

P - Preservatives

Preservatives are substances which prolong the shelf-life of foodstuffs by protecting them against deterioration caused by microorganisms. The preservatives are one of the 26 major additives categories that are used in the food processing and have been evaluated many times and confirmed to be safe by the Scientific Committee on Food (SCF) and the European Food Safety Authority (EFSA).

Maximum levels of preservatives, depending on the food type, are set from the Directive 95/2/EC which will be replaced by the Regulation (EC) 1333/2008 in 2011. The levels have been defined based on the technological necessity of the product type. In addition, bacteria, yeasts and moulds differ in their susceptibility and therefore different types of preservatives are required to kill the microorganisms.

Why preservatives are important?

Preservatives have a long history of safe use in food products.

Food preservation is one of the oldest technologies used in the food processing through methods such as heating, dehydration or smoking.

The factors that affect the microbial growth in a food product are the water activity, the pH, the presence or absence of oxygen, the availability of nutrients and the temperature.

Since foods are an excellent source of nutrients for the attraction and growth of microorganisms, causing problems such as bad taste, unpleasant smell and poor appearance, the preservatives aim at altering those conditions where microorganisms grow and prevent their growth. The main purpose of preservatives is to maintain the safety of food for human consumption, retain its nutritional value and its overall quality.

There are three types of preservatives; antimicrobials which inhibit the activity or growth of microorganisms and moulds, antioxidants which are used to prevent the oxidation of vitamins, minerals and lipids of foods, and antibrowning agents which prevent both enzymatic and non enzymatic browning of foodstuffs.

Preservatives in non-alcoholic beverages

Since soft drinks are high in water activity and some of them are rich in vitamins and minerals, they are an attractive environment for microbes. The usually low pH of the soft drinks, due to carbonation, the sugar content in some of them and the addition of preservatives help to inhibit the growth of microbes and bacteria.

The type of the chemical preservatives that can be used in soft drinks depends on the chemical and physical properties of both the antimicrobial preservatives and the soft drink. Low or high pH of the product, the presence of vitamins, the packaging and the storage conditions of the product will determine

whether preservatives are necessary and what type should be used in order to prevent the growth of microorganisms.

The main preservatives allowed and used in soft drinks are sulphur dioxide, sorbic acid and its salts and benzoic acid and its salts.

Sorbic acid (E200) and its salts

Sorbic acid and its salts (also known as sorbates) is a very effective preservative against yeasts, moulds and bacteria. The antimicrobial effectiveness of sorbate depends on the physical and chemical properties of the soft drink, including pH, other additives present, processing, packaging, storage temperature and storage length. The salts are more frequently used as they are more soluble than the acid form.

Sorbic acid is an effective antimicrobial preservative but high levels can affect the taste of a product. Benzoates and sorbates are often used in combination, especially where the soft drink is highly acidic.

Benzoic acid (E210) and its salts

Benzoic acid occurs naturally in various berries notably cranberries, cinnamon, plums, currants, cloves etc. It has long been used to inhibit microbial growth in many products including non-alcoholic beverages, jams and emulsified sauces. The salt of the benzoate is more stable than the acid form and more soluble in water making the benzoates a favorable choice for the soft drinks industry.

Sodium Benzoate has been in use for more than 100 years and is widely used by the food and beverage industry to maintain quality and taste. It is approved for use in soft drinks by the European Union as well as other international regulatory bodies including the United States, Australia, Canada and Japan.

Benzoic acid is very effective against molds, yeasts and bacteria. It is particularly well suited for use in soft drinks, such as carbonated, still and juice beverages because it works best between pH levels of 2 – 4. The composition of the drink therefore has an effect on its efficiency and suitability for use.

When ascorbic acid (vitamin C) is present as an ingredient in beverages along with sodium benzoate, benzene formation may occur under certain conditions. Formation of benzene is exacerbated in beverages if they are stored for extended periods at elevated temperatures. Although the levels and frequency at which such benzene formation has occurred in the past has not been considered to pose a public health risk, the soft drinks industry has developed methods to prevent or minimize its occurrence. In recent years the use of benzoates has been reduced because of new processing techniques but it is still necessary to use these preservatives in some beverages to maintain their quality.

Sulphur dioxide (E220) and sulphites

Sulphur dioxide and sulphites have been extensively used as antimicrobials for many centuries and are very effective preservatives. The oldest reference on sulphur dioxide dates back to Roman times when sulphur was burnt and the unfermented juice exposed to the fumes to help in the preservation of the wine. Sulphites were added to casks of lemon and lime juices in the nineteenth century to preserve the fruit juice and help to prevent scurvy on ocean-going ships.

The free forms of sulphites are more active than the bound forms of sulphur dioxide. Sulphites have numerous functions apart from their antimicrobial activity, as they are also used as antioxidants, antibrowning agents and colour stabilisers.

Sulphites are used in soft drinks in order to control the growth of undesirable microorganisms such as yeasts and act as antioxidants to prevent browning reactions occurring.

Sulphur dioxide and sulphites are known to cause allergic reactions in certain sensitive consumers notably those with asthmatic conditions. These reactions occur more commonly when sulphur dioxide gas is used or wine is ingested as the levels are usually much higher than those found in soft drinks. However, European legislation lays down detailed rules for the mandatory labelling of the additives used in a product so as to enable the consumers to make informed choices and avoid the consumption of those additives when necessary.

Are preservatives safe?

Like all additives, preservatives have to be approved for use in drinks and foods before they can be used. Expert organisations such as the Scientific Committee for Food, the European Food Safety Authority and the Joint FAO/WHO Food Additives Committee have examined the safety of each preservative and made recommendations on their use including maximum levels. Such recommendations are taken up by governments both nationally and at European level so that food and drinks can be preserved effectively whilst ensuring the food is safe to consume.

References

Branen, L.A. Davidson, P.M. and Salminen S. (1990), Food Additives, Marcel Dekker Inc, NY
European Parliament and Council Directive 95/2/EC (1995) on food additives other than colours or sweeteners. Official Journal of the European Communities L61, 18.3.95, 1-40.
Regulation (EC) No 1333/2008 of the European Parliament and of the Council of 16 December 2008 on food additives. Official Journal of the European Union L354, 31.12.2008, 16-33.