

An Overview on Food Preservation Methods

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ABSTRACT- Food is required for the survival of all living organisms. Foods include a variety of nutrients such as carbs, lipids, proteins, vitamins, and minerals. An organism consumes and digests these nutrients in order to generate energy, which is needed to promote development and sustain regular living processes. Food spoilage can be caused by environmental or food-borne chemical, enzymatic, as well as occurs when the bacteria. Food has a finite shelf life; preservative are used in food to enhance that shelf life or preserve quality; nevertheless, these preservatives may have certain detrimental side effects. As both a result, today's consumer demand for minimally processed foods devoid of chemical preservatives has fueled interest in biology alternatives. By preventing or inhibiting growth of microorganisms, processed foods are substances found in food, pharmacological dosage forms, but rather cosmetic planning and preparation to maintain product accuracy and reliability, increase and otherwise preserve nutrient advantage, maintain edibility but also wholesomeness, start providing leavening (yeast), control pH, enhance flavour, or provide colour. A good preservative must be effective at low levels, non-toxic, generally compatible with all the other components in the recipe, as well as stable throughout the shelf life of the recipe. This review article examines the use of natural food preservatives as an alternative to artificial preservatives for a better human diet.

KEYWORDS- Bacteria, Drying, Freezing, Food Preservation, Protein.

I. INTRODUCTION

Food preservation is the science of keeping food from rotting or decomposing so that it can be maintained in excellent condition for future use. In this way, you may be confident of the food quality as well as its digestibility and nutritional value. Antibacterial, fungal, and other microbes are prevented from growing, as is the oxidation of lipids to decrease rancidity. The procedure also prevents any discoloration or ageing from occurring. Sealing is another way to keep germs from re-entering. Essentialize, preservation of foodstuffs guarantees that they remain in [1-4].

- No harmful organisms and chemicals are present.
- Color, texture, taste, and nutritional value are not compromised.

A. Drying

A foods lifespan can be extended by drying it out as a result, bacterial growth is prevented. Drying decreases food's weight, making it easier to transport. You may also utilize contemporary drying methods like Bed dryer (fluid bed dry), Freeze Dryings (freezing), Shelf Dryings (drying on a shelf) and Spray Drying (spray Meat or fruit, such as apples, apricots, as well as grapes, can be dried using this technique. Drying, perhaps the oldest technique of food preservation, is an excellent way to store herbs, fruit, vegetables, or meats. People have utilised the sun and nature to remove moisture from their possessions since the dawn of humanity. This method is utilised all over the world; for example, in Southern Italy, tomatoes are dried using just the sun's intense rays, while being in India, chilies, mangos, and a variety of spices are dried using only the sun's powerful rays. You know how much flavour this approach can bring to foods if you've ever eaten a delightfully sweet, sun-dried tomato. To dry herbs, just knot them together or hang them in a sunny, low-humidity location [5,6].

- *Freezing:* Freezing is the process of storing prepared food in a cold environment. It is possible to keep potatoes under the right conditions in a dark room, although potato preparations. People used to bring ice down from a nearby mountain in the olden times. Of course, we now store our food in electric freezers [7-9]. Most fruit and certain vegetables lose their texture when frozen, while meats and fish hold up well. In the summer, you may wish to freeze your berries so that you may use them later in the year in smoothies or baking. The best technique is to freeze the fruits in batches (the same methods would apply to vegetables). For example, spread fresh berries on a baking pan and freeze them. Place them in a bag once they've frozen firm [10-12]. This will prevent berry clusters from forming that are difficult to separate without freezing and also shown in Figure 1[13].



Figure 1: illustrated diagram showing freezing methods for food preservation[14]

- **Smoking:** By exposing food to smokes from burning wood, food is cooked, flavored, and preserved. Antimicrobial as well as antioxidant, smoke is commonly used on meats and fish. Cold smoking, Smoke roasting, Hot smoking and Smoke baking are all types of smoking. If you're going to smoke as a preservative. To generate a vacuum, vacuum packing makes bags and bottles impermeable in order to create in a vacuum, germs can't survive since there's Useful for dried fruits.
- **Pickling and salting:** Foods such as beef are dried out by salting, also known as curing a brine (salt solution) or vinegar marinade is used to prevent spoilage, and in Asia, oil is utilised. Microorganisms are killed and inhibited from growing at a 20 percent concentration of salt (Figure 2). There are numerous other pickling procedures than chemical and fermented pickling. Sodium benzoate and EDTA are used to increase the shelf life of commercial pickles.



Figure 2: salt-preserved foods like fish and pork Microbial growth is inhibited by salt [15]

- **Sugar:** Syrup or crystallized sugar could be used to preserve fruit, such as candied peel as well as ginger. Glazed fruit that has a thin layer of sugar syrup on it can also If you want to preserve a luxury item like fruit in brandy you can add sugar. Liquid sodium hydroxide (commonly known as lye) makes food alkaline or inhibits.
- **Bottling or canning:** The term canning & bottling refers to the process of sealing cooked food in a because germs are killed or weakened when the container is boiled, it can be There are different cooking times for different foods. As soon as the can and bottle is opened, food becomes vulnerable to spoiling once again.
- **Jellying:** Jeeling is the process of cooking food in a substance that solidifies to form a gel. Fruit is typically stored as jelly, marmalade, and notably fruit preserves, utilising pectin, which would be found in nature in fruit, as the jellying agent. Sugar has been added to the mix.
- In the United Kingdom, potting is a method of preserving meat that entails placing it in a pot and sealing it with a coating of fat.
- Jugging is the process of preserving meat by stewing it in an earthen jug or casserole. Meat and blood from the animal are cooked in brine or wine.
- Due to the sheer lack of light or oxygen, and also the low temperature, pH level, or dehumidifiers in the soils, food is maintained by burial in the earth. This procedure is used to preserve cabbage and root vegetables [16].
- Pulsed Electric Field Processing (PEFP) is a revolutionary cell preservation approach that uses brief pulses as a high magnetic field to process cells. The project is still in its early phases of development.
- Modified atmosphere preserves food by modifying the environment around it. Salad plants that are difficult to preserve are packaged in hermetic bags with a changed atmosphere that reduces oxygen levels while boosting carbon dioxide levels [17-19].

Controlled usage of organism's benefits cheese, wine, or beer even though they might be preserved for long periods of time. This method acts as a preservative by infusing it with benign organisms that create an atmosphere in which hazardous illnesses cannot grow. High-pressure food preservation is a method that includes squeezing meals with pressures of 70,000 pounds per square inch or more within a vessel. This destroys bacteria and prevents spoilage while retaining the food's appearance, texture, or flavor [20]. Fresh food items using Modified Environment Packaging have a longer shelf life. Ambient air is substituted with a protective gas mix within a package, meeting customer expectations stays fresh for as long as possible. The methodologies for impacts on microbial growth and survival are shown in Table 1.

Table 1: In shows the effect on microbial growth and survival with different methods

Methods	Effects on Microbial Growth or survival
Refrigeration's	Lower temperature to retard development
Sugar preservation	Cooking with a high sugar concentration results in an osmotic pressure that is too high for most microbes to survive.
Applications of higher hydrostatic pressure (Pascalizations)	Vegetative microorganisms, yeast, or molds are pressure-inactivated.
Freezing	Freezing To inhibit microbial development and delay oxidation processes,
Pasteurization and appertization	lower the temperature and reduce water activity.
Emulsification	Heat is delivered to specific microorganisms to the degree that they are inactivated.

1) Classification of food Preservation

Preservative are divided into 2 categories:

- *Class 1:* All natural food preservatives, including such salt, vinegar, sugar, honey, spices, edible oils, etc, fall under this group.
- *Class 2:* Benzoates, sorbates, potassium nitrites as well as nitrates, sulfites, glutamates, or glycerides are examples of chemical and semi-synthetic natural preservatives. Those who consume or even use foods or medications that include several preservatives are more likely to be exposed to a variety of chemicals. Chemical preservatives are divided into three categories: antimicrobial, antioxidant, or anti-enzymatic.
- *Antimicrobials:* They have the ability to destroy or slow the growth of bacteria, yeast, and moulds. Botulism is prevented by nitrogen compounds in animal products, for examples (bacterial food poisoning). Sulfur dioxide prevents further degradation of fruits, wine, even beer. To prevent fungal growth, antifungal chemicals such as benzoates as well as sorbates are being used in jams, salads, cheese, as well as pickles.

The breakdown of lipids and proteins is slowed or stopped by these substances. Antioxidants: When oils in food come into contact with oxygen, they become rancid. Antioxidants are classified into three groups: True antioxidants, including such butylated hydroxytoluene (BHT) but also butylated hydroxy anisole (BHA), suppress chain reactions by reacting with free radicals, so are often used as antioxidant preservatives in food compositions. Reducers, including ascorbic acid, have a lesser redox potential than just the drugs or excipients they safeguard. Antioxidant synergists like sodium edetate help other antioxidants work better. Preservatives with anti-enzymatic properties: Even after harvesting, they hinder enzymatic processes including such ripening in foods; for examples, erythorbic acid but also citric acid prevent the enzymes phenolase, which generates a brown tint on the external surface of sliced fruits [21].

B. Chemical Classifications of Food Preservation

Acids: Benzoic acids, Sorbic acids, and Boric acid are examples of acids.

Methylparaben, Ethyl paraben, Propylparaben, Butylparaben, Sodium benzoate, Sodium propionate are examples of esters. Alcohols such as chloro butanol, benzyl alcohol, and phenyl ethyl alcohol are examples. Phenol, chlorocresol, as well as o-Phenyl phenol are examples of phenols. Thiomersal, Nitromersol, Phenylmercuric nitrate, and Phenylmercuric acetate are examples of mercurial chemicals. Benzalkonium chloride, Cetyl pyridinium chloride are examples of quaternary ammonium compounds.

C. Natural Preservatives: Classification Depending on Source

Natural sources, such as plants, minerals, and animals, are used to make these medications. For example, neem oil, sodium chloride, lemon, and honey. Preservatives Man-Made: Humans produce these preservatives, which are effective against a wide range of microorganisms at low quantities. For instance, benzoates. Sorbates, propionates, including nitrites are all instances of nitrites. Sodium benzoate is some kind of benzoate which is used to Sorbates, propionates, including nitrites are all examples of nitrites. The European Union commission awards an E-number to an additive once it has been assigned by the Scientific Advisory committee on Foods (SCF), which is accountable for the safety evaluation of food additives. E numbers are assigned to chemicals that are approved for use in the European Union and Switzerland, so they are utilised by the food industry around the world. Lysozyme is on the list of approved preservatives, as is the range of E-numbers assigned to the Additives class [22].

D. Artificial Preservatives Pose a Health Risk

Although artificial preservatives are generally regarded to be safe, some have serious, carcinogenic, and toxic side effects. Sulfites, a common preservative present in many fruits, have been linked to headaches, palpitations, allergic reactions, asthma, cancer, and other health issues. Nitrates but also nitrites: sodium nitrite is a preservation used during meats,

hams, hot dogs, sausages, especially bacon to prevent contamination. Although sodium nitrite may limit the growth of bacteria that cause botulism, it can be carcinogenic when it combines with protein and cooks at extreme temps to form N-nitrosamines. The nitrate binds to haemoglobin (the molecule that delivers oxygen from the circulation to the body's tissues), resulting in chemically altered haemoglobin (methemoglobin), reducing oxygen delivery to tissues and turning the skin blue. Benzoates are thought to cause brain damage but also allergies like rashes or asthma. Caffeine is a stimulant but also diuretic that is used as a flavour and colourant. In certain people, it might cause anxiety, heart palpitation, as well as cardiac problem [23].

II. LITERATURE REVIEW

Lothar Leistner et al. studied Hurdle technique is utilized in both developed and poor nations to preserve goods in a mild yet effective manner. Previously, hurdle technology, which consists of a mix of preservation techniques, was used experimentally with little understanding of the underlying principles. The judicious application of hurdle technology has been increasingly prevalent in the last 20 years as the principles of important preservation factors for foods (e.g., temperature, pH, competitive flora) and their interconnections have become more known. The influence of food preservation strategies on the physiology or behaviour of microorganisms in foods, such as homeostasis, metabolic exhaustion, and stress responses, has recently been investigated, leading to the creation of the multitarget food preservation concept. This article provides a brief overview of the potential obstacles for foods, the hurdle effect, and hurdle technology. But, in terms of hurdle technology, their focus is on microorganism homeostasis, metabolic exhaustion, or stress responses, but also the potential for the ultimate goal of multitarget food preservation [24].

Simon Angelo Cichello and colleagues investigated The preservation of packaged foods against oxidative degradation is critical for food shelf life, customer acceptance, and food security. Oxygen absorbers are necessary for eliminating dissolved oxygen, preserving the colour, texture, and scent of many foods, and, most importantly, preventing the growth of bacteria that cause food deterioration. Food preservation has improved throughout time as the sealing of foods in oxygen impenetrable product packaging or the quality of oxygen absorbers has improved. Newer molecules are being intended to safeguard processed food components from all shapes of degradation, and even though oxygen absorbers remain a staple result for the conservation and preservation of pharmaceutical applications in developed countries to reduce food errors or maximize food security in working to develop or third-world countries [25].

III. DISCUSSION

Food is required for survival of all living organism. Foods include a variety of nutrients such as carbs, lipids, proteins, vitamins, and minerals. An organism consumes and digests these nutrients in order to generate energy, which is needed to promote development and sustain regular living processes. Food spoiling may be caused by chemical, enzymatic, or microbiological activity in the environment or in the food itself. Food has a limited shelf life; preservative are used in food to lengthen that shelf life but also preserve quality; but, these preservatives might have other detrimental side effects. Natural processed foods not only prevent bacteria from growing, but they also prolong the shelf life of foods, medicines, but instead cosmetics. It also allows them to keep their freshness or consistency for longer periods of time without creating toxicity. Artificial preservatives are chemical compounds that may be harmful to your health. Nowadays, people are becoming more aware of the negative consequences of these chemicals in food, cosmetics, and medicines. Natural preservatives have a number of advantages over their artificial equivalents, including the fact that they are non-toxic and provide a variety of health benefits.

IV. CONCLUSION

Because of increased consumer knowledge and concern about the negative effects of synthetic chemical additions, foods preserved with natural ingredients have grown increasingly popular. As a result, organic preservatives are becoming more popular among researchers including food processors. If food additives are required for health reasons, they must be natural, have few negative effects, and be universally acknowledged as safe. Natural preservation, which we've seen, have fewer side effects, are easier to find, and are less costly than chemical antioxidants used in foods, cosmetics, or other items. As a result, we'll be able to put it to good use right away. Natural preservatives not only prevent germs from growing, but they often lengthen the shelf life of the product, medications, including cosmetics. It also allows them to keep their freshness or consistency for longer periods of time without creating toxicity. Chemical substances used as artificial preservatives may be detrimental to your health. People have become more aware of the harmful effects of these contaminants, cosmetic, or pharmaceuticals. Organic preservatives have several benefits over their synthetic counterparts, such as the fact that they too are non-toxic or offer a range of health benefits.

REFERENCES

- [1] Tripathi L, Singh R. Anticonvulsant and neurotoxicity evaluation of some novel cyclohexyl-[4-substituted benzylidene/2-oxo-1,2-dihydro-indol-3-ylidene] thiosemicarbazides. *Asian J Chem.* 2011;
- [2] Singh V, Chaudhary AK. Development and characterization of Rosiglitazone loaded gelatin nanoparticles using two step desolvation method. *Int J Pharm Sci Rev Res.* 2010;
- [3] Singh DP, Hashim SR, Singhal RG. Anti inflammatory activity of some new thio-ether derivatives of quinoxaline. *Int J Drug Dev Res.* 2010;

- [4] Tripathi L, Kumar P, Singh R. A Review on Extraction, Synthesis and Anticancer Activity of Betulinic Acid. *Curr Bioact Compd*. 2009;
- [5] Singh B, Gupta V, Bansal P, Singh R, Kumar D. Pharmacological potential of plant used as aphrodisiacs. *International Journal of Pharmaceutical Sciences Review and Research*. 2010.
- [6] Verma KG, Kaushik BK, Singh R. Propagation Delay Variation due to Process Induced Threshold Voltage Variation. In: *Communications in Computer and Information Science*. 2010.
- [7] Jahan N, Khatoon R, Ahmad S. In vitro evaluation of antibacterial potential of *Stevia rebaudiana* Bertoni against various bacterial pathogens including resistant isolates with bla genes. *Med Plants*. 2014;
- [8] Sharan HO, Kumar R, Singh G, Haroon M. Measurement of software testability. *Stem Cell*. 2011;
- [9] Agarwal S, Agarwal A, Joon P, Saraswat S, Chandak S. Fetal adrenal gland biometry and cervical elastography as predictors of preterm birth: A comparative study. *Ultrasound*. 2018;
- [10] Agarwal A, Agarwal S. Morbid Adherent Placenta Score: A Simple and Practical Approach on Application of Placenta Accreta Index. *Journal of Ultrasound in Medicine*. 2021.
- [11] Dadhich M, Pahwa MS, Jain V, Doshi R. Predictive Models for Stock Market Index Using Stochastic Time Series ARIMA Modeling in Emerging Economy. In: *Lecture Notes in Mechanical Engineering*. 2021.
- [12] Duy NT, Mondal SR, Van NTT, Dzung PT, Minh DXH, Das S. A study on the role of web 4.0 and 5.0 in the sustainable tourism ecosystem of Ho Chi Minh City, Vietnam. *Sustain*. 2020;
- [13] Mañas P, Pagán R. Microbial inactivation by new technologies of food preservation. *J Appl Microbiol*. 2005;98(6):1387–99.
- [14] BYROSE Y. COLÓN-SINGH J. How To Preserve Food | Methods And Techniques.
- [15] methods for food preservation with example.
- [16] Amos AJ. New Methods of Food Preservation. *J R Soc Promot Health*. 1957;77(8):443–5.
- [17] Sharma S, Hussain MS, Agarwal NB, Bhurani D, Khan MA, Ahmad Ansari MA. Efficacy of sirolimus for treatment of autoimmune lymphoproliferative syndrome: a systematic review of open label clinical studies. *Expert Opinion on Orphan Drugs*. 2021.
- [18] Khatri M, Kumar A. Stability Inspection of Isolated Hydro Power Plant with Cuttlefish Algorithm. In: *2020 International Conference on Decision Aid Sciences and Application, DASA 2020*. 2020.
- [19] Pathak D, Singh RP, Gaur S, Balu V. Influence of input process parameters on weld bead width of shielded metal arc welded joints for AISI 1010 plates. In: *Materials Today: Proceedings*. 2020.
- [20] Singh S, Shalini R. Effect of Hurdle Technology in Food Preservation: A Review. *Crit Rev Food Sci Nutr*. 2016;56(4):641–9.
- [21] Khan S, Science MA. Microbial Spoilage of Bakery Products and Its Control by Preservatives Microbial Spoilage of Bakery Products and Its Control by Preservatives. *Int J Pharm Biol Arch*. 2012;3(1):38–48.
- [22] ROONEY ML. Oxygen Scavenging from Air in Package Headspace by Singlet Oxygen Reactions in Polymer Media. *J Food Sci*. 1982;47(1):291–4.
- [23] SUZUKI H, WADA S, HAYAKAWA S, TAMURA S. Effects of Oxygen Absorber and Temperature on ω 3 Polyunsaturated Fatty Acids of Sardine Oil during Storage. *J Food Sci*. 1985;50(2):358–60.
- [24] Leistner L. Basic aspects of food preservation by hurdle technology. *Int J Food Microbiol*. 2000;55(1–3):181–6.
- [25] Cichello SA. Oxygen absorbers in food preservation: a review. *J Food Sci Technol*. 2015;52(4):1889–95.