Natural Food Dyes

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Natural food dyes

- **A growing number** of natural food dyes are being commercially produced:.

Some examples include:

- **Caramel coloring** (E150) made from caramelized sugar.
- **Annatto** (E160b) a reddish-orange dye made from the seed of the achiote.
- **Chlorophyll** (E140) a green dye made from Chlorella algae
- **Cochineal** (E120) a red dye derived from the cochineal insect,

Achiote

- **Betanin** (E162) extracted from beets.

- **E100 (i): Curcumin**
  E100 (ii): Turmeric

  The colour consists mainly of curcumin and is used as a food colour with E-number E100(i), crude turmeric powder is E100(ii).

- **Saffron** (carotenoids, E164)

- **Paprika** (E160)

Betanin

Saffron

Turmeric

Paprika

Caramel color (E150)

- **Caramel color** or **caramel coloring** is a water soluble food coloring. It is made by a carefully controlled heat treatment of carbohydrates, in general in the presence of acids, alkalis or salts, in a process called caramelization.

- It has an **odor** of burnt sugar

- and a somewhat **bitter** taste.

- Its color ranges from **pale yellow** to **dark brown**.

DDW Product Number	570	108	301	385	250	112	050
E.U. Classification	E150a	E150d	E150c	E150c	E150c	E150d	E150d
Typical Colour Intensity (610 nm)	44	65	109	176	183	115	243
Hue Index (typical) = Redness	7.0	5.8	5.5	5.3	5.1	4.5	4.2

Caramel colour concentration levels illustrated above are 0.1% to 0.3% diluted in water. One obtains a different appearance by changing the concentration.

Applications

- Caramel color is one of the **oldest and most widely-used food colorings**, and is found in almost every kind of commercially produced food, **including**:

- beer
- brown bread,
- chocolate,
- cookies,
- spirits and liquor,

- fillings and toppings,
- dessert mixes,
- doughnuts,
- fruit preserves,
- ice cream,
- soft drinks (especially colas),
- sweets.

Production

- Caramel is manufactured **by** heating carbohydrates, either alone or in the presence of acids, alkalies, and/or salts.

- The **acids** that may be used **are** sulfuric, phosphoric, acetic, and citric acids;

- the **alkalies are** ammonium, sodium, potassium, and calcium hydroxides;

- and the **salts** are ammonium, sodium, and potassium carbonate, bicarbonate, phosphate.

Classification

(**JECFA**) recognizes **four** classes of caramel color, differing by the **reactants** used in their manufacture:

Class	E Number	Description	Restrictions on preparation
1	E150a	**Plain caramel**	**No** ammonium or sulfite compounds can be used
2	E150b	**sulphite caramel**	In the presence of **sulfite** compounds but no ammonium compounds can be used
3	E150c	**Ammonia caramel**	In the presence of **ammonium** compounds but no sulfite compounds can be used
4	E150d	**Sulphite ammonia caramel**	In the presence of **both** sulfite and ammonium compounds

- **Limitations**

- There are **no** technical **limitations** on the use of caramels,

- although it is **important to select** the type that is most appropriate for the intended use.

Additional function

- Caramel color is a **colloid**.
- Although the primary function of caramel color is for coloring, it also serves **additional functions**.

In **soft drinks**, it functions as an **emulsifier** to help inhibit the formation of certain types of "floc "

and its **light protective quality** can aid in **preventing oxidation** of the flavoring components in bottled beverages

Annatto (E160b

- **Annatto**, sometimes called ***achiote***, is derrived from the seeds of the achiote trees of tropical and subtropical regions around the world.
- The seeds are sourced to produce a carotenoid-based **yellow to orange** food coloring and flavor.
- Its **odor** is described as "slightly peppery with a hint of nutmeg جوزة الطيب"
- and **flavor** as "slightly nutty, sweet and peppery"

nutmeg

- In **commercial processing**, annatto coloring is extracted from the reddish **out layer** which surrounds the seed of the achiote (*Bixa orellana*).

Historically, it has been used as coloring in many

- cheeses
- butter,
- margarine.

Annatto can also be used to color a number of **non-dairy** foods such as

- rice,
- custard powder,
- baked goods,
- seasonings.

Although it is a natural food colorant, it has been linked to cases of **food-related allergies**

custard powder : The product is a cornflour-based powder which thickens to form a custard-like sauce when mixed with milk and heated to a sufficient temperature.

Precautions

- Annatto **is safe** for most people,
- **however**, it can cause rare **allergic reactions** for those who are very sensitive.
- Annatto has been linked to few cases of food-related allergies, but it is not one of the **"Big Eight" aller**gens (cow's milk, egg, peanut, tree nuts, fish, shellfish, soy, and wheat) which are responsible for more than **90% of allergic** food reactions.
- The Food and Drug Administration **do not**, at present, consider annatto **to be a major food allergen**

- **Special properties:**

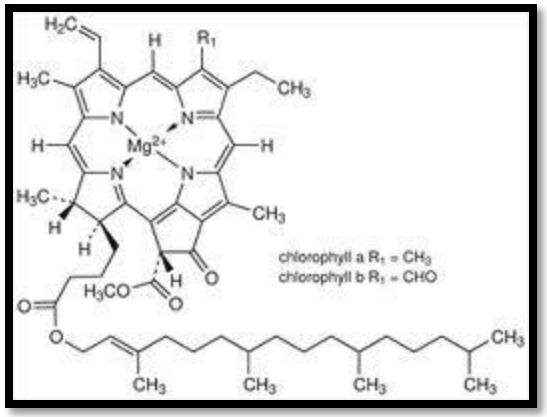
1. As a carotenoid, annatto is **sensitive to oxidation**, especially when exposed to **light**.

2. Its **stability** to **heat** is **excellent** and it may generally be used in products throughout the **acid pH range**.

3. is used to provide orange shades in both **lipid** and **aqueous** food phases.

Chlorophyll (E140)

- **Chlorophylls are** natural pigments present in all green leafy vegetation.
- They do not have a specified ADI according to JECFA, and are approved colors for use in foodstuffs
- reaching levels as high as **5.7%** in spinach.
- As a food coloring agent, chlorophyll has the E number **E140**.



JECFA : The Joint FAO/WHO Expert Committee on Food Additives (JECFA) is an international expert scientific committee that is administered jointly by the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO).

- **Function in Food**

- Chlorophylls is naturally derived colors that provide **green color** to food products.

- Commercially, products are available for use in both oil- and water-based systems.

Limitations

- Providing dull (uninteresting) olive-green colors,
- The chloropylls are **not very stable** to light and acidic conditions

Typical Products

Chlorophylls have **only limited application** in foodstuffs. They may be used

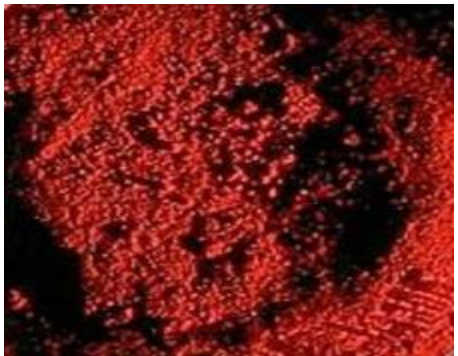
- in confectionery,
- yoghurts
- and ice cream.

Cochineal (E120)

- also called **Carmine** and **Cochineal**, or **E120**, and found as **Carminic acid**

- is the red pigment obtained by aqueous alkaline extraction from the dried bodies of the coccid insect (scale insects).

- *The word **cochineal*** is used to describe both the dried insects and the color extracted from them.



Production:

may be prepared from cochineal, by

- Boiling insects in water to extract the carminic acid .
- and then treating the clear solution with aluminum to effect the precipitation.

Properties:

- **Cochineal** has a long history of use as a food color that provides **a bright strawberry red** shade to a wide variety of products.

- It is generally used in products in which **the pH is above 3.5**

- and is available in both **water-insoluble** and **water soluble** forms.

- Carminic acid is water-soluble and is particularly appropriate for providing clear orange shapes in acid-based preparations such as **soft drinks**.

- chemically very stable, with excellent resistance to the following conditions: oxygen, light, sulphur dioxide and heat.

- The ADI by JECFA of **5 mg/kg** body weight per day and are approved colors for use in foodstuffs

- **Limitations**

- The color precipitates **in low-pH conditions** and should not be used in foods for which the **pH is below 3.5.**

- Cannot be used in products **claiming their suitability for vegetarian diets**.

- As a food dye it has been known to cause **severe allergic reactions** in some people.

- **Typical Products**
- Cochineal and its derivatives are used to color:

1. meat products,
2. beverages,
3. table jellies,
4. confectioneries,
5. And yoghurts.

Betanin (E162)

- **Betanin**, or **Beetroot Red**, is a red food dye obtained from beets; obtained by hydrolyzing away the glucose molecule.

- As a food additive, its E number is E162.

- Betanin degrades when subjected to the following conditions:
- light,
- heat,
- and oxygen;

therefore, it is mostly **used in frozen products**,

- Its sensitivity to **oxygen** is highest in products with:

➢ high content of water

➢ and/or containing metals (e.g. iron and copper);

- For slowing this process →

1. **antioxidants** like ascorbic acid can slow this process down,
2. together with **suitable packaging**

- Betanin is usually obtained from the extract of beet juice;

- the concentration of betanin in red beet **can reach 300-600 mg/kg.**

The color of betanin **depends on pH**;

1. between **four and five** it is **bright bluish-red**,
2. becoming **blue-violet** as the **pH increases**.
3. Once the pH reaches **alkaline** levels betanin degrades by hydrolysis, resulting **in a yellow-brown** color

- Betanin can be used for coloring the following food products:

1. The most common uses of betanin are in coloring **ice cream** and **soft drink beverages**;
2. other uses are in some **confectionery**,
3. sugar coatings.
4. meat and sausages.
5. In hot processed candies, it can be used if added at the final part of the processing.
6. Betanin is also used in **soups** as well as **tomato** and **bacon** products.

Betanin has the following properties (advanteges):

1. Betanin has nearly **no potential as allergen**.

2. **absorbs** well from the gut

3. and acts as an **antioxidant**.

Saffron E.164

- **Saffron** is derived from the flower of **saffron crocus**.
- Each saffron crocus grows **to 20–30 cm** and bears up to **four flowers**, each with three stigmas.
- the dried stigmas are used mainly in **various regions as** a seasoning and coloring agent.
- Saffron, long among the world's **most costly spices** by weight,
- was first cultivated in Greece.

- Traditional Use:

1. Saffron is widely used in Iranian, Arab, Central Asian, European, Indian, and Turkish **cuisines**.

2. **Confectionaries**

3. and **liquors** also often include saffron.

- **Properties of Saffron :**

1. Saffron's has bitter taste

2. or hay-like fragrance.

3. It also contains a carotenoid dye, which imparts a rich **golden-yellow** hue to dishes and textiles.

Paprika E160c

- **Paprika extract** (also known as **paprika oleoresin**) is an oil soluble extract from the fruits of Capsicum Annum (Indian red chillies),

- is primarily used as a coloring and/or flavoring in food products.

- **Extraction** is performed by percolation with a variety of solvents, primarily **hexane**.

Uses

- Foods colored with paprika include:
- cheese,
- orange juice,
- spice mixtures,
- sauces,
- processed meats.

Properties of paprika:

- Paprika color derives from a spice that has a long history of consumption by man.
- It does **not have a specified ADI** according to JECFA
- And is an approved color for use in foodstuffs according to directives.
- Its **stability to** heat and pH change is **generally good**

Limitations

- Paprika pigments are carotenoids and are **sensitive to oxidation**, especially when exposed to light.

- High dose levels may contribute an **unacceptable flavor**, especially when used in mild-flavoured sweet preparations.

E160a Carotenes

E160b Annatto; Bixin; Norbixin

E160c Paprika extract; Capsanthian; Capsorubin

E160d Lycopene

E160e Beta-apo-8'-carotenal (C30)

E160f Ethyl ester of beta-apo-8'-carotenoic acid (C30)

Turmeric (E100)

- **Curcumin** is the principal **pigment** of turmeric, a spice that is obtained from the rhizomes of *Curcuma longa.*
- It is obtained by solvent extraction from the plant.
- is a natural color that provides a **bright lemon-yellow** color when used in foods.
- Although oil-soluble, it is available in water-dispersible forms.
- The pure pigment has a high tinctorial strength

Limitations

1. has poor stability **to light**
2. and is sensitive to **sulphur dioxide.**

Properties:

- Its **stability** to **heat** is excellent
- and it may generally be used in products throughout the **acid pH** range.

- **Typical Products**

provides a lemon-yellow color and is widely used to color:

- smoked white fish,
- ice creams,
- dairy products
- and some types of confectioneries.