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Use Of Different Types Of Preservative In Food Industry With Their Benefits And Adverse Effects: A Review

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Abstract:

Due to change in lifestyle, people all over the world demand for the packaged food and beverages. Food preservation includes different steps to maintain food quality and its nutrition value. Food spoilage is caused by various chemical and biochemical reactions. To avoid the spoilage of food some conventional methods as well as new advanced technology is used for food preservation. This review present for safety and quality point of view different food preservative techniques with some advantages and disadvantages.

Key words: Preservatives, beverages, conventional, advancedtechnology, Biochemical reaction

Introduction:

Food spoilage has been a common problem throughout history. And much of spoilage is due to the activity of microorganisms or enzymatic reactions during the storage of food. Using food preservations methods has been common both naturally and chemically since the past 1000 to 8000 years.

Food is organic substances which are consumed for nutritional purposes. Food is plant or animal origin which contains moisture, protein, lipids, carbohydrates, minerals and other organic substances. Spoilage of food is due to microbial, chemical or physical action.The spoilage of food changes nutritional value, colour, texture and edibility of food [1].In the present era packaged food and beverages have great demand hence number of food preservation methods are used such as pasteurization, freezing, drying .This preservation methods and use of certain chemicals have been increased the life of food products along with maintain the food quality [2,3].Food preservatives are the substances which slow down the bacterial growth in natural as well as in synthetic compound. Conventional food preservation techniques and chemical preservations are used all over the world but now a day's new technology exists like high pressure technology, irradiation and hurdle technology [4, 5].

The preservatives which are used for preservation of food have beneficial as well as adverse effect on food products. Food preservatives can be divided in to two groups –Antimicrobial and antioxidants. Antimicrobial preservatives are the chemical substances which prevent the growth of microorganisms. Antimicrobial preservatives include benzoic acid, calcium propionate, sodium nitrate and nitrite, sulfites (sulfur dioxide,

sodium bisulfate, potassium hydrogen sulfite etc.)[6].Another group of preservatives are antioxidants, which prevents rancidity of food due to oxidation, Antioxidant are the additives which are most important in food industry because it conserve the nutritional properties of food and keep the food for longer time. Theantioxidants are natural as well as synthetic origin. Pure antioxidant and pure preservatives has mixed properties. Ascorbic acid (Vitamin C) is a pure antioxidant, whereas sorbic acid (or sorbate salts) and benzoic acid (or benzoate salts) are pure preservatives. Sulfites and bisulfites are also antioxidants and used for the prevention of enzymatic reactions in food and beverages.[7.8.9].

Classification of Preservatives

Preservatives are classified as

Natural Preservatives: eg.Salt, vinegar, syrup, spices, honey and edible oil.

Chemical or synthetic or artificial preservatives:eg. Bezoate,sorbates, nitrites and nitrate of sodium or potassium, sulfites, glutamates and glycerides.

Both natural and synthetic preservatives are categorized as antimicrobial, antioxidant, anti-enzymatic. Antimicrobials destroy or delay the growth of bacteria, yeast, molds. Antioxidants slow or stop the breakdown of fats and oils in food that occurs in presences of oxygen leading to rancidity. People consuming or using items containing more than one preservative are risk of exposure to multiple chemicals [10].People consuming or using items containing more than one preservative are at the risk of exposure to multiple chemicals as shown in Table 1.

Table 1: Preservatives and their applications

Sr.No.	Class	Preservatives	Applications
1	Anti-microbial	Nitrites, Nitrates, Sulfur dioxide, benzoate and sorbates.	Destroy or delay the growth of bacteria,yeast,molds.
2	Ant-oxidant	ButylatedHydroxyAnisole(BHA),Butylated Hydroxy Tolune(BHT),Ascorbic acid.	Slow or stop the breakdown of fats and oils to prevent rancidity.
3	Anti-enzymatic	Erythrobic acid (iso ascorbic acid) and citric acid.	Block the process during ripening and harvesting

Many of the synthetic food and cosmetic additives are considered to be safe, but some of them were found to be carcinogenic and very toxic and it is better to limit their use. In general all synthetic chemical additives and preservatives should be avoided, because many of them have not been properly tested.

Adverse effects of chemical or synthetic food preservatives

Preservatives can keep food fresher for longer periods of time, extending its shelf life. Food preservatives also are used to slow or prevent changes in color, flavor or texture and delay rancidity. Salt, sodium nitrite, spices, vinegar and alcohol have been used to preserve food for centuries. Some preservativessuch as Sodium nitrateSulfur dioxide, sodium benzoate and benzoic acid prevent or slow down the growth of microorganisms.

Sodium nitrite and sodiumnitrate:

It is used in meat and canned food. The use of nitrite and nitrates is a part of the meat processing tradition associated with their multidirectional impact on the quality of meat products including microbiological and chemical safety. The main purpose of using nitrites or nitrates is related to their preservative effect by inhibiting

the growth of bacteria. They also delay the process of oxidation reaction in the main component of meat and participate in the formation of the characteristic colour and taste of meat products [11]. When added to meat, the nitrates must first be reduced to nitrite in order to become active curing agents. The reduction of nitrates to nitrites occurs with the participation of bacteria possessing nitrate reductase activity [12].

Sulfur dioxide:

Sulfur dioxide has antimicrobial properties as well as it acts as an antioxidant that prevents browning associated with oxidation in food. Sulfur dioxide can inhibit spoilage caused by microbes and extend the shelf life of food products. Food and beverages containing Sulphur dioxide are dried fruits and vegetables, soft drinks and alcoholic beverages.[13]

Sodium benzoate

Sodium benzoate is salt of benzoic acid found with the chemical formulaC7H5NaO2, and is a white salt, odorless in crystalline and found as powder or grain. It is harmless was confirmed first in 1909 by department of agriculture in America [14-15]. Sodium benzoate is used mainly as a preservatives salad dressing, soft drink, pickles, fruit salad, wafers, bakery products, jam, jellies, juices, biscuits, cakes, muffins, tomato paste and soya sauce. Sodium benzoate has no adverse effect on health and also has no destructive effect on quality and nutritional value of food products [16].

Most of the artificial preservatives are safe but several have negative and potentially life threating sideeffects. The use of these toxic chemicals by pregnant women may adversely affect fetal brain development. High levels of exposure to toxins like these can cause DNA damage to sperm. Research has shown that the food additives used in hundreds of children's foods and drinks can cause temper tantrums and disruptive behaviors [17-22].Following are some commonly used preservatives along with health hazards namely hypersensitivity, asthma and cancer etc. Are shown in following table -2.

Table -2: Health hazard of some commonly used preservatives

Preservatives	Hypersensitivity	Asthma	Cancer
Tetra butyl Hydroquinone (TBHQ)	H	A	--
Butylated hydroxytoluene (BHT)	H	A	C
Butylated hydroxy Anisole (BHA)	H	A	C
Potassium and calcium sorbates, Sorbic acid	H	A	--
Benzoic acid	H	A	--
Sodium benzoate	H	A	C
Propyl paraben	--	A	--
Sulphur dioxide	H	--	A
Sodium meta bisiphite	--	A	--
Potassium bisulphate	H	A	--
Hexamethylene tetraamine	--	--	C
Sodium nitrite	H	A	C
Sodium or potassium nitrite	H	--	C
Calcium or potassium or sodium propionic acid	H	A	--
Propyl gallate	--	A	C

Food products will promote the growth of microbial because chemically, they consist of water, fat, carbohydrates, protein and small amount of organic compounds and minerals, since all these compounds are the source energy for microbes to grow. Various preservation methods are proposed to prevent from occurring[23].A preservative is a natural or synthetic chemical that is added to different kind of food, pharmaceuticals, paints,wood,to prevent their decomposition by microbial growth or by unwanted chemical changes.These preservatives are commonly added to various food and pharmaceutical products in order to increase their shelf life [24].

Natural preservatives: Alternatives to the artificial preservatives

Several preservatives used today in foods, cosmetics and pharmaceuticals are of plant origin. Natural substances or extracts obtained from plants, animals or minerals, can serve as beneficial alternatives .Other than their use in food, cosmetics and pharmaceutical as flavoring, binding, disintegrating gelling, thickening or suspending agents, these can also be used as preservatives. Algin, grapefruit seed extract, rosemary extract, vitamin E oil,caraageenan, citric acid, erythrobicacid, gaur gum, , honey, neem oil and basil extract are alternatives to the artificial preservatives[25-30].However in recent years, consumers are demanding complete substitution of chemically synthesized preservatives due to their toxic adverse effects on health due to this fact has lead to an increasing interest in the development of more natural alternatives in order to increase food shelf-life and safety. In recent decades, special attention has been focused on spices and aromatic vegetables which are commonly employed as food ingredients as well as in form of food preservatives. In spite of the fact that they are usually used as flavoring agents to enhance the aroma or the taste of great variety of food. It is also well known that spices ac as a natural antioxidant and having antimicrobial compounds.

Conclusion

Artificial preservatives are chemical substances that can cause health problems. Awareness about the harmful effects of these chemicals in food is increasing. Natural preservatives such as neem, citrus, extract of basil and rosemary are better alternatives to preservatives such as benzoic acid, nitrates, MSG, BHA and BHT. For maintaining goodhealth, people should use product containing natural preservatives. Natural preservatives have greater advantage over artificial preservatives due to their non-toxic nature along with wide range of health benefits. Natural preservatives have lesser side effect, easily available and economical. A natural preservative not only reduce the bacterial growth but enhances the shelf life of food products.

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