FOOD COLOUR ADDITIVES

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- Definition
- Classification
- Uses
- Health hazards
- Analysis
- Rules and regulations

INTRODUCTION

Food

- Food is the energy source
- on which depends both the health and ill health

FOOD COLOURS

- 1 factor of attraction of food is its colour
- Influence Appetite and choice of food

What the natural colour of a food indicates ?

- May indicate degree of sweetness , ripeness ,or decay
- May Indicate type of flavour
- May provide visual information about the phyto chemical properties that are + ve to health

What is a Colour Additive?

- A color additive is any dye, pigment or substance that can impart colour , alone or through reaction with other substances, when added or applied to a food, drug, cosmetic or to the human body.

SYNONYMS

- Food Coloring Agents
- Food Colorants
- Colorants
- Color additives
- Food dyes

Why are color additives added?

The primary reasons include:

- Offsetting color loss due to light, air, extremes of temperature, moisture, and storage conditions.
- Masking natural variations in color.
- Enhancing naturally occurring colors.
- Providing identity to foods.
- Protecting flavors and vitamins from damage by light.
- Decorative or artistic purposes
- Increase appetite appeal
- To make less desirable food more desirable
- To mask defects
- May keep certain foods tasting fresher for long time

Classification of food colors

FDA classification

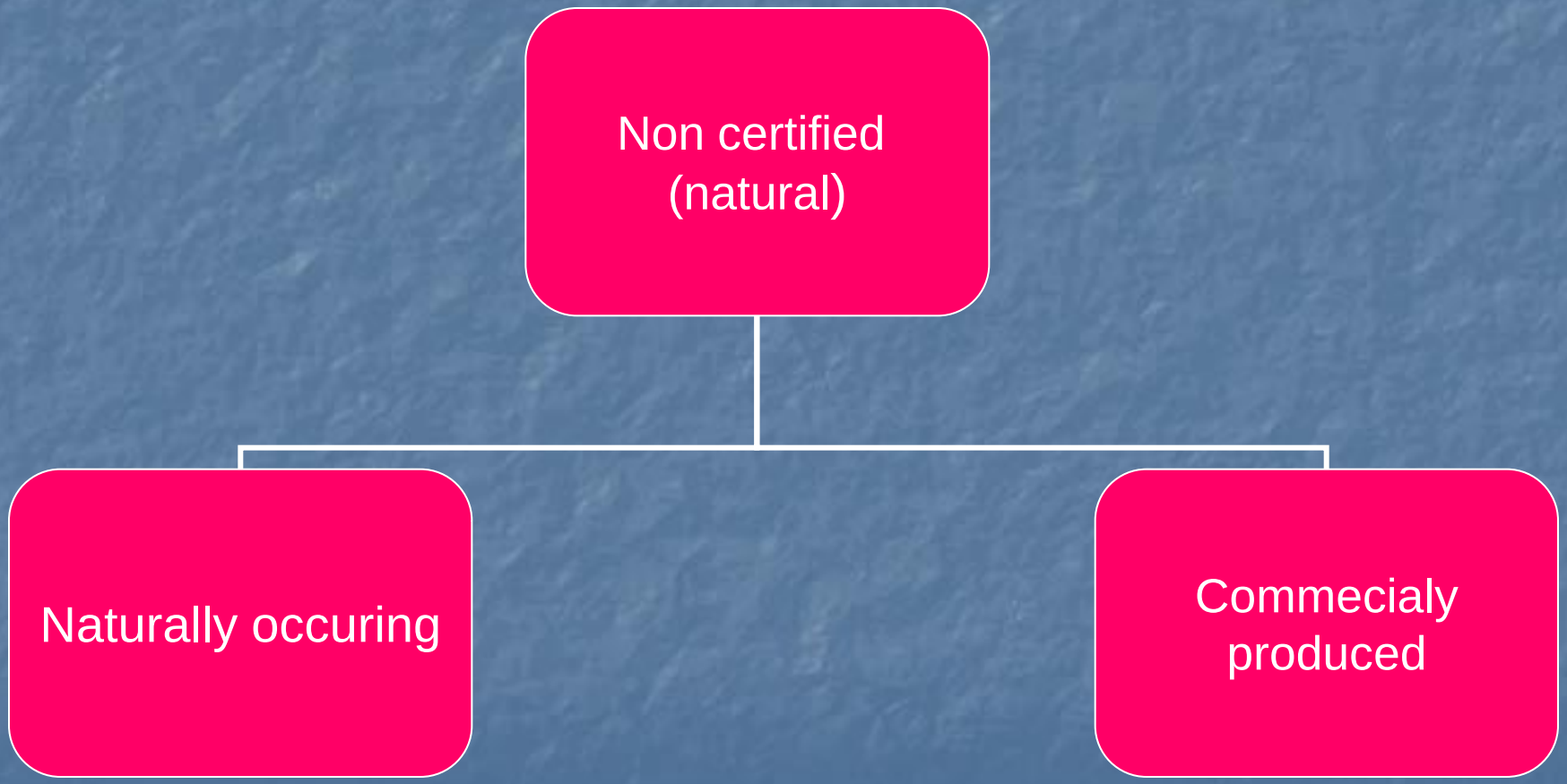
1. Non certified
2. Certified

Non certified colors

Contd……

- Do not need certificate to sell or use
- Derived from plants, animals, minerals , other than coal & phenol
- These are mainly foods and /or food ingredients rather than food additives

.....classification



Permitted Natural Colours-India

a) Beta-carotene
b) Beta-apo-8' carotenol
c) Methyl ester of Beta-apo-8, carotenoic acid
d) Ethyl ester of Betaapo-8' carotenoic acid
e) Canthaxanthin
f) Chlorophyll
g) Riboflavin (Lactoflavin)
h) Caramel
i) Annatto
j) Saffron
k) Curcumin or turmeric

Natural ingredients -code of federal regulation (CFR)

- FD&C Blue No.2 (dye &lake)
- FD&C Green No.3 (dye &lake)
- FD&C Red No.3 (dye)
- FD&C Blue No.1 (dye &lake)
- FD&C Red No.3 (dye)
- FD&C Red No.40 (dye &lake)
- FD&C Yellow No.5(dye&lake)
- FD&C Yellow No.6(dye&lake)
- Orange B
- Citrus Red No.2
- Annato extract
- B-Apo- 8’ carotenol
- Beta carotene
- Beet powder
- Canthaxanthen
- Carrot oil
- Cohineal extract

……. natural ingredients -code of federal regulation (CFR)

- Grape color extract
- Grape skin extract
- Paprika
- Paprika oleo- resin
- Riboflavine
- Saffron
- Titanium dioxide
- Turmeric
- Turmeric oleo- resin
- Vegetable juice

- Cotton seed flour-toasted partially,cooked
- Ferrous gluconate
- Fruit juice
- Grape colour extract
- Grape skin extract
- Paprika

)

Commercially produced

- Annatto - from seed of the Achiote
- A green dye - from chlorella algae.
- Cochineal- - from the cochineal insect, *Dactylopius coccus*.
- Betanine- from beets.
- curcumene -Turmeric
- Saffron-
- Paprika--red chilly
- anthocyanene – -Elderberry juice
- Caramel- from sugar

USES

colourant	colour	use
anthocyanin	Blue-reddish shades	Soft drinks ,alcoholic drinks ,pickles
annatto	Orange shades	Dairy &fat products ,desserts
Beta-carotene	Yellow-orange	Butter ,fats ,oils ,soft drinks ,fruit juices ,ice creams
canthoxanthin	Orange red-red	souses, soups ,meat &fish dishes
paprika	Orange-red	Meat products ,snack ,soups ,salad
saffron	yellow	Baked goods ,rice dishes ,meat dishes ,soups
crocin	yellow	Dairy products ,jams ,pasta ,rice
lucin	yellow	ice creams ,dairy products ,sugar ,flour
Beet powder	Bluish red	Frozen,ice creams ,flavored milk

…continue

Cochineal	orange	soft ,alcoholic drinks
carmine	Bluish red	Soft drinks ,sugar &flavor confectionary ,pickles ,souses
Sandal wood	Orange-orange red	Fish processing ,alcoholic drinks ,sea food dressings , meat products
chlorophyll	Olive green	Soups ,souses ,fruit products ,jams
caramel	Yellowish tan-red brown	Alcoholic drinks ,soft drinks ,desserts ice creams ,souses
turmeric	Bright yellow	Yogurt ,frozen products ,pickles
riboflavin	yellow	Cereal products ,sherbet ,ice cream

…coninue

safflower	yellow	Soft drinks ,alcoholic drinks
Titanium dioxide	white	Sugar coated confectionary
Iron oxide	red	Sugar coated confectionary ,meat & fish pastes
Silver ,gold ,alumineum		Surface coating of sugar confectionary ,cake decoration

Physiological properties

natural colours

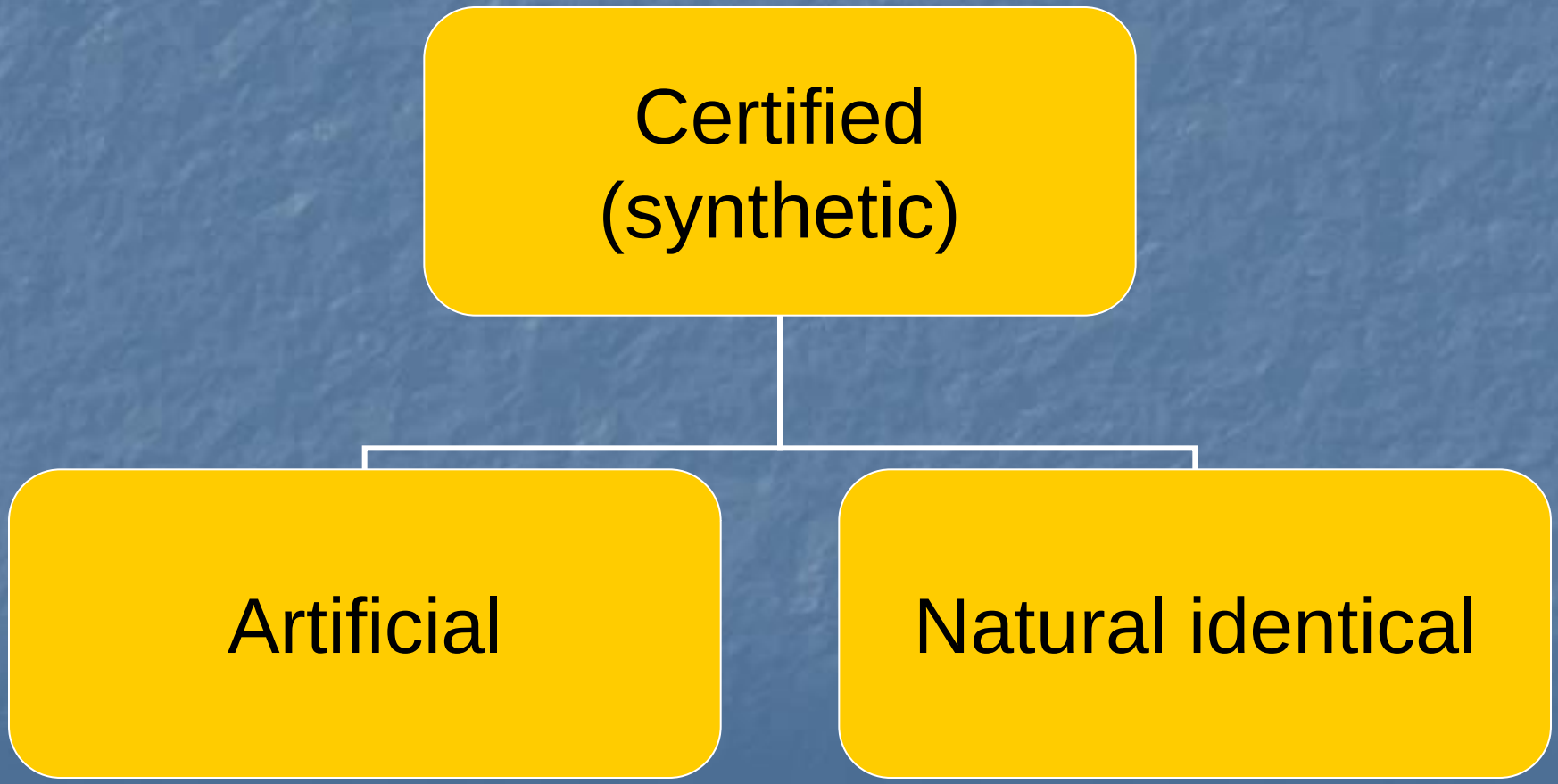
- Besides colouring food, several natural dyes posses bioactive properties and have been used as therapeutic agents and as diagnostic tools.
- Some of the dyes have been reported for following curative effects; analgesics, antibacterial, antifungal, antileprotic, antiviral and anti-inflammatory
- Choleretic and hydrochologic action- eg CURCUMINE
- Deodorant ,reduce halitosis ,healing-eg CHLOROPHYILL
- Pro vitamin A ,prevention of UV sunburns ,antioxidant and radical scavenger ,prevention of lung and breast tumor –eg CAROTENE
- Prevention of macular degeneration-eg LUTEIN
- Prevention of cardiovascular disease and tumors –eg ANTHOCYANINS

certifiable colour additives

Contd……

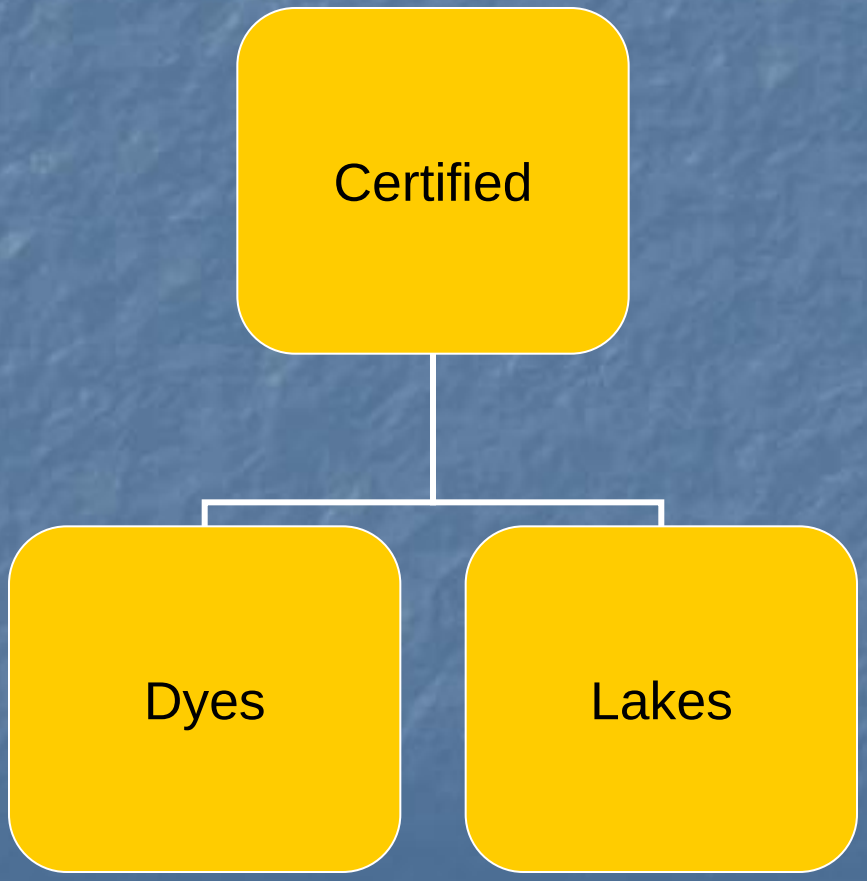
- Every batch has to be certified
- manufactured from chemical compounds like petroleum & coal sources

.....classification



.....classification

- Based on consistancy



Permitted Synthetic Colours-India

s.no	Colour	Common name	Colour Index	Chemical Class
1	Red	Ponceau4R Carmoisine Erythrosine	16255 17420 45430	Azo Azo Xanthene
2	Yellow	Tartrazine Sunset Yellow FCF	19140 15985	Pyrazolone Azo
3.	Blue	Indigo Carmine Brilliant Blue FCF	73015 42090	Indigoid Triarylmethane
4	Green	Fast Green FCF	42053	Triarylmethane

…… certifiable

In the USA, the following seven artificial colorings are permitted in food as of 2007:

- **FD&C Blue No. 1 - Brilliant Blue FCF, E133** (Blue shade)
- FD&C Blue No. 2 – Indigotine , E132 (Dark Blue shade)
- FD&C Green No. 3 - Fast Green FCF, E143 (Bluish green shade)
- **FD&C Red No. 40 - Alura Red AC , E129** (Red shade)
- FD&C Red No. 3 - Erythrosine, E127 (Pink shade) [4]
- **FD&C Yellow No. 5 – Tartrazine , E102** (Yellow shade)
- FD&C Yellow No. 6 - Sunset Yellow FCF, E110 (Orange shade)

….certifiable

colourants	**uses**
Blue No.1	Beverages ,dairy products ,icings ,syrups
Blue No.2	Baked goods ,snacks ,cereals ,ice creams ,cherries
Green No.3	Beverages ,puddings ,ice creams ,sherbets ,dairy products
Red No.40	Gelatine ,puddings ,dairy products
Red No.3	Cherries in fruit cocktails ,canned fruits for salads
Yellow No.5	Custards ,beverages ,ice creams
Yellow No.6	Cereals ,backed goods ,snacks ,ice creams ,dessert powder

Natural colours V/S Synthetic colours

Natural colorants

- Obtained from natural sources
- Processed by physical means
- May be less stable
- Less bright
- Not uniform
- No health harm
- Good consumer acceptability
- Expensive
- High microbiological contamination

Synthetic colorants

- Obtained by chemical reaction
- High stability to light,O2,PH
- Highly colored
- Color uniformity
- Health problems
- Consumer acceptability questionable
- Less costly
- Low microbiological contamination

HAZARDS OF FOOD COLOURANTS

Name	E #	Usage	Facts you need to know
Ponceau 4R, Conchineal Red A	E124	Food colouring	People with asthma, rhinitis or urtecaria - symptoms worsen
Sunset Yellow FCF, Orange Yellow S	E 110	Food Colouring	Animal studies indicate growth retardation and severe weight loss. People with asthma, rhinitis, or urtecaria should avoid this product.
Tartrazine	E 102	Yellow food coloring	Allergic reactions and asthmatic attacks. Implicated in bouts of hyperactivity disorder in children. Asthma, rhinitis and urtecaria - symptoms worsen

....hazards

Name	E#	Usage	Facts
Allura Red	129	Snacks ,soups	Asthma ,rhinitis urtecaria
Amaranth , Brilliant black	123 151	Wine ,fish role Snacks ,cheese	Asthma , rhinitis urtecaria,other allergies
Erythrocine	127	confectionaries	Promotes thyroid allergies

PERMITTED FOOD COLOURS – SAFETY ASSESSMENT

- Usage of synthetic colours has been restricted to a maximum limit of 100 -200 ppm

…*safty assessment*

Colour	Name	Acceptable Daily Intake (mg/kg b wt)
Red colour	Ponceau 4R	4.0
Red colour	Carmoisine	4.0
Red colour	Erythrosine	0.1
Yellow colour	Tartrazine	7.5
Yellow colour	Sunset yellow FCF	2.5
Blue colour	Indigo carmine	5.0
Blue colour	Brilliant blue FCF	12.5
Green	Fast green FCF	25.0

category	Range	Average
Candy &confections	10-400	100
Beverages	5-200	75
Dessert powders	5-600	140
cereals	200-500	350
cherries	100-400	200
Pet foods	100-400	200
Backery foods	10-500	50
Ice creams& sherbets	10-200	30
sausage	40-250	125
snacks	25-500	200
Nuts, gravy,jam	5-400	—

REGULATION OF FOOD COLORS

- In India control commettie for food standards (CCFS), National Codex Commettie, under Health Ministry, takes regulations according to PFA act
- Laws of FDA &British food laws are taken as the basis

HOW FDA ACT

- Regulate
- Evaluate
- Certify
- Approve

How FDA act…

Regulates

- Types of foods to which color additives to be added
- Which colorant to add
- How much to add
- Labeling, ie, how it should be identified on food label

How FDA approve and certify

- Monitor quality , concistancy, strength & safety of color prior to its use in food
- Animal studies &studies in humans are conducted
- Monitor the extent of consumption &any new researches on its safety

E number

- Are number codes for food additives ,usually found on food labels ,in European Union
- The numbering scheme follows that of the International Numbering System (INS) as determined by the Codex Alimentarius committee
- Accepted internationally ,with out the E,

E value classification by numeric range

100–199

Colours

100–109	yellows
110–119	oranges
120–129	reds
130–139	blues & violets
140–149	greens
150–159	browns & blacks
160–199	others

Analysis of food colorants

- To quantify
- To identify

Methods should be

- Simple
- Rapid
- Inexpensive

Analysis of natural colourants

- General methods
- Specific instrumental methods

General methods

Sensorial analysis-

Direct inspection

- Visual
- Smells
- flavors

Specific instrumental methods

1. Physical instrumental methods
2. Physico- chemical instrumental methods

Physical instrumental methods

1. Monochromatic colorimeter
2. Tri stimulus colorimeter
3. Colorimetric spectrophotometer

….Analysis

Physico chemical analysis

1. Sample preparation
2. Identification
3. Qualitative evaluation

Analysis of synthetic colourants

- Chromatography
- Spectrometry
- Electro chemical methods

DYES

- Dissolve in water,
- Not soluble in oil ,soluble in water
- Manufactured as powders, granules, liquids or other special purpose forms.
- Used in beverages, dry mixes, baked goods, confections, dairy products, pet foods and a variety of other products.
- Have side effects

LAKES

- Are the combination of dyes and insoluble material.
- Lakes tint by dispersion.
- Lakes are oil dispersible.
- Lakes are more stable than dyes
- Ideal for coloring products containing fats and oils or items lacking sufficient moisture to dissolve dyes.
- Typical uses include coated tablets, cake and donut mixes, hard candies and chewing gums, lipsticks, soaps, shampoos, talc, etc. in which leaching of colour is indesirable

Applying the Food Coloring

- Apply a few drops of food colours to the food at a time
- stirr until it reaches the desired color.
- . Food coloring is essentially made up of molecules that are formulated to absorb certain wavelengths of light, called photons.
- The molecules are so efficient that, when added to food of a different color, they can either trump or alter the original shade of the food.

…applying food colouring

- Food colouring processes depends up on the solubility and stability of the colourant

Eg:annatto

stability –light-fair

heat-good under 130 degrree c

solubility-fats& oils

Colour retention agents

- Used to preserve a foods existing colour
- Absorb or bind O2, to prevent damage of food

  Eg -Vit c

conclusion

- Colour additives are added to foods for imparting colours,give natural look ,attract consumers .....
- Though synthetic colourants have more advantages ,have side effects as they may affect health
- Their Controlled use benefits
- Sticking to natural colours is more healthful

THANK YOU