

## MODERN METHODS FOR FOOD PRODUCTS PRESERVATION

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### ABSTRACT

*Bacteria, molds and yeasts are microorganisms that play an essential role in spoiling food. Food products preservation technologies are intended to reduce the intensity of the activity of pathogenic microorganisms that generate decomposition processes. From the point of view of food technologies, heat treatments (pasteurization, sterilization) are the main way of preserving food. The trend is to minimize or replace heat treatments with non-thermal, non-destructive methods, in order to preserve the freshness, nutritional and bioactive value of the food products. This paper presents the working principles and the effects of various modern methods of preservation, thermal and athermal, on food.*

### INTRODUCTION

Microorganisms have a special importance and a major impact on human activity. They are essential for obtaining some food, but they are also the main cause of food spoilage. In addition, they play an important role in food intoxications, as they are the main cause of infection outbreaks and epidemics.

There are many factors that influence the growth of microorganisms in food. All these factors must be taken into account when trying to prevent food intoxication. There are many types of microorganisms, of different forms and

with more or less complex structures. Bacteria, molds and yeasts are microorganisms that play an essential role in spoiling food. With regard to foodborne illness, we can say that bacteria are undoubtedly the main responsables.

Many factors contribute to the presence of microorganisms in food. The presence of pathogens and cross-contamination could be the main factors influencing the development of microorganisms in food.

### MATERIAL AND METHOD

Food preservation technologies are intended to reduce the intensity of the activity of pathogenic microorganisms that generate decomposition processes. Modern preservation methods include athermal and thermal methods.

From the point of view of food technologies, heat treatments (pasteurization, sterilization) are the main method to ensure safety and food preservation. The trend is to minimize or

replace heat treatments with non-thermal, non-destructive methods, in order to preserve the freshness, nutritional and bioactive value of food.

Minimum food processing is defined as a trend to replace the classic thermal treatment processes with new, athermal processes, including new thermal, milder processes.

The minimum processing consists of a simplified processing, so that the degree of processing to which the food

has been subjected is not always perceived.

Minimum processing techniques can be applied to different stages of

## RESULTS AND DISCUSSIONS

Modern processing methods include athermal methods and thermal methods.

Within the category of **modern athermal preservation methods**, more important are: preservation with high pressures, preservation with ionizing radiation, preservation with high voltage pulsating electric field, preservation / prolongation of storage time with UV radiation, preservation with antiseptic substances, ultrasonic processing, modified atmosphere packaging and sterilizing filtration (sestoabiosis).

*Preservation with the help of high pressures* involves the destruction of vegetative forms of microorganisms under the action of high pressures (4000-10000 bar). High pressures affect the hydrogen, hydrophobic, ionic bonds of microorganisms, having the following effects:

- inactivation of some enzymes due to the denaturation of their protein part (preservation of vegetables and fruits);
- stimulation of enzymes such as thermolysin and cellulases;
- decreased activity of enzymes such as trypsin and carboxypeptidase;
- modification of the tertiary and quaternary structure of proteins, increase of digestibility and increase their susceptibility to protease attack;
- gelling of starch and proteins;
- modification of the melting point of fats, of the enlargement of triglyceride crystals;
- intensifying the aroma of some food products by disorganizing some cellular organs that release proteolytic enzymes that act on proteins with the formation of taste substances.

*Preservation with ionizing radiation* (mainly  $\gamma$ ) is used for the following purposes:

processing on the agricultural raw materials storage - ready-made product chain.

- elimination of pathogenic microorganisms;
- elimination of spoilage microorganisms - vegetative forms (radurization - radiopasteurization);
- elimination of microorganisms - vegetative forms and spores, respectively radapertization or radiosterilization.

The action of accelerated electrons and  $\gamma$  radiation is manifested at the level of atoms and at the level of molecules with negative effects on the nutritional principles and enzymes in food.

*Preservation with high voltage pulsating electric field* is applied to liquid products, the effect being manifested when the transmembrane potential exceeds 1 V in the cell membrane. The process has no negative effects on the nutritional value and sensory properties of the treated products.

*Preservation / prolongation of storage time with UV radiation* involves the use of the germicidal character of non-ionizing UV-C ultraviolet radiation. The lethal action of UV-C radiation can be explained by:

- inhibition, inactivation of some enzymes containing active SH groups (sulfhydryl);
- the action of water radiolysis products;
- disorganization of the protein structure, by cleaving the bonds - SS (disulfide) and breaking the peptide bonds;
- formation of thymine dimers that cause DNA distortion.

*Preservation with antiseptic substances* is based on the action of some substances that stop the development and action of certain microorganisms (bacteriostatic substances) or destroy them (bactericidal substances), depending on the concentration and species of the

microorganism. Factors influencing the action of antiseptics are: concentration of substances, duration of contact, temperature, species and number of microorganisms in the substrate, the stage of development of microorganisms, the chemical composition of the environment and its pH. Ozone also falls into the category of antiseptic substances.

*Ultrasonic processing* of a product involves the appearance on the surface of its separation from the environment, of alternative increases or decreases in pressure that lead to changes in the properties of the material (physical rupture, acceleration of certain chemical reactions etc.).

*Modified atmosphere packaging* consists in modifying the gas or the composition of the gaseous mixture used for packaging, in order to increase the shelf life and better maintain the quality of the product. In order to change the atmosphere in the package, several techniques have been established to achieve the proposed goal. These include: vacuum packaging, gas modified atmosphere packaging, modified atmosphere packaging at equilibrium, active packaging.

*Sterilizing filtration (sestoabiosis)* consists in the retention of microorganisms by certain filter membranes that allow the passage of

liquids to be preserved, the latter having to be packaged in aseptic conditions.

From the category of ***modern thermal preservation methods***, we mention: processing with infrared radiation, microwave processing and processing with the help of cryogenic thermal shock.

*Infrared radiation processing* is based on heat transfer by radiation. The most important applications of infrared heating are: drying vegetables and fish, drying pasta and rice, heating flour, roasting meat, roasting cereals and coffee. This technique is also used to defrost food, to pasteurize the surface of the bread and to pasteurize the packaging materials.

*Microwave processing* consists in obtaining thermal energy using high frequency electromagnetic radiation. Microwave applications in the food industry are numerous: dehydration-drying, heating (bleaching, pasteurization, baking, frying, thawing), detoxification, clarification, structural modification, analytical determinations and others. The most common, however, are thawing and vacuum drying.

*Processing with the help of cryogenic thermal shock* consists in the rapid reduction of the temperature of the products, using cryogenic thermal agents, with bacteriostatic effect on the microorganisms with the potential to depreciate the quality of the products.

## CONCLUSIONS

Preservation of food products by thermal pasteurization and sterilization consists in the destruction of microorganisms with the help of heat.

In addition to the classical methods of conservation, modern methods have been used more and more frequently lately. They can be thermal or athermal, the purpose being to preserve the freshness, nutritional and bioactive value of food..

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