



Types of Food Preservatives, Emerging Technologies, Impact of Chemical Preservatives on Human Health.

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Abstract

Food is among the necessities for life on the planet, and the worldwide populace is confronting an emergency of having 3-time feasts a day, and in such a period squandering food is unseemly. Wastage of food in the feeling of bringing down dietary benefits, rancidity, microbial development, and so forth. Preservatives are used to avoid all of these things; however, the chemical preservatives we use can be harmful to ourselves. As a result, the focus of this review will be on the various types of preservatives that are available, as well as the contemporary preservatives techniques that are being developed through nanotechnology and tools and techniques. We will also discuss various chemical preservatives and how they affect human health in tandem.

Keywords: Preservatives, Shelf life, Antioxidant, Antimicrobial

Introduction

Food is a fundamental requirement for every human. In the present time we are seeing monstrous populace development this development has been expanded fundamentally over the years and these developing populace requests for food, These food prerequisites must be satisfied and hence food security is required, we are additionally mindful of the way that our food is squandering in every single cycle, as when they are transporting they get squander while putting away, they debase, while handling they are taken out (the ones which no longer don't depend on the mark), Moreover the utilization of compound in rural practices brings down the timeframe of realistic usability of this food material for which the food additives are added.

Out of 100 % based on weight 42% of leafy foods squander, 26% of dairy things squander, 19% of grains waste, and 13% of different edibles squander happens ReFED 2016. This much wastage happens on a day-to-day basis because of the absence of safeguarding.

Talking about the loss on modern premise we get 20% creation squander, 1% handling waste, 19% dissemination squander, and 60% buyer squander this waste happens in actuality that the food isn't being saved as expected yet additionally influencing the soundness of individual devouring it.

All of these statements indicate that food preservation is necessary and that preservation should be beneficial so that everyone can access food without raising prices.

Preservation Techniques are numerous as we can find in this survey from the normal strategies to synthetic techniques to present-day techniques. Aside from flavors, salt, and honey, there are different compounds for usage in safeguarding. However compound additives are utilized broadly yet their outcomes are likewise there that we have concentrated on underneath in this article. Current nanotechnology-based additives have maximum capacity for safeguarding utilization yet their full use is yet to be found.

Modern helps have been found yet their utilization is restricted to specific businesses however their impact is great affecting the food sources creation.

Preservation

Conservation is an unquestionable necessity. As our populace is developing, we want more food accessible at various moments. Safeguarding is thusly an unquestionable necessity to keep away from misfortunes and wastage of food in such a time when there is a lot lesser measure of food than a prerequisite. Preservatives are added to our food in this way to extend its shelf life. There are various procedures and help that we will concentrate on here.

Preservative and shelf life

Substances that enhance food flavour and shelf life are known as preserves. They kill microbes that cause food deterioration and keep food from ruining. Likewise, some can be acquired from regular sources while others are blended. The period of usability is characterized as the greatest time a food can be put away while as yet being protected to eat. This period begins counting when the food is ready and numerous factors, for example, bundling materials, stockpiling conditions, air gases, capacity temperature, relative dampness, and timeframe of realistic usability can be determined.

Properties of ideal preservatives

- Improve or maintain the nutritional value of food
- Increase the shelf life.
- Reduce wastage of food
- Inhibit the growth of microbes
- Reduce the risk of food-borne disease

Types of Preservative Techniques

Here we will be dealing with preservatives based on their categories from natural to modern we will also be discussing various side effects of the ones that are overly used nowadays

1. Natural preservatives

Regular additives are those additives that are tracked down in nature and don't have a lot of terrible effects on food some of them change the taste yet for long-haul use they are perfect.

Aside from salts, spices, acidic acid, Honey, and eatable oil, there are a few instances of normal additives that are given below

- **Algin** - These are obtained from and are stabilizers of food, being a gelatin agent they are edible preservatives.
- **Rosemary extract** - These extracts of the rosemary plant are antioxidants and prevent the food from oxidizing.
- **Vitamin E oil** - These oils are extracted from wheat germplasm, sunflower, and suffola oil and act as antioxidants.
- **Citric acid** - These are obtained from citric fruit and are natural acidifying agents meaning they reduce the Ph of food making them acidic.
- **Gwar Gum** - These are obtained from seeds of the Gwar plant they are stabilizing preservatives.
- **Sodium Aluminosilicate:** - These are naturally occurring minerals that keep the powdered food free from caking up or clumping up.
- **Basil Extract**- Obtained from the Basil plant these extracts have the combined properties of antimicrobial and antioxidant agents.
- **Neem oil** - obtained from the fruit and seed of the neem plant this oil has the properties of antifungal, Antibacterial, and Antiprozoal and also has a detoxifying effect.

2. Chemical preservation of Food

These have three broad classes:

1. Antimicrobial agent

These are those chemicals that prevent the food from microbial growth or contamination so that the food will remain as nutritious as it was before.

Name of antimicrobial chemical	Permissible usage in food
Sodium /Pottasium benzoate or Bezoic acid	200 ppm
Methyl/ Propyl paraben	0.1%
Sorbic acid or Sodium /Pottasium /Calcium Sorbate	200 ppm
Sulphite, Sulphur dioxide	200-300 ppm

Propionate	0.32%
Nitrite, Nitrate	100-200 ppm

The effects of these chemicals if they are beyond the concentration level are harmful and lethal some of their side effects are mentioned below: -

- Sodium benzoate: - Causes gastric irritation, Nausea, Diarrhoea, asthma attack, and Skin rashes.
- Benzoic acid: - Causes allergic reaction and if they are mixed with ascorbic acid/ citric acid then they can cause leukemia or cancer as well due to the formation of benzene.
- Parabens: - Causes interference with the production of hormones hence termed as endocrine disrupting chemicals.
- Sorbic causes diarrhea, redness of the skin, headache, stomach cramps,
- Calcium sulphite
- Causes Branchial problems, can lower Blood pressure, and even analytical shock can occur.
- Potassium nitrate: -Causes a decrease in oxygen-carrying capacities of blood, combined with other substances to form nitrosamine which is an active carcinogen.
- Sodium Nitrite: - Causes formation of nitrosamine (carcinogen) when reacts with other chemicals.

2. Antioxidant agent

These are that chemical which prevent oxidation of food material so that they cannot become rancid within a due interval of time.

Name of anti-oxidant chemical	Maximum permissible concentration
Propyl Gallate	200 ppm
Butylated hydroxy anisole (Bha)	100 ppm (for meat)
Butylated hydroxy toluene (Bht)	50 ppm (breakfast cereal)
Tert- butyl hydro Quinone	100ppm

When the permissible limit is crossed everything becomes harmful

Propyl gallate

Affects the functioning of the kidney and liver when combined with other chemicals like Bha and Bht. Also, dermal sensitivity irritates the skin and eyes.

Bha and Bht

These are potential carcinogens and cause skin irritation and organ system toxicity.

Tert- butyl hydro Quinone

Causes impaired growth because of chronic and nutritional disorders that it may cause

3. Antienzymatic agent

These are those chemicals that suppress the enzymatic activity with hi the food to prevent the food from wastage.

Name of Antienzymatic chemical	Maximum permissible concentration
Erythorbic Acid	200- 3500 ppm

Usage of Nanotechnology in Food Preservation

Nanotechnology is a field full of potential because of the nano range of the particles used they are helpful in medical and other fields of human health concerns.

Types of nanoparticles used for food preservation

1. Organic nanoparticles (Lipid nanoparticles, protein nanoparticles, carbohydrate nanoparticles)
2. Inorganic nanoparticles (silver nanoparticles, ZnO, TiO², SiO²)

Organic nanoparticles

Lipid Nanomaterial

These nanoparticles prevent the active ingredient from reacting with other ingredients of food so that food cannot spoil. (Severino et al. 2012; Ban et al. 2020; Paliwal et al. 2020)

Protein Nanomaterials

These are nontoxic materials encapsulating active compounds to avoid spoilage of food and they are biodegradable as well as having high nutritional value. (Samadarsi et al. 2020)

Carbohydrate Nanomaterial -

These can be digestible Or indigestible but are very efficient in encapsulating active ingredients. (Verma et al. (2020)

Inorganic nanoparticles

Silver Nanoparticles

These are antimicrobial agents in food, they can be a part of storage containers and act as stabilizing agents in food composition. (Li et al. 2020; Zorraquín-Penã et al. 2020; Seray et al. 2020)

Zinc oxide Nanoparticles

These are biocompatible materials that have the properties of positive control on food-borne pathogens. (Venkatasubbu et al. 2016; Seray et al. 2020)

Titanium oxide Nanoparticles

These nanoparticles prevent the photoactivity of food on contact surfaces. (Weir et al. 2012; Peter et al. 2015; Yemmireddy and Hung 2015)

Silicon oxide Nanoparticles

These are anti-caking in powdered food materials having the power to cope up the food with abiotic stress. (Lim et al. (2015); Zahedi et al. (2020))

Modern tools and techniques

Though these techniques are used in lesser industries due to their newness in the future they will be widely used as their side effects are minimal and health benefits are.

Ultrasound preservation

Ultrasound techniques use high-frequency sound waves that travel through food.

The use of ultrasound in the drying system can accelerate the drying of fruits, vegetables, meat, and fish. It reduces drying time and increases heat and mass transfer to improve product quality. This versatile technique is inexpensive.

Four types of ultrasound

1. Ultrasonication: - Use of non-thermal ultrasound waves.
2. Mano sonication: - Application of ultrasound waves with pressure.
3. Thermosonication: - The use of ultrasound waves to assist in producing high temperatures or humidity
4. Manothermosonication: -. Ultrasound waves using temperature and pressure.

Electroplasmolysis preservation

Electroplasmolysis preservation involves the usage of electric current to disrupt of cell and the food material is such that food should be intact. (Bazhal et. al. 2003)

Microwave Heating

This technique involves the absorption of Electromagnetic energy by the food materials that increases the food's temperature. This technique can be used post-pasteurization to kill the remaining bacteria and this technique can increase the yield of oil extraction (Farrar et. al. 2020)

Ohmic Heating

The food materials are heated because of their resistance towards electric current acting as a whole matrix on the passage of electric current through them. (Demirdoven and Baysal 2014; Salari and Jafari 2020).

High-pressure freezing

Freezing of water at high pressure so that, once the pressure is released the water directly converts to ice crystals. (Volkert et al. 2012; You et al. 2020).

Radioactive freezing

Not prominently used but in this technique radio waves generate a turning force in molecules of liquid and ice crystals are created as a result of the dipolar and dielectric properties of liquid. (Ravindran and Jaiswal 2019; Mousavi Khaneghah et al. 2020) .

Osmo dehydration freezing

The food is first dehydrated by osmotic dehydration and then they are frozen.

Conclusion

There is an assortment of additives that we have run over separated from the ones that we are utilizing richly now for example substance additives, these compound additives have been concentrated on colossally by scientists and observed that they are hurting our bodies in various ways some of which we have concentrated on here in these survey reports whereas though we change to the regular additives however there conservation isn't giving a lot of rack season (of some) yet they are not hurting our body as much the others are hurting, the facts confirm that they might change the food's taste yet they increment the dietary benefit of our food and keep them safeguard for sometime later. Where in present-day innovation we have concentrated on nanotechnology-based additives and impending apparatuses and procedures in both of their contexts the facts confirm that they won't hurt the people however much the substance additives are hurting yet there's one more side of the coin that we have not completely comprehend their utilization and their approach to working in food just in light of the assessment these won't be off-base that from nanotechnology the fate of our food innovation strategies will change endlessly yet in how long we don't have any idea. However, chemical methods and tools will undoubtedly be phased out in favor of modern ones shortly.

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