

## FOOD ADDITIVES: AN OVERVIEW

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### **INTRODUCTION**

According to the Food Protection Committee of the Food and Nutrition Board, food additives may be defined as a substance or mixture of substances, other than a basic foodstuff, which is present in a food as a result of any aspect of production, processing, storage, or packaging. The term does not include chance contaminants.

### **TYPES OF ADDITIVES**

Additives can be divided into nutritional additives, preservatives, coloring agents, flavoring agents and texturizing agents.

#### **1. Nutritional Additives**

The term nutritional additives can be used to mean the addition of vitamins, minerals, amino acids, fatty acids, as well as other pure chemical compounds to food in order to improve or maintain the nutritional quality of foods. However, manufacturers soon discovered that along with an improvement in nutritional qualities, nutritional additives often provide functional qualities. The earliest use of nutritional additives was to correct dietary deficiencies. Examples include vitamin D added to milk and vitamin A added to margarine. Nutritional additives can be used to restore nutrients to levels found in the food before storage, packaging, handling, and processing. An early example of this is the enrichment of grain products, corn meal, and rice. Another use of nutritional additives is to improve the nutritional status or correct nutritional inferiority in a food that replaces a more traditional nutritional food, an example would be the fortification of breakfast drink substitutes with folacin and vitamin C. With the advent of nutritional labeling and increased public interest in nutritional properties of food, the food industry rapidly recognized that the addition of nutritional additives can be a selling point. Although it is often thought that the major reason to add nutritional additives to a food supply is to provide nutrients and improve dietary status, nutrients are also added for a variety of other purposes. For example, vitamins C and E may be used for antioxidant properties; beta carotene may be used to provide color.

#### **2. Preservatives**

Chemicals such as salt, alcohol and acetic acid have been used for hundred years for preserving meat and vegetables and the pickling of food. These processes rely on reducing the water activity or the pH in the food to inhibit the growth of pathogenic organisms.

#### **3. Colouring agents**

Colour additives are dye pigment or substances that impart colour when added or applied to food, drug and cosmetic or to the human body.

**Dyes:** dissolve in water and are manufactured as powders, granules, liquids or other special purpose form. They can be used in beverages, dry mixes, bakery goods, confectionary, dairy products.

**Lakes:** are the water soluble form of the dye. Lakes are more stable than dyes and are ideal for colouring products containing fats and oils or items lacking sufficient moisture to dissolve dyes. Typical uses include coated tablets, cake, doughnut mixes, hard candies and chewing gums.

**Natural Colourants:** Anthocyanins: the anthocyanins comprise a diverse group of glycosidic derivatives of the 2-phenyl benzopyrylium structure. Anthocyanins impart blue, violet and certain red colours to many edible vegetables and fruits.

**Table 1.** Preservatives in current use

Sl. No.	Name	Properties	Uses	Related Preservative
1	Sorbic acid	Inhibits the growth of yeast and molds	Yoghurt, sweets, pizzas and desserts	Sodium, potassium and calcium salts
2	Benzoic acid	Antibacterial and antifungal action in acid foods.	Jams, jellies, soft drinks	Sodium, potassium and calcium salts
3	Sulphur dioxide	Sterilizing at high levels inhibits fungal growth and no enzymatic browning	Fruits and vegetable products.	Sodium sulphite, sodium metabisulphite
4	Acetic Acid	Antibacterial	Pickles, chutneys, cheese	Salts may be used

**Carotenoids:** Carotenoids are tetraterpene pigments, which exhibit yellow, orange, red and purple colours. Carotenoids are the most widely distributed pigments in nature and are present in photosynthetic bacteria, some species of archaea and fungi, algae, plants, and animals. Carotenoids are oil soluble colours.

**Xanthophylls:** They are yellow pigments that occur widely in nature and form one of two major divisions of the carotenoid group, the other division is formed by the carotenes. The molecular structure of xanthophylls is similar to that of carotenes but xanthophylls contain oxygen atom while carotenes are purely hydrocarbons with oxygen. Three kinds of xanthophylls are canthaxanthin, zeaxanthin, lutein. They are also considered as antioxidants. They play significant role in human health, particularly the health of eyes and are linked with reduced risk of age-related macular degeneration and cataracts.

**$\beta$ -carotene:** It is the most known carotenoid and the most often naturally occurring carotene.  $\beta$ -carotene is also provitamin A can be metabolized to vitamin A in different tissues (liver).  $\beta$ -carotene is also an antioxidant.  $\beta$ -carotene is predominantly found in orange and yellow fruits and vegetables.

**Synthetic Colours:** Generally synthetic colours give bright and uniform colours. Food companies prefer to use synthetic food colours because they are cheaper, stable and provide long shelf life compare to natural colours.

#### 4. Flavouring Agents

The flavours of most fruits and vegetables are produced by very complex mixtures of aldehydes and esters of organic alcohols and acids, with a range of

essential oils with complex terpenoid structures. Many of the synthetic compounds used are nature – identical that is they occur naturally in foods or formed in cooking processes.

**Flavour Enhancers:** It enhances or modifies the original flavor or aroma of a food without contributing flavours of their own. Monosodium glutamate and yeast are examples of flavor enhancers. It is used in masalas, spices, noodles and Chinese cookery.

### **5. Texturing Agents (Emulsifiers and Stabilizers)**

The texture of many processed foods depends on the fact that they are emulsions or foams and if they are to retain these textural properties they must be stabilized in some way. The additives used for this purpose are surfactants, amphipathetic molecules which act at the interfaces of the two phases in the food. The most commonly used emulsifiers are mono and diglycerides and phospholipids such as lecithin.

Stabilizers are usually macromolecules which form a dispersed matrix or gel into which other smaller molecules can be incorporated. Substances used as stabilizers are polysaccharides. Agar and pectin are examples of stabilizers.

**Table 2.** Permitted and non-permitted food colours

<i>Permitted Food Colours</i>	<i>Non –Permitted Food Colours</i>
Brilliant blue	Rhodamine B
Carmoisine	Amaranth
Fast green	Orange II
Sunset yellow	Metanil yellow

### **FUNCTIONS OF FOOD ADDITIVES**

Additives may be found in varying quantities in foods, perform different functions in foods and ingredients, and function synergistically with other additives. Their functions can usually be classified as one of the following:

- (1) To maintain or improve nutritional quality.
- (2) To maintain or improve product safety or quality.
- (3) To aid in processing or preparation.
- (4) To enhance sensory characteristics.

Additives that affect nutritional quality are primarily vitamins and minerals. In some foods, these may be added to enrich the food or replace nutrients that may have been lost during processing. In other foods, vitamins and minerals may be added for fortification in order to supplement nutrients that may often be lacking in human diets. Preservatives or antimicrobial substances are used to prevent bacterial and fungal growth in foods. These additives can delay spoilage or extend the shelf life of the finished product. Antioxidants are additives that also can extend the shelf life of foods by delaying rancidity or lipid oxidation. Additives that maintain product quality may also ensure food product safety for the consumer. For example, acids that may be added to prevent the growth of microorganisms that cause spoilage may also prevent the growth of microorganisms that can cause foodborne illness. Additives that are used for processing or preparation aids usually affect the texture of ingredients and finished foods. Some of these are classified as emulsifiers, stabilizers, thickeners, leavening agents, humectants, and anticaking agents. Chemicals in this group of

food additives are also used to adjust the homogeneity, stability, and volume of foods. The fourth major function of food additives is to enhance the flavor or color of foods to make them more appealing to the consumer. Natural and artificial coloring substances are added to increase the visual appeal of foods, to distinguish flavors of foods, to increase the intensity of naturally occurring color.

### **SAFETY OF FOOD ADDITIVES**

Food additives have been studied by international experts and organization like Codex and the level for their use in the manufacture, processing, preparation treatment etc laid down. Independent experts who are members of the JECFA (Joint Expert Committee) of FAO and WHO recommend ADIs and standard specifications of food additives. The national food control authorities assess the safety of food additives before permitting their use under the country regulations. While assessing the safety, the regulatory authorities take into account toxicity, acceptable daily intake, international standard and limitations. The Food Safety and Standard of India also lays down specifications for the use of food additives.

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