OPEN ACCESS
Haya: The Saudi Journal of Life Sciences
Abbreviated Key Title: Haya Saudi J Life Sci
ISSN 2415-623X (Print) |ISSN 2415-6221 (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Review Article

New Insights in Food Processing, Preservation through Advanced Methods and Applications in Food Technology

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DOI: 10.36348/sjls.2021.v06i12.001 | **Received:** 29.10.2021 | **Accepted:** 01.12.2021 | **Published:** 07.12.2021

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Abstract

Several procedures, methods, and techniques aiming at generating higher quality foodstuffs with minimal sensory and nutritive qualities have been developed and adapted over the past several decades. Pasteurization is a heat treatment procedure that kills harmful micro-organisms in foods and drinks. Pasteurized juices have been warmed to great temperatures for limited period of time to destroy any germs or bacteria which may still present. Double-pasteurization, that contains a subordinate heating procedure, can increase the shelf-life by killing the spores which have developed. Drying is indeed a natural method of prevent spoiling because most of the disease-causing microorganisms needed a humid environment to exist and grow. Chemical and physical methods of preserving food are used to destroy or hinder the development of germs. Modified atmosphere packaging, different conditions dehydration, controlled atmospheric storage, freezing, refrigeration, vacuum- packing, different forms of thermal treatment, ultraviolet-radiation, ionizing radiation, and extreme hydrostatic pressure are all physical ways of preserving food. canning heat methods are meant to eliminate the spores of a bacteria *C. botulinum*.

Keywords: Food preservation, dehydration, freezing, nanotechnology, microorganisms.

INTRODUCTION

Food preparation include fundamental food preparation, the transformation of food products into different form (such as preparing fruit preserves), and conservation and packing procedures. The term "food process engineering" refers to a set of processing methods used in the food business. One of the most important aspects of these activities is use of heat, either direct or indirect, to deliver meals free of pathogenic bacteria, as well as to increase or intensify other processes like separation, component alteration and extraction. Several procedures, methods, and techniques aiming at generating higher quality foodstuffs with minimal sensory and nutritive qualities have been developed and adapted over the past several decades. Some of these cutting-edge technologies have reduced dramatically the thermal element of food preparation while also providing non thermal alternatives [1-3].

New insights in food preservation

Under the anaerobic circumstances, yeasts, bacteria and many other micro-organisms decompose the carbohydrates. This indicates that there is no need of oxygen for this process to occur (apart from the presence of oxygen in the sugar). Fermentation is commonly utilized in forming alcoholic drinks like wine, cider and beer as well as in preserving foods like sauerkraut, yoghurt, and dry sausages as well as raising of dough in baking process. Packaged foods are a major source of salt in the diet. Sodium is added to various foods, mainly in Nacl form to avoid contamination, add some spice, and enhance quality. Some packaged foods may have a salt content of more than 2%. Americans use around of 3436 mg of salt each day, which is more than the daily recommended limit of 2300 mg for the healthy persons and much more than double the daily limit of 1500 mg for those at higher risk of heart attack [4-7].

Pasteurization is a heat treatment procedure that kills harmful micro-organisms in foods and drinks.

The temps and timeframes required to kill the Mycobacterium-tuberculosis and the other heat resistant, non-spore forming disease causing micro-organisms present in milk have been identified. This process also kills the majority of spoilage causing microbes, extending the food storing time. The kinds of food as well as the pathogen to be destroyed influence the temperature and time at which the food is cooked. The heating method eliminates the pathogenic germs and micro-organisms that can degrade the food, as well as reducing enzyme activity that can change sensory properties over the time. As a result, this technique can increase the shelf life of the food over many days or even weeks [8-12].

Pasteurization isn't same as the sterilization, and it doesn't destroy the spores. Double-pasteurization, that contains a subordinate heating procedure, can increase the shelf-life by killing the spores which have developed. The acceptance of the double-pasteurization fluctuates by dominion. Milk is pasteurized when it is delivered by the dairy in regions where it is permitted, so it does not deteriorate before preparation. Many nations do not permit this milk to be labelled as "pasteurized," but they do permit it to be labelled as "theorized," which relates to a reduced temperature technique [13-15].

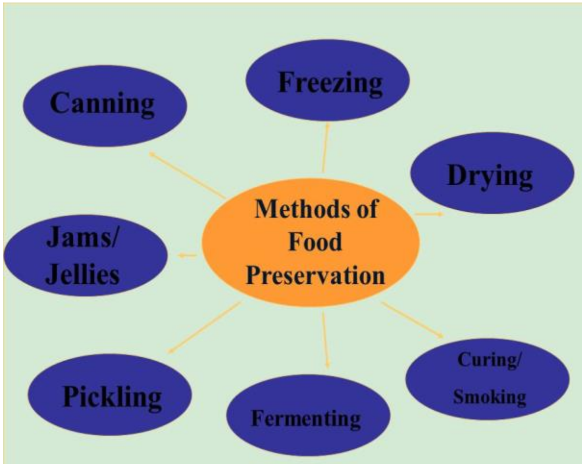

Fig-1: Shows the different methods for food preservation

Cool-plasma is an ionized gas form which is created when liquids or gasses are immediately agitated to the degree of partially ionization by a source of electricity. With technological developments permitting processing at bigger scales and at atmospheric pressures, interests in the cool-plasma for food preparation has grown. An air, oxygen or the nitrogen are commonly employed in food applications. Thermal disinfection is a thermomechanical procedure that kills all microbes (molds, yeasts, spore formers and the vegetative bacteria), extending the shelf-life of products. Thermal sterilization is divided into two main categories: aseptic processing and retorting [16, 17].

Applications in food technology

Nano-technology has grown into a major invention with enormous promise for promoting the sustainability. Physics, food technology, biology, environmental engineering, materials processing and medicine, are among the fields of applied sciences that it encompasses. This technique is popular because it has several characteristics, including gradual release, specific targeting, precise impact on active areas, and a large specific surface area [18, 19].

A modified form of the cold-plasma-treatment is the only technique in which the reactive chemical species are seized in the water, either in the solution (plasma-activated-water) or in discrete-fine-droplets. For plasma-activated-water, the plasma is produced and inoculated in to water mass; for PAM (discrete-fine-droplets) the droplets of water are passed by a plasma jet or dielectric barrier discharge. Heat treatment of foods is intended to reduce the number of foodborne pathogens or eliminate the food spoilage organisms from the desired products, guaranteeing the microbiological safety and extending the shelf life. The D-value corresponds to the heating rate demanded at a certain degree to kill the ninety percent of viable cells or the spores of specific species; the z-value corresponds to heating time needed at a particular temperature to kill the ninety percent of the cell viability or spores of specified organism. The z-value indicates the temperature change required to change D-value by one log-cycle, indicating an organism's comparative high thermal stability. Raising the heating rate reduces the time necessary to obtain the required deadly effects at a certain temperature [20-22].

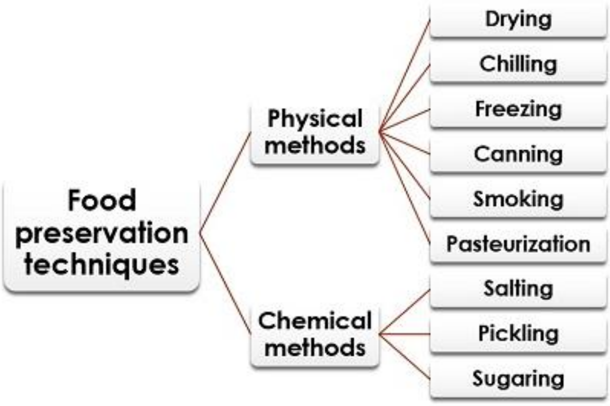

Fig-2: Shows the different techniques for storage of food

Chemical and physical methods of preserving food are used to destroy or hinder the development of germs. Modified atmosphere packaging, different conditions dehydration, controlled atmospheric storage, freezing, refrigeration, vacuum-packing, different forms of thermal treatment, ultraviolet-radiation, ionizing radiation, and extreme hydrostatic pressure are all physical ways of preserving food. In today's world, the food business is always looking for ways to improve manufacturing efficiency and effectiveness. The majority of organizations in the Europe and in the United States use authorized risk management systems that continuously monitors and record temperatures and time. Temperature and time are crucial for not only to the security of the finished products but also to its quality, from thermal treatment to freeze and cold stores [23-25].

As a consequence, it is evident that, temperature, time and thus energy are critical to the food sector. In this study, we suggest adapting a special term "Action" towards a more scientific and valued approach in a sector where empiricism has previously dominated. Because action in sciences permits for the utilization of analogies, it has a greater applicability in many adjacent subjects. Enzymes present in foods could be blocked by altering their circumstances such as temperature and relative humidity. For example, one approach of preserving beans is to place them in boiling water for a few mins. This technique is also identified as blanching inactivates enzymes and therefore, aids in conserving food [26-28].

Sterilization is a process of destroying all the bacteria by heating them over 100°C. The temperature and time needed for full sterilization of foodstuffs are heavily influenced by various parameters such as the kind of germs present on the foodstuff, the length of containers, the pH and the acidity of food, and heating manners. Generally, canning heat methods are meant to eliminate the spores of a bacteria *C. botulinum* (can effortlessly produce under the anaerobic environments, producing the lethal poison that reasons botulism) [29-32].

Boiling is method of application of heat to water to reached at a temperature of at least 100°C. Whereas boiled foods does not totally eradicate all germs, the reproductive cells of bacterium, molds and yeasts are normally eliminated at temperature of 100°C or higher. Some microbe's spores are exceptionally heat resistant and therefore are not destroyed at this temperature, though their growth is inhibited. As a result, boiling foodstuff may seldom be relied on to completely destroy all organisms [33-35].

Most of the pathogens are destroyed if enough exposure time is sustained. Even though the spores of Clostridium-botulinum, which causes botulism are exceedingly resistant to heat, the toxin generated by such organism is easily eliminated through boiling. Nevertheless, some chemicals produced by the other bacteria, like staphylococci, are difficult to neutralize. If atmospheric conditions are perfect for thermophilic (heat loving) organisms, they can withstand the impacts of boiling and induce the food spoiling [1, 8].

Although atmospheric-steam-canning is being used for some period, it's not an authorized method of preservation by the USDA (United States Department of Agriculture) until lately, when the research determined that it was a secure process of protecting high acid food products as long as advices were followed. It is crucial to remember that while utilizing the atmospheric-steam-canning process, the treatment duration must never exceed mins because the volume of water utilized in the canner's base has the ability to boil dry beyond 30 min. Before using atmospheric-steam-canner, carefully read and follow the instructions. The market for organic foods has grown significantly in response to increased consumer desire for balanced food and healthier life [7, 11, 16].

Consumers require a regular diet that is devoid of preservatives and additives and has a long shelf-life. As a result, the idea of ozone-treatment-technology has grown in popularity in recent decades. The reason for using ozone is because of its various features and the rapid decomposition. Bottling and canning refers to the process of sealing prepared meals in sterilized cans and bottles. Bacteria are killed or weakened when the container is heated. Foods are cooked for varying amounts of time or for varying lengths of time. The food is again at danger of rotting that once container or jar is open. The canning procedure itself contains some steps: washing and additional making the raw food materials; blenching it; filling containers, typically under vacuum; sealing and closing the containers; sterilization of canned foodstuffs; and warehousing and cataloging the final goods [23, 29, 32].

Drying is indeed a natural method of prevent spoiling because most of the disease-causing microorganisms needed a humid environment to exist and grow. However, one of oldest means of preserving food is laying the meals out in the wind and sun to dry out. Drying of vegetables, fish, meat and fruits has been documented since the beginning of humanity's history. At a certain time, humans discovered that different mechanical processes might be used to speed up and optimize the process of drying. The acidic nature of the maximum juices allows the pasteurization, which is defined as use of temperature close to 100ºCdestroy the spoilage organisms. Though spores may thrive at pH levels lower than the 4.6, outgrowth is improbable. In contrary, spore thermal efficiency requires an operating temperature of more than 115oC over a sustained period of time at the pH higher than 4.6 [34, 35].

Pasteurized juices have been warmed to great temperatures for limited period of time to destroy any germs or bacteria which may still present. The residual small percentage of juice vended is un-pasteurized. Un-pasteurized juice may comprise damaging bacteria which can form some individuals sick. One more effective and gentle conservation technique is sterile-filtration. Clarified juices could be passed by the membrane filter with undeviating size of pore 0.2 micrometers, in that way physically the elucidation of all virus and the micro-organisms. Of course, disease-free packaging of foodstuffs are necessary and the leakage of membrane is catastrophic [36-38].

CONCLUSION

The spermidine and the polyamines putrescine changed texture when penetrated in to apples and spermidine and spermine augmented inflexibility in sliced-strawberries. The growth controllers like2,4,5-trichlorophenoxyacetic acid and 2,4-dichlorophenoxyacetic acid were added to the fruits waxes as anti-senescent amalgams to enhance the shelf-life of mandarin-oranges. 2,4-D and maleic hydrazide were injected to waxes emulsions to postpone the mangos ripening.

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