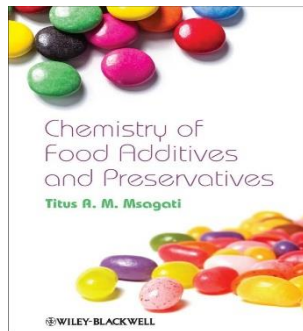


3. Week: THE USE OF FOOD ADDITIVES

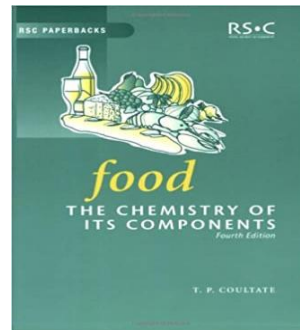


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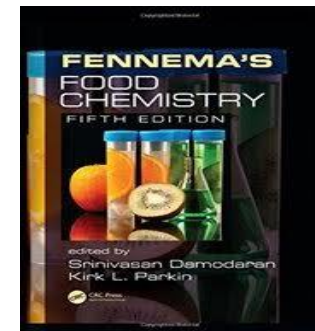
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1. Msagati, Titus A.M. 2013. *Chemistry of Food Additives and Preservatives*, JohnWiley & Sons, Ltd, West Sussex, UK.
2. Coultate T. P. 2002. *FOOD: The Chemistry of Its Components*, RSC Paperbacks, Royal Society of Chemistry, Cambridge, UK.
3. Ekşi A., Tayfur M., Ercan A., Bağcı Bosi A. T., Kivanç P., Soylu P., Berat Özdemir M. ve Şişik N. 2014. *A'dan Z'ye Gıda Katkı Maddeleri*, Detay Yayıncılık, Ankara.
4. Fennema O.R., Ed: Damodaran S. and Parkin K.L. 2017. *Fennema's Food Chemistry*, CRC Press Taylor & Francis Group Boca Raton, FL, USA

Foods are complex systems that contain a large number of chemical compounds. According to their sources, these compounds can be divided into groups such as:

- * Food components
- * Food additives
- * Processing aids
- * Residues
- * Contaminants

FOOD ADDITIVES

It is a group of substances that are not consumed as food alone, do not have a typical food ingredient, have a nutritional value or not, but knowingly participate in the food to perform a certain function, whose harmless dose is known and is subject to permission to use. The most decisive feature of food additives is that they are consciously added to the food and expected to perform a certain function.

REGULATION OF FOOD ADDITIVES

To guarantee food safety, use of food additives is strictly regulated by national and international laws. The use of food additives must comply with the following principles:

- 1.** Food additives must be nontoxic, do not generate toxic compounds upon decomposition and do not cause chronic poisoning symptoms after long-term intake of dose allowed.
- 2.** Food additives do not destroy the nutritional components of foods, reduce food quality, or generate toxic compounds upon decomposition.

- 3.** Food additives can not be applied for the purpose of adulteration or for shielding the facts of food spoilage and food deterioration.
- 4.** Food additives cannot be applied for the purpose of concealing the quality deficiency caused by the food itself or by processing.
- 5.** The application ranges, dosages, and residues of food additives must comply with related national standards and regulations, and try to minimize the using amount to bring about the desired result.
- 6.** Processing aids must be removed after processing, except those with allowed residues.

THE USE OF FOOD ADDITIVES

Using additives in foods is not new:

- * The use of incense and salt dates back to the first era.
- * Vinegar, oil and honey were used as food additives in ancient Egypt.
- * Sulfur dioxide as a preservative was first used in ancient Rome.
- * Boric acid was used in 1775 and sorbic acid in 1833.
- * Saffron is also a food additive that has been used since antiquity.

The use of food additives at that time was aimed at improving flavor and extending the duration of preservation. The purpose of using food additives today is no different. The main purpose is to increase the shelf life by improving the quality and delaying the deterioration.

Common functions for food additives:

Firstly, food additives improve food quality and meet consumers' requirements on flavor, color, and taste.

Secondly, food additives make food processing more reasonable, more hygiene, more convenient and enhance the mechanized, automated, and scaled production of foods.

Thirdly, food additives contribute to saving resources, reducing cost, and providing significantly social and economic benefits.

Classification of Food Additives

According to origin or source, food additives are divided into natural and artificial ones.

Food additives are also classified by functions and are subdivided into 21 categories, including acidulant, anticaking agent, antifoaming agent, antioxidant, bleaching agent, bulking agent, chewing gum base, coloring agent, color fixative, emulsifier, enzyme preparation, flavor enhancer, flour treatment agent, coating agent, water retention agent, nutrition enhancer, preservative, stabilizing and coagulating agent, sweetener, thickener and others.

THE FUNCTIONS AND MAIN EXAMPLES OF FOOD ADDITIVES

Preservatives: It is an antimicrobial effective additive group that prevents the deterioration caused by microorganisms and extends the shelf life of food and ensures its safety. Nitrate in sausage, benzoate in olive paste, sorbate in mustard, boric acid in caviar, sulfur dioxide in dried fruit are examples of this group.

Colorants: It is a natural or synthetic additive group that adds color to food or restores its color. Examples of this group are tartrazine in candies, curcumin in sausage and caramel in carbonated beverage (fizzy drinks).

Sweeteners: It is a group of additives used to add sweetness to foods with low energy or zero energy or tooth decay (kariostatic effect). Taste-intensive compounds such as saccharin, cyclamate, aspartame, acesulfam, taumatin, stevioside and polyol (sugar alcohol) compounds such as sorbitol, xylitol, maltitol are from this group.

Antioxidants: It is a group of additives that prevents taste changes and discoloration caused by oxidation in fats and fatty foods, thus ensuring a longer shelf life. The most common examples of this group are; gamma-tocopherol is propyl gallate, butylhydroxyanisole (BHA), butylhydroxytoluene (BHT), tertiarybutylhydroquinone and ascorbic acid.

Emulsifiers: It is a additive group that keeps oil and water phases together which do not mix with each other . Emulsifiers such as lecithin, stearyl monoglyceride, sorbitanmonolaurate used to prevent phase separation in mayonnaise, ice cream, etc. and oil leakage in foods such as tahini halva. There is also a similar group of additives called emulsifying salt, which disperses the proteins in the cheese and ensures homogeneous dispersion of fat and other components.

Stabilizers: It is the additive group that maintains the physicochemical condition of food, stabilizes the homogeneous distribution of different phases, protects or strengthens the color of the food itself, and ensures the interconnection of cross-linked particles between proteins.

Acidity regulators: It is the additive group that changes or controls the acidity and basicity of foods. Substances such as monopotassium tartrate disodium citrate, calcium hydrogenmalate are examples of this group. The additive group that increases acidity only and ensures sour taste in food is called acidifier. Typical examples are citric acid, malic acid, tartaric acid, etc.

Thickeners: It is the additive group that ensures the consistency of the food. Modified starch, guar gum, acacia gum (gum Arabic), xanthan gum, carob (karob) gum. Modified starches are starch groups whose functional properties have been improved by changing their structure by physical or enzymatic application and chemical treatment.

The gelling agents: It is a additive group that creates a gel-like structure in food. Typical examples of this group are pectin, which allows the Jam to gel, and gelatin used in canned meat and fish.

Thickeners: It is an additive group that provides the thickening of vegetables and fruits and strengthens the gelling. For this purpose, mostly calcium chloride and similar salts are used.

Glazing Agents: It is a additive group that creates a protective layer on the outer surface of the food, which increases the brightness and also reduces the stickiness (lubricant). Such as magnesium stearate, liquid paraffin, wax.

Anticaking Agents: It is an additive group that prevents particles from sticking to each other in powdered foods. Such as calcium silicate, magnesium carbonate, silicon dioxide.

Humectants: It is an additive group that prevents the moisture loss and thus drying of the food in the environment with low relative humidity and facilitates the dissolution of powdered foods in the liquid.

Foaming Agents: It is the additive group that provides homogeneous dispersion of the gas phase in liquid and solid foods.

Antifoaming Agents: It is an additive group that prevents or reduces foam formation. Such as silicone, mono- and di-glyceride.

Volume enhancers: It is the additive group that increases the volume of the food without significantly increasing its calorific value. The substance or mixture of substances that increases the volume of the dough by creating gas is defined as the blister additive group. Typical examples are cooking soda or bicarbonate.

Flavor enhancer: It is a additive group that strengthens the unique taste of food. Such as monosodium glutamate (MSG), sodium guanylate, sodium inosinate.

Metal binder: It is a additive group that forms complex with metal ions.

Packaging gas: It is a group of substances that are gasified from the outside into the packaging atmosphere where the food is located. Like carbon dioxide and nitrogen.

Propellant: It is the general name of the gases that allow the food to come out of the package it contains.

Carrier: It is a group of substances that facilitates the use of food additive, flavoring agent or food enzyme without affecting its functional properties.