of the food product preservation using UV light;
- study of the food product preservation using vacuum;
- study of the food product preservation using mixed procedures, with different techniques.

3. THE RESEARCH

In this study it will be considered several known preservation methods, which are part of the category of the most known and modern applied in the last years.

Maintaining the quality of a food product during its preservation supposes to keep at maximum the sensorial, physical-chemical and biochemical characteristics, adding their nutrient value.

The effectiveness of preservation activity for a food product can be established function of keeping its quality, but also depending on the economical performances: complexity of preservation techniques, energy consumption, usage costs etc., which will be take into consideration in research evaluation.

Study of preservation action of food products using cool

The low temperature has a preservative effect, due to microorganisms' sensibility to cool action. This is explained by reduction the mobility of water cell from the cellular juice, which is affecting the biochemical reactions and the microorganisms' metabolism.

At low temperature (beyond -11°C), the water is freezing and forms ice crystals, so the value of water activity indicator "a" is reduced and there is an increase in soluble substances concentration in water (dry matter is reported to a smaller water quantity). The effect is modification of osmotic pressure of cell's juice, which will determine a disorganization of microorganisms' metabolism.

The decrease speed regarding number of microorganisms varies depending of feather and temperature (table 1):

Table 1

Microorganism	Duration for a generation (h)							
	Aerobioză $^{\circ}\text{C}$				Anaerobioză $^{\circ}\text{C}$			
	2	5	10	15	2	5	10	15
Pseudomonas - nefluorescent	7,6	5,1	2,8	2,0	-	-	-	-
- fluorescent	8,2	5,4	3,0	2,0	-	-	-	-
Acinetobacter	15,6	8,9	5,2	3,1	-	-	-	-
Enterobacter	11,1	7,8	3,5	2,4	55,7	23,2	8,5	5,4
Brochatrix thermosphacta	12,0	7,3	3,4	2,8	32,8	20,1	9,7	6,8
Lactobacillus	-	-	-	-	8,4	6,5	4,6	3,8

The research shows the influence of low temperatures on microorganisms:

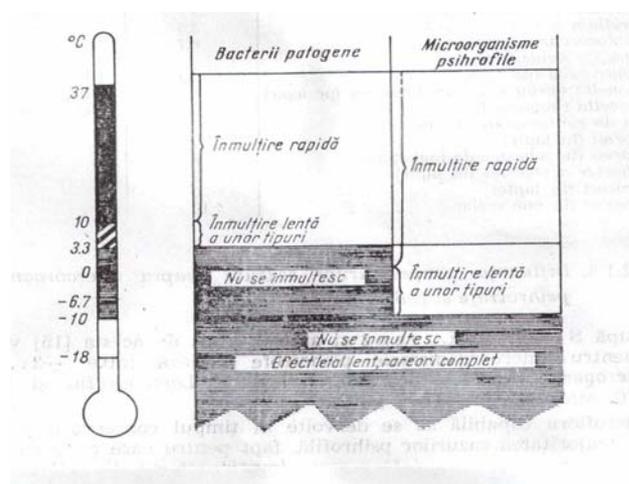


Figure 1. Influence of low temperatures on some microorganisms

The preservation process of food product is intense influenced by the initial microorganisms' affection level of food product as it can be observed in table 2.

Table 2. Preservation duration for a fresh food product, depending on initial affection level

Initial microbial population no/cm ²	Preservation duration (to same temperature)
100.000	7 days
10.000	9 days
1000	12 days
100	15 days
10	18 days

From experimental data results that the preservation duration of food products, is

chilling there are generally kept the initial product's qualities, to very high level, at freezing took place transformations of the sensorial, physical-chemical, biochemical, histological and nutrient properties, which are reducing the quality level of product during freezing and than during the increase of duration of cool preservation. In the same time it is very important to continuously maintain the cool chain applied.

Study of preservation activity of UV light on food products

The research shows that UV light issued by source with mercury bean lamp having short wavelength, with $\lambda = 200 - 280$ nm, have a bactericidal action, having a reduced penetrable power (1-2 mm).

This antimicrobial surface action is advantageous, due to the fact that microorganisms development starts usually from the food product's surface, then they are penetrating through inside.

The preservative action of UV light is explained through their photochemical effects (depending on dose and irradiation duration),

In parallel, from the point of view of the activity of spoilage micro flora, it has to be mention that the presence of air favors the development of aerobes bacteria, so elimination of air through vacuum reduces

increasing with the temperature decrease (as shown in table 3).

Table 3. Preservation duration of a fresh food product depending on preservation temperature

Preservation temperature	Preservation duration
0°C	12 days
5°C	8 days
<u>10°C</u>	4 days
20°C	2 days
-10°C	18 days

Preservation by cool includes two main methods: chilling and freezing. If in the case of which is modifying on biochemical way the normal structure of the microbial cells ADN.

The experiments made on meat and vegetable products shows that through the surface irradiation with UV lights, having the wavelength $\lambda = 254$ nm, to a distance to source of 10 cm, the preservation duration is prolonged with 60-100%.

Study of preservation activity of food products using vacuum

The damage of food products can be produced due to the activity of spoilage micro flora or due to some chemical or enzymes catalased oxidation processes. So the absence of atmospheric oxygen (through vacuum) will lead to increase the stability of food products by rapport with the oxidation processes.

The oxidation is responsible of the damage of sensorial qualities, nutrient value, getting around to formation of some toxically substances as peroxides.

In the same time it took place self oxidation processes for some base components presented in food product, which can provoke the fat, color, flavor and taste substances damage and vitamin C losses.

sensible the number of germs which can develop.

These aspects lead to applying the vacuum techniques during technological processes

phases, especially for packaging the preserved product, under vacuum.

The vacuum's level depend function of product and vacuum equipment's complexity and can reach level of 700 – 740 mm Hg.

The research shows that applying the vacuum prolongs preservation duration with cca 50%.

Study of mixed preservation techniques action

The mixed preservation techniques represent a high level domain of preservation activity, due to the fact that worldwide, for the food product, it is applied „The obstacles technology” or „barriers technology”.

Using the obstacles technology by mixed preservation methods, it will solve two main issues:

- A preservation of food products in the conditions of applying gentle preservation treatments, with the consequence of keeping in a higher measure the initial sensorial, physical-chemical and nutrient characteristics;
- A higher stability in time of products, doubled by a higher safety for consumers' health.

In our case, it can be realized a mixture of two or three preservation techniques already presented: chilling + UV irradiation, vacuum packing + chilling, vacuum packing + freezing, UV irradiation+ vacuum packing + chilling, UV irradiation + vacuum packing + freezing.

Each of preservation's methods, individually applied, will realize lower preservation duration and quality aspects by rapport with any mixed procedure.

The explanation of these results can be argued by the fact that each preservation technique has its own distinct characteristics, and as overview the result is higher.

For example by UV irradiation the surface's micro flora is destroyed (the source of profound affection), by vacuum it is obtained a decrease of oxidation's reactions with 98% and is blocked the development of aerobes bacteria, and through applying cool is inhibited or

blocked the development of all damage's microorganisms.

Taking into account the combined action, the applied treatments can be gentler than applied individually, with the consequence of keeping the initial quality of preserved product.

4. FINAL CONCLUSIONS

The research emphasizes the advantages and disadvantages of each preservation techniques already presented:

- preservation using cool;
- preservation using UV light;
- preservation using vacuum;
- food's preservation using mixed techniques.

The main conclusion is that the effectiveness of preserving high level quality of food products is assured by using mixed preservation techniques, called the obstacles technologies, due to several reasons:

- it can be applied gentler preservation treatment, which will not affect the intrinsic qualities of preserved products;
- it will be assured in time a higher stability of products and a higher safety regarding consumers' health.

5. REFERENCES

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