UNIT 14 STANDARDS FOR FOOD INGREDIENTS

Structure

14.0 OBJECTIVES

After reading this unit, we will be able to :

- define food additives;
- describe the role of preservatives;
- differentiate bulk and artificial sweeteners; and
- conduct identification tests for different additives.

14.1 INTRODUCTION

The development of agro-industries resulted in the enactment of first food law known as the Prevention of Food Adulteration Act in 1954 and then specifications have been formulated for a number of foods. Simultaneously, the Indian standards Institution was established in 1947 to assist the industries to raise their standard of quality and these have proved most valuable to the industry and the consumers.

With the increase production of milk in India and diversification in the production of wide variety of dairy products, dairy products manufacturers have started adding a large number of substances, generally in small quantities, to improve the appearance, flavour, texture or storage properties of dairy products. The use of certain additives in dairy products is controlled by regulations made under the

Prevention of Food Adulteration Act 1955. Further, as impurities in these substances have been found to be harmful it is necessary to have a strict quality control of these food additives. Therefore, BIS fixed a series of standards to check purity and identification of these substances. These standards also helped in checking purity at the stage of manufacture, for it is extremely difficult to detect the impurity, once these substances have been added to the dairy products.

14.2 DEFINITION AND CLASSIFICATION

The quality of dairy products is mainly affected by a number of factors, which can be grouped into three categories.

A. Ingredients (milk-based and non-milk based)

B. Processing

C. Hygiene

In this unit, only non-milk based ingredients are discussed. Food ingredients are substances, which include food additives along with vitamins, minerals or other nutrients used for the purpose of fortifying or enriching food or of restoring the constituents of food, herbs or spices when used as seasoning, salt, yeast or yeast extracts, starter cultures, malt or malt extract, air or water, etc.

The term food additive is defined as any substance, not commonly regarded or used as food, which is added to, or used in or on, food at any stage to affect its keeping qualities, texture, consistency, appearance, odour, alkalinity or acidity, or to serve any other technological function in relation to food, and includes processing aids in so far as they are added to, or used in or on, food as aforesaid, but does not include the followings:

a) vitamins, minerals or other nutrients used for the purpose of fortifying or enriching food or of restoring the constituents of food,

b) herbs or spices when used as seasoning,

c) salt,

d) yeast or yeast extracts,

e) protein or its hydrolytic products,

f) starter cultures,

g) malt or malt extract,

h) air or water.

The food ingredients extensively used in dairy industry can be categorized into :

- Colouring matter
- Preservative
- Antioxidant

- Emulsifier
- Stabilizer
- Acidulants
- Anticaking agent
- Flowing agent
- Sweetener
- Enzyme

14.3 COLOURING MATTERS

The use of colouring matter has been acknowledged to play an important role in the consumer acceptability of certain dairy products. However, the need to monitor the compounds used to has been recognized since the early days of the century when cheaper coloured salts of heavy metals were used instead of natural colour. Milk, cream, condensed milk and dried milk are not permitted to contain added colouring matters. However, dairy products viz., cheese, butter, flavoured milk, ice cream are only permitted to contain a restricted number of colours. Specifications for commonly used colourants are given below.

Specification for β-Carotene (Food Grade) as per IS:3841-1966

S. No.	Characteristic	Requirement
1.	*Description* It is obtained as dark violet hexagonal prisms when crystallized from benzene-methanol solution; or as red rhombic, almost quadratic plates, from petroleum ether.	
2.	Melting point, °C	183±1
3.	*Solubility* Soluble in carbon disulphide, benzene and chloroform; moderately soluble in n-hexane, cyclohexane, petroleum ether and oils; practically insoluble in methanol and ethanol; insoluble in water.	
4.	*Spectrophotometric requirements* - The wavelengths of absorption maxima of all trans b-carotene in cyclohexane (0.2 mg per 100 ml) and in 1 cm cell shall be 456 nm to 355 nm region. (b) A solution of b-carotene in chloroform on addition of antimony trichloride solution shall give a dark blue colour having maximum absorption at a wavelength of 590 nm.	
5.	*Colour reaction* When 2 ml of concentrated sulphuric acid is added to 2 ml of 0.2 percent solution of b-carotene in chloroform, the acid layer shall turn blue.	

6.	Purity, % by mass	95.0 Min.
7.	Arsenic (as As), ppm	5 Max.
8.	Lead (as Pb), ppm	20 Max.

Specification for Annatto colour for food products as per IS:2557-1994

S. No.	Characteristic	Requirement

1. *General*

The material shall be derived only from the plant *Bixa orellana* L. and shall not contain any extraneous colouring matter. It shall be processed, packed, stored and distributed under hygienic conditions in licensed premises (IS:2491-1972).

2(a) *Solution of Annatto colour in oil*

1 Annatto extract in oil, as solution or suspension, is prepared by extraction of the outer coating of seeds with vegetable oils. Only the vegetable oils included under the Prevention of Food Adulteration Rules, 1955 shall be used, either singly or in a mixture.

(b) The solution of annatto colour in oils shall be clear and shall remain so on storage in suitable containers at 15°C except for a slight deposit of stearin or shall be in the form of a suspension.

2(b) *Colour*

(a) The colour of solution in amyl acetate at a dilution of 1:1000 (w/v), when measured in a Lovibond Tintometer with a 1 cm cell, shall be not less than 5.o yellow units and 0.4 red units, or

(b) be not less than the colour of the inorganic solution (potassium dichromate-0.32g, cobalt ammonium sulphate ($CoSO_4.(NH_4)SO_4.6H_2O$)-2.02g and sulphuric acid (sp. Gravity 1.84)-2 ml to make solution to 1 litre with distilled water.

3(a) *Solution of Annatto colour in water*

Water-soluble annatto is prepared by extraction of outer coating of the seeds with dilute (0.5-3%) aqueous alkali (sodium or potassium hydroxide). The solution shall clear and shall be remain so on storage in suitable containers at a temperature of 15°C.

3(b) *Colour*

The colour of solution in 0.1 N sodium hydroxide or potassium hydroxide at a dilution of 1:1000 (w/v), when measured in a Lovibond Tintometer with a 1 cm cell, shall be not less than 5.0 yellow units and 0.4 red units,

4.0 *Identification*

4.1 *Spectrophotometry*

Annatto extracts in oil, diluted with chloroform exhibit absorbance maxima at 439, 470 and 501 nm. Water-soluble annatto extracts, diluted with water exhibit absorbance maxima at 453 and 482 nm.

4.2 *Column chromatography and Carr-Price reaction*

Prepare a small chromatography column by filling a glass tube (7´mm internal dia.), stoppered with glass wool, with alumina (800-200 mesh) slurried in benzene so that settled alumina fills about 2/3rd of the tube. Fill the column with benzene and adjust the flow rate to about 30 drops/min using a rubber outlet tube and clamp using the benzene layer is 2-3 mm above the alumina surface.

4.2.1 *Annatto extract in oil*

Add to the top of the alumina column 3 ml of a solution containing sufficient sample in benzene to impart a colour equivalent to a 0.1% potassium dichromate solution; elute with benzene until a pale yellow fraction is washed from the column. Wash the column with three 10 ml volumes of dry chloroform; then add 5 ml of Carr-Price reagent and allow it to run onto the top of the column. The orange-red zone (bixin) at the top of the column immediately becomes blue-green.

4.2.2 *Water-soluble annatto*

Transfer 2 ml or 2 g to a 50 ml separating funnel and add sufficient 2N sulphuric acid to make the solution acidic in pH paper (pH 1-2). Dissolve the red precipitate of norbixin by mixing the solution with 50 ml of benzene. Discard the water layer and wash the benzene phase with water until it no longer gives an acid reaction. Remove any undissolved norbixin by centrifugation or filtration and dry the solution over anhydrous sodium sulphate. Transfer 3-5 ml of the dry solution to the top of an alumina column prepare as described above. Eluate the column with benzene, three 10 ml volumes of dry chloroform, followed by 5 ml of Carr-Price reagent added to the top of the column. The orange-red band of norbixin immediately becomes blue-green.

4.3 *Thin layer chromatography*

4.3.1 *Annatto extract in oil*

Use silica gel with 12 percent calcium sulphate as binding agent, and a mixture of acetic acid, chloroform and acetone (1:50:50, by volume) as developing solvent. He sample in oil produces at least 3 or 4 red or yellow spots, Two red spots are clearly more intense than the other spots. Dissolve the two spots in benzene and identify the spot that is bixin by Carr-Price reaction.

4.3.2 *Water-soluble annatto*

Prepare a chromatogram as described in 9(a). Three or four spots are obtained, of which 2 spots have an orange colour and the others an orange-yellow colour. Dissolve the orange spots in benzene and identify one of he spots that is norbixin by Carr-Price reaction.

5.0 Purity

(as Carotenoids)

5.1 Annatto extract in oil, expressed as bixin, % by mass 0.24 Min.

5.2	Water-soluble annatto expressed as norbixin, % by mass	0.24 Min.
6.	Arsenic (as As), mg/kg	3 Max.
7.	Lead (as Pb), mg/kg	10 Max.
8.	Copper (as Cu), mg/kg	30 Max.
9.	Heavy metals, mg/kg	40 Max.

Specification for Saffron (Filaments and powder form) as per IS:5453-1996

S. No.	Characteristic of Saffron filaments	Requirement Grade 1	Grade 2	Grade 3	Grade 4
1.	Floral waste*, % by mass	0.5 Max.	4 Max.	7 Max.	10 Max.
2.	Extraneous matter, % by mass	0.1 Max.	0.5 Max.	1.0 Max.	1.0 Max.

* Yellow filaments that are unattached and separated, pollens, stamens, parts of ovaries and other parts of the flower of *Crocus sativus* L.

S. No.	Characteristic	Requirement
1.	*Flavour :* Flavour shall be characteristic of saffron, slightly bitter and slightly pungent. The product shall be free from foreign flavours.	
2.	*Freedom from moulds, insects, etc. :* Saffron shall be free from living insects and shall be practically free from mould growth, dead insects, insect fragments and rodent contamination, visible to naked eye.	
		Saffron (in filaments) **Saffron (in powder form)**
3.	Moisture & volatile matter, % by mass	12 Max. 10 Max.
4.	Total ash, % by mass	8 Max. 8 Max.
5.	Acid insoluble ash, % by mass	
	(a) Grade 1 & 2	1.0 Max. 1.0 Max.
	(b) Grade 3 & 4	1.5 Max. 1.5 Max.
6.	Solubility in cold water, % by mass (on dry basis)	65 Max. 65 Max.
7.	Bitterness expressed as direct reading of the absorbance of picrocrocine at 257 nm (on dry basis)	
	(a) Grade 1	70 Min. 70 Min.
	(b) Grade 2	55 Min. 55 Min.
	© Grade 3	40 Min. 40 Min.
	(d) Grade 4	30 Min. 30 Min.
8.	Safranal, expressed as direct reading of the absorbance at 330 nm (on dry basis)	20-50 20-50

9.	Colouring strength, expressed as direct reading of the absorbance of crocine at 440 nm (on dry basis)		
	(a) Grade 1	190 Min.	190 Min.
	(b) Grade 2	150 Min.	150 Min.
	© Grade 3	110 Min.	110 Min.
	(d) Grade 4	80 Min.	80 Min.
10.	Total nitrogen, % by mass (on dry basis)	3.0 Max.	3.0 Max.
11.	Crude fibre, % by mass	6 Max.	6 Max.

Specification for Tartrazine (Food Grade) as per IS:1694-1994

S. No.	Characteristic	Requirement
1.	*Freedom from contaminants:* Material shall be free from mercury, copper and chromium in any form: aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	87 Min.
3.	Loss on drying at 135°C, % by mass and	
	Chlorides & sulphates (as sodium salt), % by mass	13 Max.
4.	Water-insoluble matter, % by mass	0.2 Max.
5.	Combined ether extracts, % by mass	0.2 Max.
6.	Subsidiary dyes, % by mass	1.0 Max.
7.	Dye intermediates, % by mass	0.5 Max.
8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Heavy metals, mg/kg	40 Max.

Specification for Carmoisine (Food Grade) as per IS:2923-1995

S. No.	Characteristic	Requirement
1.	*Freedom from contaminants:* Material shall be free from mercury, selenium and chromium in any form: aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	87 Min.
3.	Loss on drying at 135°C, % by mass and Chlorides & sulphates (as sodium salt), % by mass	13 Max.
4.	Water-insoluble matter, % by mass	0.2 Max.
5.	Combined ether extracts, % by mass	0.2 Max.
6.	Subsidiary dyes, % by mass	1.0 Max.
7.	Dye intermediates, % by mass	0.5 Max.

8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Heavy metals, mg/kg	40 Max.

Specification for Sunset yellow (Food Grade) as per IS:1695-1994

S. No.	Characteristic	Requirement
1.	*Freedom from contaminants*: Material shall be free from mercury, copper and chromium in any form: aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	87 Min.
3.	Loss on drying at 135°C, % by mass and	
	Chlorides & sulphates (as sodium salt), % by mass	13 Max.
4.	Water-insoluble matter, % by mass	0.2 Max.
5.	Combined ether extracts, % by mass	0.2 Max.
6.	Subsidiary dyes (lower sulphonated dyes including traces of orange II), % by mass	3.0 Max.
7.	Dye intermediates, % by mass	0.5 Max.
8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Heavy metals, mg/kg	40 Max.

Specification for Ponceau 4R (Food Grade) as per IS:2558-1994

S. No.	Characteristic	Requirement
1.	*Freedom from contaminants:* Material shall be free from mercury, selenium and chromium in any form: aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	82 Min.
3.	Loss on drying at 135°C, % by mass and Chlorides & sulphates (as sodium salt), % by mass	18 Max.
4.	Water-insoluble matter, % by mass	0.4 Max.
5.	Combined ether extracts, % by mass	0.4 Max.
6.	Subsidiary dyes, % by mass	1.0 Max.
7.	Dye intermediates, % by mass	0.5 Max.
8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Heavy metals, mg/kg	40 Max.

Specification for Brilliant blue FCF (Food Grade) as per IS:6406-1994

S. No.	Characteristic	Requirement
1.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	85 Min.
2.	Loss on drying at 135°C, % by mass and Chlorides & sulphates (as sodium salt), % by mass	15 Max.
3.	Water-insoluble matter, % by mass	0.2 Max.
4.	Combined ether extracts, % by mass	0.2 Max.
5.	Subsidiary dyes, % by mass	3.0 Max.
6.	Dye intermediates, % by mass	
	(a) O-sulpho-benzaldehyde	1.5 Max.
	(b) N,N' ethyl-benzyl-aniline-3-sulphonic acid	0.3 Max.
	© Leuco base	5 Max.
7.	Lead (as Pb), mg/kg	10 Max.
8.	Arsenic (as As), mg/kg	3 Max.
9.	Heavy metals, mg/kg	50 Max.

Specification for Fast Green FCF (Food Grade) as per IS:6022-1994

S. No.	Characteristic	Requirement
1.	*Freedom from contaminants:* Material shall be free from aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	85 Min.
3.	Loss on drying at 135°C, % by mass and Chlorides & sulphates (as sodium salt), % by mass	13 Max.
4.	Water-insoluble matter, % by mass	0.2 Max.
5.	Combined ether extracts, % by mass	0.2 Max.
6.	Subsidiary dyes, % by mass	1.0 Max.
7.	Organic compounds other than colouring matter, uncombined intermediates and products of side reactions:	
	(a) Sum of 2-, 3-, 4-formyl benzene sulphonic acid, sodium salt, % by mass	0.5 Max.
	(b) Sum of 3- and 4-[ethyl (4-sulfophenyl) amino] methyl benzene sulphonic acid, disodium salt, % by mass	0.3 Max.
	© 2-formyl-5-hydroxybenzene sulphonic acid, sodium salt, % by mass	0.5 Max.
	(d) Leuco base, % by mass	5.0 Max.
	(e) Unsulphated primary aromatic amines (as aniline), % by mass	0.01 Max.

8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Chromium (as Cr), mg/kg	50 Max.
11.	Mercury (as Hg), mg/kg	Absent
12.	Heavy metals, mg/kg	40 Max.

Specification for Indigo carmine (Food Grade) as per IS:1698-1994

S. No.	Characteristic	Requirement
1.	Freedom from contaminants: Material shall be free from mercury, copper and chromium in any form: aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	85 Min.
3.	Loss on drying at 135°C, % by mass and Chlorides & sulphates (as sodium salt), % by mass	15 Max.
4.	Water-insoluble matter, % by mass	0.4 Max.
5.	Combined ether extracts, % by mass	0.4 Max.
6.	Subsidiary dyes, % by mass	3.0 Max.
7.	Isatin sulphonic acid, % by mass	1.0 Max.
8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Heavy metals, mg/kg	40 Max.

Specification for Amaranth (Food Grade) as per IS:1696-1994

S. No.	Characteristic	Requirement
1.	*Freedom from contaminants:* Material shall be free from mercury, selenium and chromium in any form: aromatic amines, aromatic nitro compounds, aromatic hydrocarbons and cyanides.	
2.	Total dye, % by mass (on dry at 105±1°C for 2h basis)	85 Min.
3.	Loss on drying at 135°C, % by mass and Chlorides & sulphates (as sodium salt), % by mass	15 Max.
4.	Water-insoluble matter, % by mass	0.5 Max.
5.	Combined ether extracts, % by mass	0.2 Max.
6.	Subsidiary dyes, % by mass	4.0 Max.
7.	Dye intermediates, % by mass	0.5 Max.
8.	Lead (as Pb), mg/kg	10 Max.
9.	Arsenic (as As), mg/kg	3 Max.
10.	Heavy metals, mg/kg	40 Max.

Specification for Caramel as per IS:4467-1996

S. No.	Characteristic	Type 1 (Plain)	Type 2 (Caustic sulphite)	Type 3 (Ammonia process)	Type 4 (Ammonia sulphite)
1.	*Description:* Caramel shall be a dark brown to black liquid or solid material having the characteristic odour of burn sugar and a pleasant bitter taste. It shall be miscible with water. Its solution, when spread in a thin layer on a glass plate should appear homogeneous, transparent and have reddish-brown colour. Caramel shall be free from any other extraneous colouring matter.				
2.	Solid content, % by mass	62-77	65-72	53-83	40-75
3.	Colour intensity, % by mass	0.01-0.12	0.06-0.10	0.08-0.36	0.10-0.60
4.	Ammoniacal N_2, % by mass*	0.01 Max.	0.01 Max.	0.4 Max.	0.5 Max.
5.	4-Methyl-imidazole, mg/kg	-	-	300 & 200 on an equivalent colour basis	Max. 1000 & 250 on an equivalent colour basis Max.
6.	Lead (as Pb), mg/kg	5 Max.	5 Max.	5 Max.	5 Max.
7.	Arsenic (as As), mg/kg	3 Max.	3 Max.	3 Max.	3 Max.
8.	Total sulphur, % by mass	0.3 Max.	1.3-2.5	0.3 Max.	1.4-10.0
9.	Sulphur dioxide, % by mass	-	0.2 Max.	-	0.5 Max.
10.	Total Nitrogen, % by mass	0.1 Max.	0.2 Max.	1.3-6.8	0.5-7.5
11.	Heavy metals, mg/kg	25 Max.	25 Max.	25 Max.	25 Max.
12.	2-Acetyl-4-hydroxy butyl-imidazole, mg/kg	-	-	40 & 25 on an equivalent colour basis Max.	-
13.	Mercury (as Hg), mg/kg	0.1 Max.	0.1 Max.	0.1 Max.	0.1 Max.
14.	Copper (as Cu), mg/kg	20 Max.	20 Max.	20 Max.	20 Max.

* Requirement of ammoniacal nitrogen is based on a product having a minimum colour intensity prescribed in S. No. 3 proportionately higher value of ammoniacal nitrogen apply for product of higher colour intensity.

Check Your Progress – 1

1. What are the Factors, which affect the quality of Food?

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2. Define food additives?

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3. Why preservatives are added to food?

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4. What are antioxidants?

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5. Define stabilizers and emulsifiers.

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6. For what purpose β-carotene is used in butter and cheese?

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7. What should be the purity of food grade β-carotene?

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8. Give the maximum limit for arsenic and lead in food grade β-carotene?

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9. What solvent is used to extract annatto colour?

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10. How many grades of saffron are there? What is the maximum limit for extraneous matter in grade saffron?

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11. Name any two artificial food grade colour and any 2 natural colour.

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14.4 ACIDULANTS

Specification for Ascorbic acid (Food Grade) as per IS:5342-1996

S. No.	Characteristic	Requirement
1.	*Identification*	
(a)	To 2 ml of a 2 percent solution add a few drops of sodium nitroferricyanide followed by 1 ml of 0.1N sodium hydroxide. A transient blue colour shall be produced immediately.	
(b)	When to 2 ml of 2 percent solution in water are added, 2 ml of water, 0.1 g of sodium bicarbonate, and about 0.02 g of ferrous sulphate, mixture is shaken and allowed to stand, a deep violet colour shall be produced which shall disappear on the addition of 5 ml of dilute sulphuric acid.	

(c)	Solution of ascorbic acid in ethanol shall decolourize a solution of 2,6-dichlorophenol indophenol.	
2.	Specific rotation of 2 % m/v solution in water at 20°C under sodium light	+20.5°-+21.5 °
3.	pH of 2 % (m/v) solution	2.4-2.8
4.	Purity (as $C_6H_8O_6$), % by mass	99 Min.
5.	Loss on drying over sulphuric acid for 24 h, % by mass	0.4 Max.
6.	Sulphated ash, % by mass	0.1Max.
7.	Arsenic (as As), mg/kg	3 Max.
8.	Heavy metals (as Pb), mg/kg	20 Max.

Specification for Lactic acid (Food Grade) as per IS:9971-1981

S. No.	Characteristic	Requirement
1.	Description : Lactic acid shall be yellowish to colourless syrupy liquid with an acidic taste and no odour. It consists of a mixture of lactic acid and lactate ($C_6H_{10}O_5$). It is obtained by lactic fermentation of sugars or is prepared synthetically (50-90 percent).	
2.	*Identification*	
(a)	Solubility : Lactic acid shall be miscible with water and ethanol.	
(b)	Test for acid : Ten percent solution in water shall be acidic to litmus paper.	
(c)	Test for lactate : The material shall give positive test for lactate.	
3.	Purity (as $C_3H_6O_3$), % by mass of the labeled concentration	95.0-105.0
4.	Sulphated ash % by mass	0.1 Max.
5.	Chlorides, % by mass	0.2 Max.
6.	Sulphates (as SO_4), % by mass	0.25 Max.
7.	Citric, oxalic, phosphoric and tartaric acids	Conform to test
8.	Sugars	Conform to test
9.	Readily carbinizable substances	Conform to test
10.	Volatile fatty acid	Conform to test
11.	Cyanide	Conform to test
12.	Methanol, % by mass	0.2 Max.
13.	Iron (as Fe), mg/kg	10 Max.
14.	Heavy metals (as Pb), mg/kg	10 Max.
15.	Arsenic (as As), mg/kg	3 Max.

Specification for Phosphoric acid (Food Grade) as per IS:10508-1983

S. No.	Characteristic	Requirement
1.	*Description:* It is a clear, colourless, odourless and viscous liquid.	
2.	*Identification*	
	(a) *Solubility:* Miscible in water and ethanol.	
	(b) *Test for acid:* Phosphoric acid is strongly acid, even in high dilution.	
	(c) Neutralize a few ml of phosphoric acid and add dilute nitric acid. Then add an equal volume of ammonium molybdate solution and warm. A bright canary-yellow precipitate is obtained.	
	(c) *Test for phosphate:* A 10% percent solution gives positive test for phosphate.	
3.	Purity (as H_3PO_4), % by mass	85 Min.
4.	Fluoride, mg/kg	10 Max.
5.	Total heavy metals (as Pb), mg/kg	10 Max.
6.	Lead (as Pb), mg/kg	5 Max.
7.	Arsenic (as As), mg/kg	3 Max.

Specification for Citric acid (Food Grade) as per IS:13186-1991

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be in the form of white or colourless, odourless, crystalline solid with a strongly acid taste. The monohydrate effloresces in dry air.	
2.	*Identification*	
	(a) *Solubility:* The material is very soluble in water, freely soluble in ethanol and soluble in ether.	
	(b) Boil a neutralized solution of the sample with an excess of mercury sulphate test solution and filter, if necessary. Add a few drops of potassium permanganate. The violet colour disappears and a white precipitate forms.	
	(c) Add a neutralized solution of the sample with dilute sulphuric acid test solution and a few drops of 1 % potassium permanganate. Warm until the violet colour disappears and then add an excess of bromine test solution. A white precipitate forms either immediately or on cooling.	
3.	Purity (as $C_6H_6O_7$), % by mass (on anhydrous basis)	99.5 Min.
4.	Moisture, % by mass	
	(a) Anhydrous	0.5 Max.
	(b) Monohydrate	8.8 Max.
5.	Sulphated ash, % by mass	0.05 Max.
6.	Total heavy metals (as Pb), mg/kg	10 Max.
7.	Arsenic (as As), mg/kg	3 Max.
8.	Oxalates (as $C_2H_2O_4$)	To pass the test
9.	Readily carbinizable substance	To pass the test

14.5 SWEETENERS

In addition to the sensation of sweetness, sweeteners like sugar, glucose syrup, jaggery, lactose, honey, etc. provide bulk, energy value and, at high concentrations, important preservative action. Alternative non-carbohydrate sweeteners must provide an adequate degree of sweetness to justify their use but they do not necessarily need the other permitted sugar products. The non-carbohydrate sweeteners are classified into two classes:

1. **Bulk Sweeteners:** Those with a sweetening effect similar to sucrose, e.g. mannitol, sorbitol, etc.

2. **Intense Sweeteners:** Those have sweetness many times that of sucrose, e.g. saccharin, aspartame, cyclamate salts, etc.

Specification for Lactose (Commercial) as per IS:1000-1989

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be obtained from the whey of milk of cow or buffalo or mixture thereof. It shall be in the form of a crystalline powder, white to pale yellow in colour, nearly odourless, free from dirt or other foreign matter. It shall not be musty or rancid.	
2.	*Particle size:* The material shall pass through a 250 mm IS sieve.	
3.	Lactose, % by mass (on dry basis)	99.0 Min.
4.	Moisture, % by mass	
	(a) Monohydrate	5.5 Max.
	(b) Anhydrous	1.0 Max.
5.	Sulphated ash, % by mass (on dry basis)	0.2 Max.
6.	pH of 10 percent solution	4.0-6.5
7.	Specific rotation	52.0-52.6
8.	Nitrogen, % by mass	0.05 Max.
9.	Arsenic (as As), mg/kg	1 Max.
10.	Lead (as Pb), mg/kg	2 Max.
11.	*E. coli* per 0.1 g	Absent
12.	*Salmonella* per 0.1 g	Absent

Specification for Dextrose monohydrate as per IS:874-1992

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be purified and crystallized D-glucose containing one molecule of water of crystallization. It shall be white or light cream in colour. The material shall be a crystalline or granular, odourless powder readily soluble in water with a characteristic sweet taste free from foreign flavour.	

2.	*Freedom from colouring matter:* The material shall be free from any added colouring matter.	
3.	*Freedom from foreign matter:* The material shall be free from dirt, other extraneous matter, insects, and rodent of other contamination.	
4.	Loss on drying, % by mass	7.5-9.5
5.	Specific rotation of solution containing 1 g of the material, previously dried at 105°C for 6h, with 0.02 ml of ammonium hydroxide solution in each 10 ml of water	+52.5° - +53.3°
6.	Specific volume, ml/g	160 Max.
7.	D-glucose, % by mass (on dry basis)	99.5 Min.
8.	Total solids, % by mass	90 Min.
9.	Sulphated ash, % by mass (on dry basis)	0.1 Max.
10.	Acidity	To satisfy the test
11.	Sulphur dioxide, mg/kg	70 Max.
12.	Arsenic (as As), mg/kg	1.1 Max.
13.	Copper (as Cu), mg/kg	2 Max.
14.	Lead (as Pb), mg/kg	0.5 Max.
15.	Zinc (as Zn), mg/kg	50.0 Max.
16.	Tin (as Sn), mg/kg	250.0 Max.
17.	Mercury (as Hg), mg/kg	1.0 Max.
18.	Cadmium (as Cd), mg/kg	1.5 Max.

Specification for Liquid glucose as per IS:873-1974

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be in the form of odourless and viscous syrup with a characteristic sweet taste. It shall be clear, free from fermentation, mould growth, sediment, dirt or other suspended and extraneous matter, or added sweetening and flavouring agents or any other deleterious substances.	
2.	*Colour:* When a 50 % m/v solution of the material of regular conversion grade is tasted in a Lovibond Tintometer in a 2.54 cm cell, the colour of the material in terms of Lovibond units shall not be deeper than:	
(a)	0.1 yellow and 0.1 red within a period of 90 days from the date of manufacture, and	
(b)	0.2 yellow and 0.1 red within a period of 180 days from the date of manufacture.	
3	Dextrose equivalent for different grades shall be :	
	(a) Low conversion (LC)	28-37
	(b) Regular conversion (RC)	38-47
	(c) Intermediate conversion (IC)	48-57
	(d) High conversion (HC)	58-67
	(e) Extra high conversion (EHC)	68 and above

4.	Total solids, % by mass	80 Min.
5.	Ash, % by mass	0.3 Max.
6.	pH	4.8-5.5
7.	Sulphur dioxide, mg/kg	40 & 400* Max.
8.	Arsenic (as As), mg/kg	1 Max.
9.	Lead (as Pb), mg/kg	2 Max.
10.	Copper (as Cu), mg/kg	5 Max.
11.	*Escherchia coli*, in 20 g	Absent
12.	*Salmonella*, in 20 g	Absent

***** Used for manufacture of sugar confections only.

Specification for Dried glucose syrup as per IS:8847-1978

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be in the form of coarse or fine white to creamish white powder, sweet to taste, bland in flavour and somewhat hygroscopic. It shall be free from fermentation, evidence of mould growth, dirt or other extraneous matter, or added sweetening and flavouring agents.	
4.	Total solids, % by mass	93.0 Min.
5.	Reducing sugar, % by mass (on dry basis) or dextrose equivalent (DE)	20.0 Min.
6.	Sulphated ash, % by mass	1.0 Max.
7.	Sulphur dioxide, mg/kg	40 & 150* Max.
8.	Arsenic (as As), mg/kg	1 Max.
9.	Lead (as Pb), mg/kg	2 Max.
10.	Copper (as Cu), mg/kg	5 Max.

***** Used for manufacture of sugar confections only.

Specification for Refined sugar as per IS:1151-2003

S. No.	Characteristic	Requirement
1.	*Description:* Refined sugar shall be crystalline, white, odourless and free from dirt, iron fillings and other extraneous matter.	
2.	Loss on drying, % by mass	0.05 Max.
3.	Polarization, °Z	99.7 Min.
4.	Reducing sugar, % by mass	0.04 Max.
5.	Colour in ICUMSA units	60 Max.
6.	Conductivity ash, % by mass	0.04 Max.
7.	Sulphur dioxide, mg/kg	15 Max.
8.	Lead (as Pb), mg/kg	0.5 Max.
9.	Chromium (as Cr), mg/kg	20 Max.

Specification for Mishri as per IS:12906-1990

S. No.	Characteristic	Requirement
1.	*Description:* Mishri shall be in the form of white crystals of varying sizes. It shall be sweet to taste and shall not possess sour, salty or any other objectionable taste. The material shall be free from other extraneous matter and substances deleterious to health. It shall also be free from iron fillings and added colouring matter.	
2.	Sucrose, % by mass (on dry basis)	99.5 Min.
3.	Moisture, % by mass	0.2 Max.
4.	Reducing sugar, % by mass	0.04 Max.
5.	Sulphur dioxide, mg/kg (on dry basis)	70 Max.
6.	Sulphated ash, % by mass (on dry basis)	0.1 Max.

Specification for Cane gur (Jaggery) as per IS:12923-1990

S. No.	Characteristic	Requirement
1.	*Description:* Cane gur shall be prepared in the form of solid lumps which shall be of firm consistency. It shall be golden yellow to light brown in colour, free from dirt, other extraneous matter and substances deleterious to health. Cane gur shall be sweet to taste and shall not possess sour, salty or any other objectionable taste.	
2.	Sucrose, % by mass (on dry basis)	80 Min.
3.	Reducing sugar, % by mass (on dry basis)	10 Max.
4.	Moisture, % by mass	5 Max.
5.	Water insoluble matter, % by mass (on dry basis)	1.5 Max.
6.	Sulphated ash, % by mass (on dry basis)	3.5 Max.
7.	Sulphur dioxide, mg/kg (on dry basis)	50 Max.
8.	Acid insoluble ash, % by mass	0.3 Max.
9.	Total sugar (expressed as invert sugar), % by mass (on dry basis)	90 Min.

Specification for Extracted Honey as per IS:4941-1994

S. No.	Characteristic	Requirements		
		Special grade	A grade	Standard grade
1.	*General:* It shall be well-ripened natural product. It shall be clear. It shall have been extracted with the help of an extractor. It shall be free from objectionable flavour due to overheating, fermentation and smoke. It shall have been strained clear through a double-layered cheese cloth (150 microns) at a temperature not exceeding 70°C.			
2.	*Freedom from foreign matter:* When visually inspected, the honey shall be free from any foreign matter, such as mould, dirt, scum, pieces of beeswax, the fragments of bees and other extraneous matter.			

3.	*Colour:* The colour of honey shall be uniform throughout and may vary from light to dark brown.			
4.	The honey shall not contain any food additives such as colour, vitamins, minerals and saccharin.			
5.	Specific gravity at 27°C	1.37 Min.	1.37 Min.	1.37 Min.
6.	Moisture, % by mass	20 Max.	22 max.	25 Max.
7.	Total reducing sugar, % by mass	70 Min.	65 Min.	65 Min.
8.	Sucrose, % by mass	5.0 Max.	5.0 Max.	5.0 Max.
9.	Fructose-glucose ratio*	1.0 Min	1.0 Min	1.0 Min
10.	Ash, % by mass	0.5 Max.	0.5 Max.	0.5 Max.
11.	Acidity (as formic acid), % by mass	0.2 Max.	0.2 Max.	0.2 Max.
12.	Fiehe's test	Negative	Negative	Negative
13.	Hydroxymethyl furfural (HMF), mg/kg	80 Max.	80 Max.	80 Max.
14.	Total count of pollens and plants elements/g	50000 Max.	50000 . Max.	50000 Max.
15.	Optical density at 600 nm	0.3 Max.	0.3 Max.	0.3 Max.

* If HMF content is more than 80 mg/kg, then fructose-glucose ratio should be more than 1.0.

Specification for Aspartame (Food Grade) as per IS:13657-1993

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be a white, odourless, crystalline powder, having a strong, sweet taste.	
2.	*Identification*	

(a) *Solubility:* The material shall be slightly soluble in water and ethanol/ methanol.

(b) *Positive test for amino group:* Dissolve 2 g of ninhydrin in 75 ml of dimethyl sulphoxide. Add 62 mg pf hydrindantin, dilute to 100 ml with 4 M lithium acetate buffer solution (pH 9), and filter. Transfer about 10 mg of the sample to a test tube; add 2 ml of the reagent solution, and heat. A dark purple colour is formed.

(c) Positive test for ester group: Dissolve about 20 mg in 1 ml of methanol. Add 0,5 ml of methanol saturated with hydroxylamine hydrochloride, mix, and then add 0.3 ml of 5 N potassium hydroxide in methanol. Heat the mixture to boiling, and then cool. Adjust the pH to between 1 and 1.5 with hydrochloric acid (10 percent), and add 0.1 ml of ferric chloride (9 g $FeCl_3.6H_2O$) in water o make 100 ml). A burgundy colour is produced.

(d) The transmittance of a 1 % solution in 2N hydrochloric acid, determined in a 1 cm cell at 430 nm, with a suitable spectrophotometer, using 2N hydrochloric acid as a reference, is not less than 0.95, equivalent to an absorbance of not more than approximately 0.022.

3.	Specification rotation $[a]^{20}_{D}$ calculated on dry basis when determined in a solution containing 4 g of sample in sufficient 15N formic acid to make 100 ml and determined within 30 min after preparation of the sample solution.	+14.5° - +16.5°
4.	Purity (as $C_{14}H_{18}N_2O_5$), % by mass (on dry basis)	98.0-102.0
5.	Moisture, % by mass	4.3 Max.
6.	Sulphated ash, % by mass (on dry basis)	0.2 Max.
7.	pH (0.8 % solution)	4.5-6.0
8.	5-Benzyl-3,6-dioxo-2-piperazine acetic acid, diketo piperazine), % by mass	1.0 Max.
9.	Heavy metals (as Pb), mg/kg	10 Max.
10.	Arsenic (as As), mg/kg	3 Max.

Specification for Saccharin (Food Grade) as per IS:6385-1997

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be in the form of white crystals or white crystalline powder. It shall be odourless or having a faint aromatic odour. It has intensely sweet taste. The material shall be slightly soluble in water, sparingly soluble in ethanol, slightly soluble in chloroform and ether and is readily absorbed by dilute solution of ammonia, solutions of alkali hydroxides or solutions of alkali carbonates with the evolution of carbon dioxide.	
2.	*Identification*	
	(a) A saturated aqueous solution of saccharin shall be acidic to litmus.	
	(b) Dissolve about 100 mg of the material in 5 ml of 5 percent sodium hydroxide solution. Evaporate to dryness and gently fuse the residue over a small flame until it no longer evolves ammonia. After the residue has cooled, dissolved it in 20 ml of water, neutralize the solution with dilute hydrochloric acid and filter. The addition of a drop of ferric chloride solution (9 g of ferric chloride with100 ml water) to the filtrate shall produce a violet colour.	
	(c) Mix 20 mg of the material with 40 mg of the resorcinol, add 10 drops of conc. Sulphuric acid and heat he mixture in a liquid bath at 200°C for 3 minutes. After cooling add 10 ml of water and an excess of 10 percent sodium hydroxide solution. A fluorescent green liquid shall be produced.	
3.	Melting range, °C	226-230
4.	Purity (as $C_7H_5NO_3S$), % by mass (on dry basis)	98 Min.
5.	Moisture, % by mass on drying at 105°C for 2h	1.0 Max.
6.	Benzoic and salicylic acids	To pass the test
7.	Readily carbinizable substances	To pass the test
8.	Sulphated ash, % by mass	0.2 Max.
9.	Toluene sulphonamides, mg/kg	25 Max.

10.	Heavy metals (as Pb), mg/kg	10 Max.
11.	Arsenic (as As), mg/kg	3 Max.
12.	Selenium (as Se), mg/kg	30 Max.

Specification for Sodium saccharin (Food Grade) as per IS:5345-1996

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be in the form of white crystals or white crystalline powder. It shall be odourless or having a faint aromatic odour. It has intensely sweet taste, even in dilute solution. 1 g is soluble in 1.5 ml of water and in about 50 ml of alcohol.	
2.	*Identification*	
	(a) A saturated aqueous solution of saccharin shall be acidic to litmus.	
	(b) Dissolve about 100 mg of the material in 5 ml of 5 percent sodium hydroxide solution. Evaporate to dryness and gently fuse the residue over a small flame until it no longer evolves ammonia. After the residue has cooled, dissolved it in 20 ml of water, neutralize the solution with dilute hydrochloric acid and filter. The addition of a drop of ferric chloride solution (9 g of ferric chloride in100 ml water) to the filtrate shall produce a violet colour.	
	(c) Mix 20 mg of the material with 40 mg of the resorcinol, add 10 drops of conc. Sulphuric acid and heat he mixture in a liquid bath at 200°C for 3 minutes. After cooling add 10 ml of water and an excess of sodium hydroxide solution (4.3 g in 100 ml water). A fluorescent green liquid shall be produced.	
	(d) The residue obtained by igniting a 2 g of sample shall give positive test for sodium.	
	(e) *Test for sodium:* A solution of sodium compound, previously converted to chloride or nitrate, when mixed with 5 times its volume of cobalt uranyl acetate, a golden yellow precipitate is formed on shaking. Sodium compounds impart an intensely yellow colour to non-luminous flame.	
	(f) To 10 ml of a 10 % solution, add 1 ml of hydrochloric acid, wash the crystalline precipitate of saccharin formed with cold water and dry at 105°C for 2 h. The residue shall melt between 226°C and 230°C.	
3.	Purity (as $C_7H_4NNaO_3S$) after drying at 120°C for 4h, % by mass	99-101
4.	Loss on drying, % by mass	1.5 Max.
5.	Acidity and alkalinity	To pass the test
6.	Benzoic and salicylic acids	To pass the test
7.	Readily carbinizable substances	To pass the test
8.	Toluene sulphonamides, mg/kg	25 Max.
9.	Heavy metals (as Pb), mg/kg	10 Max.

10.	Arsenic (as As), mg/kg	2 Max.
11.	Selenium (as Se), mg/kg	30 Max.

Specification for Sorbitol powder (Food Grade) as per IS:4750-1996

S. No.	Characteristic	Requirement
1.	*Description:* Sorbitol is a white hygroscopic powder having a sweet taste. Its solution in water is clear, colourless, odourless, syrupy liquid having a pleasant sweet taste. Sorbitol is very soluble in water and slightly soluble in ethanol.	
2.	*Identification:* Dissolve about 5 g of the material in 6 ml of water, add 7 ml of methanol, 1 ml of benzaldehyde, and 1 ml of hydrochloric acid, and shake in a mechanical shaker until crystals appear. Filter with aid of suction, dissolve the crystals in 20 ml of boiling water containing 1 g of sodium carbonate, filter while hot, cool the filtrate, filter with suction, wash with 5 ml of methanol-water mixture (1 in 2), dry in air. The Sorbitol monobenzylidene so obtained shall melt between 173°C and 177°C.	
3.	Purity (as D-sorbitol, $C_6H_{14}O_6$), % by mass (on dry basis)	91 Min.
4.	Moisture, % by mass	1.0 Max.
5.	Melting range, °C	92.5-93.5
	(a) Metastable	92.5-93.5
	(b) Stable	96.0-97.5
6.	Reducing sugars, % by mass	0.2 Max.
7.	Sulphated ash, % by mass	0.1 Max.
8.	Sulphates (as SO_4), % by mass	0.01 Max.
9.	Chlorides (as Cl), % by mass	0.005 Max.
10.	Total sugar (as dextrose), % by mass	1 Max.
11.	Heavy metals (as Pb), mg/kg	10 Max.
12.	Arsenic (as As), mg/kg	3 Max.
13.	Nickel (as Ni), mg/kg	2 Max.
14.	Lead (as Pb), mg/kg	1 Max.

Check Your Progress – 2

1. What are acidulants?

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2. Name two organic and 2 inorganic acidulants.

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3. What is the maximum permissible limit for heavy metals in food grade critic acid?

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4. Differentiate between bulk and intense sweetners.

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5. What is the maximum limit for moisture in food grade lactose?

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6. What is dextrose equivalent? What is the dextrose equivalent for low conversion (LC) and high conversion (HC) liquid glucose?

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7. What is the maximum limit for reducing sugar in refined sugar?

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8. What should be the minimum sucrose in gur Jaggery?

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9. What is the maximum limit for HMF in honey?

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14.6 ANTIOXIDANTS

Antioxidants are added to oils and fats to delay the onset of oxidative rancidity, which is the major cause of spoilage. Natural constituents of foods such as tocopherols, ascorbates, phenolic compounds, also have antioxidant properties. Chelating agents such as citric acid may also contribute to antioxidant properties since they inhibit the catalytic effects of traces of copper and iron, which may be present in foods. The use of artificial antioxidants like BHA, BHT, TBHQ and gallates are permitted in certain dairy products.

Specification for *Tert*-Butylhydroquinone Food grade as per IS:11913-1986

S. No.	Characteristic	Requirement
1.	*Description: Tert*-butylhydroquinone shall be a white crystalline solid having a characteristic odour. It shall be soluble in alcohol and ether but practically insoluble in water.	
2.	*Identification:* Dissolve a few mg of the product in 1 ml of methanol and add a few drops of 25 % solution of dimethyl amine in water. A pink to red colour shall be produced.	
3.	Melting range, °C	126.5-128.5
4.	Purity (as $C_{10}H_{14}O_3$), % by mass	99.0 Min.
5.	t-Butyl-p-benzoquinone, % by mass	0.2 Max.
6.	2,5-Di-t-butylhydroquinone, % by mass	0.2 Max.
7.	Hydroquinone, % by mass	0.1 Max.
8.	Arsenic (as As), mg/kg	3 Max.
9.	Heavy metals (as Pb), mg/kg	10 Max.
10.	Toluene, mg/kg	25 Max.
11.	UV absorbance (polynuclear hydrocarbons)	To pass the test

Specification for Butylated hydroxyanisole (Food grade) as per IS:5343-1996

S. No.	Characteristic	Requirement
1.	*Description:* BHA is a mixture of 3- and 2- isomer. It is white or slightly yellow waxy crystalline solid with an aromatic odour. The material is insoluble in water, freely soluble in ethanol and propylene glycol.	

2.	*Identification*	
	(a) When 2 ml of 2 % aqueous borax solution and a few small crystals of 2,6-dichloro quinone chlorimide are added to an ethanolic solution (1% m/v) of butylated hydroxyanisole, a blue colour shall appear.	
	(b) When 2 ml of ferric chloride (0.2 % $FeCl_3.6H_20$ in absolute ethanol and 2 ml of 0.2 % 2,2' bipyridine in absolute ethanol are added to 5 ml of 0.5 % butylated hydroxyanisole in 50 % ethanol, a red colour shall appear.	
3.	Melting point, °C	48-63
4.	(a) Purity (as $C_{11}H_{16}O_2$), % by mass	98.5 Min.
	(b) 3-t-butyl 4-hydroxyanisole, % by mass	85 Min.
5.	Sulphated ash, % by mass	0.06 Max.
6.	Phenolic impurities, % by mass	0.5 Max.
7.	Arsenic (as As), mg/kg	3 Max.
8.	Heavy metals (as Pb), mg/kg	10 Max.
9.	Specific absorbance $E_{1\%}$ (1 cm cell) in ethanol at	
	(a) 290 nm	190-210
	(b) 228 nm	326-345

14.7 CHEMICAL PRESERVATIVES

Chemical preservatives are those food additives, which are specifically added to prevent the deterioration or decomposition of a food. These deteriorations may be caused by microorganisms, by food enzymes, or by purely chemical reactions. Preservatives may be used as antioxidants to hinder the oxidation of unsaturated fats, as neutralizers of acidity, as stabilizers to prevent physical changes, as firming agents, and as coatings or wrappers to keep out microorganisms, prevent loss of water, or hinder undesirable microbial, enzymatic, and chemical reactions. The federal Food, Drug and Cosmetic Act defines a chemical preservatives as any chemical which, when added to food, tends to prevent or retard deterioration thereof; but does not include common salt, sugars, vinegars, spices, or oils extracted from spices or substances added by smoke.

Specification for Sorbic acid (Food grade) as per IS:4818-1996

S. No.	Characteristic	Requirement
1.	*Description:* It is slightly soluble in water and soluble in ethanol.	
2.	*Identification*	
	Melting range: The melting range of the material shall be 132°C to 135°C.	
	When to 1 ml of saturated solution of bromine in water, 0.02 g of the material is added and shaken well, the colour shall disappear.	
3.	Purity (as $C_6H_8O_2$), % by mass	99.0 Min.
4.	Moisture, % by mass	0.5 Max.

5.	Sulphated ash, % by mass	0.2 Max.
6.	Aldehydes, % by mass	0.1 Max.
7.	Stability	To conform to test
8.	Arsenic (as As), mg/kg	3.0 Max.
9.	Heavy metals (as Pb), mg/kg	10 Max.

Specification for Sodium benzoate (Food grade) as per IS:4447-1994

S. No.	Characteristic	Requirement
1.	*Description:* Sodium benzoate is a white, almost odourless, crystalline powder or flakes. It is freely soluble in water and sparingly soluble in 95% ethanol.	
2.	*Identification* *Reaction with ferric chloride:* When ferric chloride solution is added to a 10 % solution of sodium benzoate in water, a buff precipitate shall be formed. *Reaction with uranyl zinc acetate:* The material shall give a yellow crystalline precipitate with uranyl zinc acetate. *Flame test:* The material shall give a distinct golden-yellow flame. *Melting range of precipitate with hydrochloric acid:* The melting range of precipitate obtained with hydrochloric acid shall be between 121.5°C to 123.5°C.	
3.	Purity (as $C_7H_5O_2N$), % by mass	99.0 Min.
4.	Moisture, % by mass	1.5 Max.
5.	Acidity or alkalinity	To conform to test
6.	Readily carbinizable substances	To conform to test
7.	Readily oxidizable substances	To conform to test
8.	Chlorinated organic compounds	To conform to test
9.	Arsenic (as As), mg/kg	3.0 Max.
10.	Heavy metals (as Pb), mg/kg	10 Max.

Specification for Sodium benzoate (Food grade) as per IS:4447-1994

S. No.	Characteristic	Requirement
1.	*Description:* Sodium benzoate is a white, almost odourless, crystalline powder or flakes. It is freely soluble in water and sparingly soluble in 95% ethanol.	
2.	*Identification* *Reaction with ferric chloride:* When ferric chloride solution is added to a 10 % solution of sodium benzoate in water, a buff precipitate shall be formed. *Reaction with uranyl zinc acetate:* The material shall give a yellow crystalline precipitate with uranyl zinc acetate.	

	Flame test: The material shall give a distinct golden-yellow flame. *Melting range of precipitate with hydrochloric acid:* The melting range of precipitate obtained with hydrochloric acid shall be between 121.5°C to 123.5°C.	
3.	Purity (as $C_7H_5O_2N$), % by mass	99.0 Min.
4.	Moisture, % by mass	1.5 Max.
5.	Acidity or alkalinity	To conform to test
6.	Readily carbinizable substances	To conform to test
7.	Readily oxidizable substances	To conform to test
8.	Chlorinated organic compounds	To conform to test
9.	Arsenic (as As), mg/kg	3.0 Max.
10.	Heavy metals (as Pb), mg/kg	10 Max.

Specification for Sodium propionate (Food grade) as per IS:6030-1997

S. No.	Characteristic	Requirement
1.	*Description:* Sodium propionate shall be colourless and in the form of transparent crystals or a granular crystalline powder. It shall be odourless or has a faint acetic butyric odour. It shall be deliquescent in moist air and freely soluble in water and soluble in ethanol.	
2.	*Identification* Five percent solution of material gives positive test for sodium. A solution of sodium propionate acidified with dilute acetic acid, filtered, if necessary, and treated with uranyl zinc acetate, shall yield a yellow crystalline precipitate, indicating the presence of sodium. Upon ignition, the material shall yield an alkaline residue, which effervesces with acids. Warm a small sample with sulphuric acid. Propionic acid evolved shall be recognized by its odour. The pH of 10 % m/v solution of the material at 25±2°C shall be between 7.5 and 10.	
3.	Purity (as $C_3H_5O_2Na$), % by mass (on dry basis)	99.0 Min.
4.	Moisture, % by mass	1 Max.
5.	Matter insoluble in water, % by mass	0.1 Max.
6.	Arsenic (as As), mg/kg	3.0 Max.
7.	Heavy metals (as Pb), mg/kg	10 Max.
8.	Iron (as Fe), mg/kg	30 Max.
9.	Lead (as Pb), mg/kg	5 Max.
10.	Fluoride (as F), mg/kg	10 Max.

Specification for Calcium propionate (Food grade) as per IS:6031-1997

S. No.	Characteristic	Requirement
1.	*Description:* It shall be in the form of white crystals or crystalline solid or possessing a faint odour of propionic acid. The material shall be freely soluble in water.	
2.	*Identification* Five percent solution of material gives positive test for calcium. He presence of calcium may be demonstrated by reacting a solution of calcium propionate with ammonium oxalate solution. The white precipitate formed is soluble in hydrochloric acid, but insoluble in acetic acid. Upon ignition at a relatively low temperature, it yields an alkaline residue which effervesces with acids. Warm a small sample with sulphuric acid. Propionic acid evolved shall be recognized by its odour. The pH of 10 % m/v solution of the material at 25±2°C shall be between 7 and 9.	
3.	Purity (as $C_6H_{10}O_4Ca$), % by mass (on dry basis)	98.0 Min.
4.	Moisture, % by mass	5.0 Max.
5.	Matter insoluble in water, % by mass	0.3 Max.
6.	Arsenic (as As), mg/kg	3.0 Max.
7.	Heavy metals (as Pb), mg/kg	10 Max.
8.	Iron (as Fe), mg/kg	30 Max.
9.	Lead (as Pb), mg/kg	5 Max.
10.	Fluoride (as F), mg/kg	10 Max.
11.	Magnesium (as MgO), % by mass	0.4 Max. (To pass the test)

Specification for Sodium metabisulphite (Food grade) as per IS:4752-1994

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be colourless crystals or white to yellowish crystalline powder having an odour of sulphur dioxide. The material is soluble in water but insoluble in ethanol.	
2.	*Identification* Aqueous solution of the material shall be acidic to a solution of phenol red. Aqueous solution of the material shall decolourize a solution of iodine give positive. Ten percent solution of the material shall give positive test for sodium. *Test for sodium:* When uranyl zinc acetate is added to the solution yellow crystalline precipitate shall be formed with several minutes' agitation. *Test for sulphite:* When dilute sulphuric acid is added to the solution, sulphur dioxide shall be produced which may be recognized by its characteristic odour, or by blackening of filter paper moistened with	

mercurous nitrate or by the development of a blue colour on filter paper treated with potassium iodate and starch.

3. *Water insolubles:* Twenty grams of the material when dissolved in 200 ml of water shall give a clear with only a trace of suspended matter.

4. Purity

(a) as $Na_2S_2O_3$, % by mass 95 Min.

(b) as SO_2, % by mass 64 Min.

5.	Moisture, % by mass	1 Max.
6.	Matter insoluble in water, % by mass	0.05 Max.
7.	Thiosulphate, % by mass	0.1 Max.
8.	Arsenic (as As), mg/kg	3.0 Max.
9.	Heavy metals (as Pb), mg/kg	10 Max.
10.	Iron (as Fe), mg/kg	5 Max.
11.	Selenium (as Se), mg/kg	5 Max.
12.	Lead (as Pb), mg/kg	2 Max.
13.	pH	Acidic to litmus

Specification for Potassium nitrate (Food grade) as per IS:4753-1996

S. No.	Characteristic	Requirement

1. *Description:* Potassium nitrate shall be colourless, transparent prisms, or white granules or a crystalline powder. It shall be odourless and shall have a salty taste. It shall produce a cooling sensation in the mouth. It shall be slightly hygroscopic in moist air. The material is soluble in water and slightly soluble in ethanol and glycerol.

2. *Identification*

Aqueous solution of the material shall be neutral to litmus.

Ten percent solution of the material shall give positive test for potassium.

Test for potassium: When to a neutral 10 % solution of the material sodium bitartrate is added, a white precipitate shall be formed. This precipitate shall be soluble in ammonia and in solutions of alkali hydroxide or carbonates.

Test for nitrate: When the solution is mixed with a n equal volume of sulphuric acid, the mixture cooled, and a solution of ferrous sulphate superimposed, a brown colour shall be produced at the junction of the two liquids.

When the solution is heated with sulphuric acid and metallic copper, brownish red fumes shall be evolved.

The solution shall not decolourize acidified potassium permanganate solution (distinction from nitrites).

3. Purity as KNO_3, % by mass 99 Min.

4.	Moisture, % by mass	1 Max.
5.	Matter insoluble in water, % by mass	To pass the test
6.	Chlorate	To pass the test
7.	Arsenic (as As), mg/kg	3.0 Max.
8.	Sulphates (as K_2SO_4), % by mass	0.1 Max.
9.	Heavy metals (as Pb), mg/kg	20 Max.
10.	Nitrite, mg/kg	1000 Max.

14.8 EMULSIFIERS AND STABILIZERS

Most dairy products are not permitted to contain any emulsifier or stabilizer.

Specification for Sodium alginate (Food Grade) as per IS:5191-1993

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be white, yellowish or pale brown, fibrous or granular powder. It shall be almost odourless and tasteless.	
2.	*Identification*	

(a) *Solubility:* Slowly soluble forming a viscous solution in water; insoluble in ethanol, ether and chloroform.

(b) To a 0.5 % solution of the sample in sodium hydroxide add 1/2 of its volume of a saturated solution of ammonium sulphate. No precipitate is formed. This test distinguishes sodium alginate from agar, carboxymethyl cellulose, carrageenan, de-esterified pectin, gelatin, locust bean gum, methylcellulose and starch.

(c) To a 0.5 % solution of the sample in sodium hydroxide add 1/5 of its volume of a 2.5 % aqueous solution of calcium chloride. A voluminous, gelatinous precipitate is formed. This test distinguishes sodium alginate from Arabic gum, carboxymethyl cellulose, carboxymethyl starch, carrageenan, gelatin, ghatti gum, karaya gum, locust bean gum, methylcellulose, pectin and tragacanth.

(d) *Test for alginic acid:* Take a quantity of material equivalent to 5 mg of alginic acid in a test tube. Add 5 ml of water, 1 ml of a freshly prepared 1 in 100 solution of naphthoresrcinol in ethanol and 5 ml of concentrated hydrochloric acid. Heat the mixture to boiling. Boil gently for about 3 min and then cool to about 15°C. Transfer the contents of the test tube to a 30 ml separator with the aid of 5 ml of water and extract with 15 ml of isopropyl ether. Perform the blank using the same quantities of the same reagents by the same procedure omitting the sample. The isopropyl ether extract from the material shall exhibit a deeper purplish hue than that from the blank.

(e) Moisten 1-5 mg of the sample with water; add 1 ml of acid ferric sulphate solution. Within 5 min a cherry red colour develops that finally becomes deep purple.

(f) Dissolve the sulphated ash of the sample in dilute acetic acid solution and filter. Add to the filtrate uranyl zinc acetate solution. A yellow crystalline precipitate is formed within a few minutes.

3.	Purity (as $C_6H_7O_6Na$), % by mass	91-106
4.	Moisture, % by mass	15 Max.
5.	Matter insoluble in water, % by mass	1.0 Max.
6.	Viscosity of 1% solution (m/m), in centipoises	30 Min.
7.	Ash, % by mass (on dry basis)	18-27
8.	Acid insoluble ash, % by mass (on dry basis)	0.5 Max.
9.	Heavy metals (as Pb), mg/kg	40 Max.
10.	Arsenic (as As), mg/kg	3 Max.
11.	Lead (as Pb), mg/kg	10 max.
12.	*E. coli* in 1 g	Absent
13.	*Salmonella* in 10 g	Absent

Specification for Sodium carboxymethyl cellulose (Food Grade) as per IS:5306-1996

S. No.	Characteristic	Requirement
1.	*Description:* Sodium carboxymethyl cellulose is a white or slightly yellowish powder consisting of very fine particles, fine granules or fine fibres. It is almost odourless and tasteless. The powder is hygroscopic. It readily disperses in water to form colloidal solutions. It is insoluble in most of the solvents including ethanol and ether.	
2.	*Identification* Add about 1 g of powder sample to 100 ml of warm water at a temperature of about 60-70°C while stirring to produce uniform dispersion. Continue the stirring until a colloidal solution is produced. Cool the solution to room temperature. The solution may be identified by the following tests: (a) To a part of the solution add 1 volume of uranyl zinc acetate solution and shake. A yellow precipitate shall form within a few minutes. (b) Boil a part of the solution for 5 min; the solution shall remain limpid. This test distinguishes sodium carboxymethyl cellulose from methyl cellulose. (c) Dilute 1 ml of the solution with water to 100 ml. To 1 ml of the dilution add 2 ml of naphthalenediol solution and place in a boiling water bath for 20 min. A deep red colour shall develop. (d) Add iodine solution to a part of the solution; no blue colour shall appear. This test distinguishes sodium carboxymethyl cellulose from carboxymethyl starch. (e) Add a solution of copper sulphate to the sample; a blue precipitate shall form. This test distinguishes sodium carboxymethyl cellulose from gelatin, locust bean gum, methyl cellulose and tragacanth.	

(f) 0.1 percent solution of the sample is shaken vigorously. No layer of foam shall appear. This test permits the distinction of sodium carboxymethyl cellulose from other cellulose ethers and from alginates and natural gums.

3. *Viscosity*

The viscosity of 2 % fresh solution (m/m) in presence of a preservative shall be not less than 25 centipoises and the viscosity of 4 weeks old solution shall not show a drop in viscosity of more than 25 % when determined.

The apparent viscosity of a solution of sodium carboxymethyl cellulose 20°C containing 1 g of the material in 100 ml of water shall be not less than 60 percent and not more than 140 percent of that stated on the label for viscosity grades of 100 centipoises or less and not less than 70 percent and not more than 130 percent of that on the label for viscosity grades higher than 100 centipoises.

4. Purity (as sodium carboxymethyl cellulose), % by mass (on dry basis) 99.5 Min.

5.	Degree of substitution	0.2-1.5
	Loss on drying, % by mass	10 Max.
	Sodium chloride, % by mass (on dry basis)	0.5 Max.
	Free glycolate, % by mass (on dry basis)	0.4 Max.
	Combined sodium chloride and free glycolate, % by mass (on dry basis)	0.5 Max.
	pH of 1 % colloidal solution	6-8.5
	Heavy metals (as Pb), mg/kg	40 Max.
	Arsenic (as As), mg/kg	3 Max.
	Lead (as Pb), mg/kg	10 max.

Specification for Guar gum (Food Grade) as per IS:10502-1993

S. No.	Characteristic	Requirement
1.	*Description:* It shall be white to yellowish white powder with a characteristic guar odour.	
2.	*Identification*	
	(a) *Solubility:* Forms a solution in cold or hot water.	
	(b) A water solution of guar gum having a pH between 5.4 and 6.5, which may be converted to a gel by the addition of small amounts of sodium borate.	
	(c) Transfer 2 g of the sample into a 400 ml beaker, moisten it thoroughly with 4 ml of isopropanol, add with vigorous stirring 200 ml of water and continue the stirring until the gum is completely and uniformly dispersed. An opalescent, viscous solution is formed. Transfer 100 ml of the solution into another 400 ml beaker, heat the mixture in a boiling water bath for about 10 min and then cool to room temperature. There is no substantial increase in viscosity (differentiating guar gum from carob bean gum).	

(d) *Test for alginic acid:* Take a quantity of material equivalent to 5 mg of alginic acid in a test tube. Add 5 ml of water, 1 ml of a freshly prepared 1 in 100 solution of naphthoresrcinol in ethanol and 5 ml of concentrated hydrochloric acid. Heat the mixture to boiling. Boil gently for about 3 min and then cool to about 15°C. Transfer the contents of the test tube to a 30 ml separator with the aid of 5 ml of water and extract with 15 ml of isopropyl ether. Perform the blank using the same quantities of the same reagents by the same procedure omitting the sample. The isopropyl ether extract from the material shall exhibit a deeper purplish hue than that from the blank.

(e) Identify sugars for mannose and galactose.

(f) Place some ground guar gum in an aqueous solution containing 0.5 % iodine and 1 % potassium iodide on a glass slide for microscopic examination. Guar gum shows close groups of round to pear formed cells; their colours are yellow to brown. Locust bean gum contains long stretched tubiform cells, separate or slightly inter-spaced; their brown contents are much less regularly formed than in guar gum.

3.	Purity (as galactomannons), % by mass	77.5 Min.
4.	Loss on drying at 105°C for 5 h, % by mass	12.0 Max.
5.	Acid insoluble matter, % by mass	3.0 Max.
6.	Protein (N´5.7), % by mass	6.0 Max.
7.	Total ash, % by mass	1.5 Max.
8.	Starch	To pass the test
9.	Heavy metals (as Pb), mg/kg	20 Max.
10.	Arsenic (as As), mg/kg	3 Max.
11.	Lead (as Pb), mg/kg	10 Max.
12.	Mould and Yeast count/g	1000 Max.
13.	Coliform bacteria in 1 g	Absent
14.	*Salmonella* in 10 g	Absent

Specification for Gelatin (Food Grade) as per IS:5719-2005

S. No.	Characteristic	Requirement
1.	*Description:* Gelatin shall be in the form of sheets, flakes, shreds or coarse to fine powder, faint yellow or amber in colour, the shade varying in depth according to particle size. It shall have a slight bouillon like odour. It is stable in air when dry, but is susceptible to microbial decomposition when moist or in solution.	
2.	*Identification*	

(a) *Solubility:* Gelatin is practically insoluble in cold water but shall swell and soften when immersed in it, gradually absorbing from 5 to 10 times its own weight of water. It is soluble in hot water; mixture of hot water and glycerol forming a jelly on cooling; and in acetic acid (5N). Gelatin is practically insoluble in alcohol (95 %), in chloroform, solvent ether and fixed and volatile oils.

(b) *Precipitate formation*

(a) To a solution of gelatin (1 in 100) add trinitrophenol TS or a solution of potassium dichromate (1 in 15 previously mixed with about ¼ its volume of dilute hydrochloric acid, a yellow precipitate shall be formed.

(b) To a solution of gelatin (1 in 100) add mercuric nitrate solution; a white precipitate shall be formed which develops a brick red colour on warming.

(c) Development of turbidity

(a) To a solution (1 in 5000) add tannic acid TS; the solution becomes turbid.

(b) When heated with sodalime, ammonia is evolved.

3.	Loss on drying, % by mass	18 Max.
4.	Gel strength	To pass the test
5.	Total ash, % by mass	2 Max.
6.	Sulphur dioxide, mg/kg	40 Max.
7.	Nitrogen, % by mass (on dry basis)	15 Min.
8.	Heavy metals (as Pb), mg/kg	50 Max.
9.	Arsenic (as As), mg/kg	1 Max.
10.	Lead (as Pb), mg/kg	5 Max.
11.	Total Bacterial count, per g	10000 Max.
12.	*E. coli* per g	10 Max.
13.	Faecal streptococci / entercocci per g	100 Max.

Specification for Sodium citrate (Food Grade) as per IS:5058-1996

S. No.	Characteristic	Requirement
1.	*Description:* Sodium citrate shall be in the form of colourless crystals or white crystalline powder. It may be anhydrous or may contain two molecules of water of crystallization. One gram of the dihydrate dissolves in 1.5 ml of water at 25°C and in 0.6 ml of boiling water. It is insoluble in alcohol.	
2.	*Identification*	
	(a) A 5 percent solution of sodium citrate shall give positive test for sodium and positive test for citrate.	
	(b) *Test for sodium:* Convert the material to chloride or nitrate. When to this solution uranyl zinc acetate is added, a yellow crystalline precipitate shall be formed with several minutes' agitation.	
	(c) *Test for citrate:* To 5 ml of 5 % solution, add 1 ml of calcium chloride and 3 drops of bromothymol blue, slightly acidify with dilute hydrochloric acid, and add 1N sodium hydroxide until the colour changes to a clear blue, then boil for 3 min, agitating gently during the heating period. The precipitate shall appear in the liquid. The precipitate shall be insoluble in sodium hydroxide but soluble in dilute hydrochloric acid.	

3.	Purity (as $C_6H_5O_7Na$), % by mass (on dry basis)	99 Min.
4.	Moisture, % by mass	
	(a) Anhydrous	1 Max.
	(b) Dihydrate	13 Max.
5.	Alkalinity	To pass the test
6.	Heavy metals (as Pb), mg/kg	10 Max.
7.	Arsenic (as As), mg/kg	3 Max.
8.	Oxalates (as $C_2H_2O_4$)	To pass the test
9.	Readily carbinizable substance	To pass the test

Specification for Dicalcium phosphate (Food Grade) as per IS:9970-1981

S. No.	Characteristic	Requirement
1.	*Description:* It shall be white crystals or granules, granular powder or powder.	
2.	*Identification*	
	(a) *Test for calcium:* Dissolve about 0.1 g of the sample by warming with a mixture of 3 ml of dilute hydrochloric acid and 5 ml of water. Add 3.5 ml of ammonia solution drop wise with shaking and then add 5 ml of ammonium oxalate solution. A white precipitate shall form.	
	(b) *Test for phosphate:* To 10 ml of warm solution (1 in 100) of the sample containing a slight excess of nitric acid, add 10 ml of ammonium molybdate solution. A yellow precipitate shall form.	
	(c) *Test for orthophosphate:* Wet the sample with silver nitrate solution. A yellow colour shall be produced.	
3.	*Solubility:* The material shall be sparingly soluble in water and insoluble in ethanol.	
4.	Purity (as Ca_2HPO_4), after drying at 200°C for 3 h, % by mass	98.0-102.0
5.	Loss on drying, % by mass	
	(a) Anhydrous	2 Max.
	(b) Dihydrate	18-22
6.	Fluoride (as F), mg/kg	50 Max.
7.	Lead (as Pb), mg/kg	10 Max.
8.	Arsenic (as As), mg/kg	3 Max.
9.	Heavy metals (as Pb), mg/kg	30 Max.

Specification for Glyceryl monostearate (Food Grade) as per IS:9953-1981

S. No.	Characteristic	Requirement
1.	*Description:* It shall be white to creamish white in colour, in the wax like solid form, powder or granules. It shall have slight characteristic fatty odour and taste and shall be free from rancidity.	

2.	Acid value	6.0 Max.
3.	Monostearate, % by mass	40 Min.
4.	Free glycerol, % by mass	10 Max.
5.	Melting point, °C	54-60
6.	Iodine value	5.0 Max.
7.	Residue on ignition, % by mass	
	(a) Selfemulsifying	1 Max.
	(b) Non-emulsifying	0.1 Max.
8.	Moisture, % by mass	2.0 Max.
9.	Saponification value	140-155
10.	Iron (as Fe), mg/kg	20 Max.
11.	Arsenic (as As), mg/kg	3 Max.
12.	Lead (as Pb), mg/kg	10 max.

Specification for Polyglycerol esters of fatty acids (Food Grade) as per IS:13658-1993

S. No. Characteristic **Requirement**

1. *Description:* Polyglycerol esters of fatty acids are yellowish to amber unctuous liquids, semi-solids or waxy solids.

2. *Identification*

   (a) *Solubility*

   The esters range from very hydrophilic to very lipophilic but as a class tend to be dispersible in water and soluble in organic solvent and oils.

   (b) The product shall give a positive test for fatty acids.

   (c) Spot 5-20 ml of the aqueous layer along side control spots of glycerol on paper such as Whatman No. 3 and develop using descending chromatography for 36 h with isopropanol : water 90:1 (v/v). The glycerol spot moves 40 cm and the polyglycerols are revealed in succession below that for glycerol when the paper is sprayed with either permanganate in acetone or ammoniacal silver nitrate.

3. Purity

   Acids: Acids other than fatty acids shall not be detectable.

   Polyglycerols: The polyglycerol moiety shall be composed of not less than 75 % of di-, tri- and tetra-glycerols and shall contain not more than 10 % of polyglycerols equal to or higher than heptaglycerol.

4.	Total fatty acid ester, % by mass	90 Min.
5.	Free fatty acids (as oleic acid), % by mass	6 Max.
	Total glycerol and polyglycerol, % by mass	18-60

	Free glycerol and polyglycerol, % by mass	7 Max.
	Sulphated ash, % by mass	0.5 Max.
6.	Heavy metals (as Pb), mg/kg	10 Max.
7.	Arsenic (as As), mg/kg	3 Max.
8.	Lead (as Pb), mg/kg	10 Max.
	Copper (as Cu) and Zinc (as Zn), mg/kg	50 Max.
9.	Zinc (as Zn), mg/kg	25 Max.

14.9 OTHERS (SALT SILVER LEAF LECITHIN)

The important additives such as salt (as preservative), silver leaf (as sweet coating agent) and lecithin (as flowing agent) are included in this section. BIS specifications are not available for extensively used additives (processing aids) like starter culture, rennet enzyme, etc. in dairy industry.

Specification for Silver leaf as per IS:3110-1982

S. No.	Characteristic	Requirement
1.	Silver leaf shall be in the form of sheet free from creases and folds.	
2.	*Weight:* Silver leaves shall be supplied in weight as given: Weight of one pack of 100 silver leaves (10 books each of 10 leaves) =10±0.5 g	
3.	*Size:* Unless otherwise specified, the silver leaf may be supplied in approximately 170´145 mm size.	
4.	Purity as Ag, g/1000 g	999 Min.
4.	Lead (as Pb), mg/kg	2.5 Max.
5.	Arsenic (as As), mg/kg	1.1 Max.
6.	Cadmium (as Cd), mg/kg	0.8 Max.
7.	Mercury (as Hg), mg/kg	0.01 Max.

Specification for Edible common salt (Dairy salt) as per IS:253-1985

S. No.	Characteristic	Requirement
1.	*Description:* The material shall be crystalline white solid and free from any visible impurities.	
2.	*Particle size:* 99 percent by mass of the material shall pass completely through 850 micron IS sieve.	
3.	Moisture, % by mass	0.5 Max.
4.	Water insoluble matter, % by mass	0.03 Max.
5.	Chloride (as NaCl), % by mass	99.6 Min.
6.	Water soluble calcium (as Ca), % by mass	0.01 Max.
7.	Water soluble magnesium (as Mg), % by mass	0.01 Max.

8.	Sulphates (as SO_4), % by mass	0.3 Max.
9.	Alkalinity (as Na_2CO_3), % by mass	0.1 Max.
10.	Potassium/Sodium ferrocyanide or Ammonium ferric citrate, mg/kg	15.0 Max.
11.	Lead (as Pb), mg/kg	2.0 Max.
12.	Iron (as Fe), mg/kg	10.0 Max.
13.	Arsenic (as As), mg/kg	1.0 Max.
14.	Copper (as Cu), mg/kg	2.0 Max.

Specification for Lecithin (Food grade) as per IS:5055-1996

S. No.	Characteristic	Requirement
1.	*Description:* The material is a viscous semi-liquid with a characteristic odour. It is light yellow to brown depending upon whether it is bleached or unbleached. Lecithin is obtained from egg or edible vegetable oilseeds by suitable dehydration or solvent extraction using food grade solvents. It may also be obtained from animal sources. Edible diluents, such as cocoa butter and vegetable oils may be added to improve functional and flavour characteristics.	
2.	The material is insoluble in water but characteristically hydrated with swelling. It is insoluble in acetone but soluble in chloroform and benzene. The lecithin fraction is soluble while cephalin fraction is insoluble in ethanol.	
3.	*Identification* *Yellow precipitate with Ammonium molybdate:* Ignite 1 g of the material with 2 g of anhydrous sodium carbonate. Cool and dissolve the residue in 5 ml of water and 5 ml of nitric acid. Add 5 ml of ammonium molybdate and heat to boiling. A yellow precipitate shall be formed. *Blue precipitate with ferrous sulphate:* Fuse about 0.5 g of the material with about o.o5 g of sodium in a soft glass tube, and heat to redness. Plunge while hot into about 10 ml of distilled water, heat to boiling and filter. Add a few crystals of ferrous sulphate to the filtrate boil and add dilute sulphuric acid until just acidic. Allow to stand for 15 min, filter and wash. A blue precipitate shall be formed. Reflux 1 g of lecithin for 1 h with 25 ml of 0.5N ethanolic potassium hydroxide. When cooled to 0°C, a precipitate of potassium soap shall be obtained.	
4.	Total gossypol, % by mass*	5.0 Max.
5.	Purity (as acetone insoluble residue), % by mass	62 Min.
6.	Moisture, % by mass	2 Max.
7.	Benzene insoluble matter, % by mass	0.3 Max.
8.	Acid value	35 Max.
9.	Peroxide value	100 Max.
10.	Lead (as Pb), mg/kg	10 Max.

11.	Arsenic (as As), mg/kg	3 Max.
12.	Heavy metals (as Pb), mg/kg	40 Max.

* In case of cottonseed lecithin

Check Your Progress – 3

1. Name any two natural antioxidants present in food.

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2. Name the antioxidant which is permitted in whole milk powder? What is the maximum linut of this antioxidant which can be used in whole milk powder?

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3. Name any two chemical antioxidant which are permitted in food products.

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4. What is the purpose of adding surbic acid and sodium benzoate in food?

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5. Is CMC an emulsifier stabilizer or both?

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6. Name the cheapest and very effective stabilizer produced in India.

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7. Name the stabilizer which is obtained from animal source.

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14.10 LET US SUM UP

With the increase in m ilk production and production of a wide range of value added dairy products necessitated the use of large number of substances, generally in small amount, to improve the appearance, flavour, texture or self life of the products. The use of these additives in food products is controlled by regulations made under the prevention of food adulteration Act-1954. Further, as imperaritise in these additives have been found to be harmful it is necessary to have a strict quality control for these additives. Therefore, Bureau of Indian Standards (BIS) has formulated standards for the identification of these products and to detect imparity at the manufacturing stage. Food additive can be defined as substance not commonly regarded or used as food, whichis added to or used in or an, food at any stage to affect its quality or to serve any other technological function in relation to food and include processing aids in so far as they are added to or used in or on, food as aforesaid but does not include vitamins, minerals, herbs or spices, salt, yeast-or yeast extract, proteins or their hydrolysate, starter cultures, malt or its extract and water. These additives can be categorized intocolouring matter, preservatives, antioxidants, emulsifiers, stabilizers, acidulates, anticacking agents, sweetner and enzymers.

14.11 KEY WORDS

Ingredient : Component or nutrients of Food

Processing Aid : The substance which is used to facilitate the processing of food

Protein Hydrolysate : Product of protein hydrolysic

Preservative : substance that prevent the spoilage of food

Emulsifier : Substance which stabilige the outer water emulsion

Stabilizer : Substance which prevent coagulation or separate of a product

Antioxident : Substance which precent the development of rancidity in food

Acidulants : Substance used to make a food acidic

Anticaking Agent	:	Substance which prevent the caking
Flowing Agent	:	Substance which make the powder to few freely.
Sweetner	:	Substance which is sweeeting the food (cane sugar)
Annato colour	:	A natural colour obtained for Bix a ovellana is plant
Salfron	:	Kesar
Sunset yellow	:	Yellow colour
Caramel	:	Black coloured cherred
Amaranth	:	Shared brown coloured product obtained by heating of sugar
Dextrose	:	Grape sugar
TBHQ	:	Test bictye hydroquinone
BHA	:	Butylated Hydroxy Anisole
BHT	:	Butylated Hydroxy Touline
Lecthin	:	Fraction of phospholipid which act as an emulsifier
CMC	:	Carbohymethyle culture which is used as stabilizer and emulsifier

14.12 SOME USEFUL BOOKS

BIS (2006) Food Additives. Bureau of Indian Standards, Manak Bhavan, New Delhi

PFA Act (2006), Ministry of Health, Government of India, New Delhi

General Standard for Food Additives, Codex Alimentarius Commission, CAC/ STAN 192-1995, Rev. 6 (2005).

Person's Composition and Analysis of Foods (edited by R.S. Kirk and R. Sawyer) 8th Edn., Addison Churchill Livingstone New York 1981.

14.13 ANSWER TO CHECK YOUR PROGRESS

Your answers should include the following points

Check Your Progress – 1

1. Ingredients, Processing and Hygience.

2. Substance not commonly regarded or used as food but used in food.

3. To increase self-life or prevent deterioration of food.
4. Substances which prevent rancidity or oxidation of food.
5. Substances which prevent coagulation and provide stability to food are known as stabilizers while substance which stabilize emulsion are known as emulsifiers.
6. To impart colour.
7. 95%.
8. 5 and 20 ppm.
9. Vegetable oil.
10. 4, 0.1%.
11. Tartrazine carmoisine sunset yellow etc.

Check your Progress - 2

1. Acidulents are acidifying agents which cause an increase in acidity of food.
2. Citric acid, lactic Acid and phosphoric acid and hydrochloric acid.
3. 10 mg/kg or 10pb
4. With less sweetening effect like sucrose are known as bulk sweetner while having many time sweetening effect composed to sucrose are termed as intense sweetener like saccharine.
5. 5.5% (Monohydrate) and 1.0% (Anhydrous).
6. Dextrose equivalent is the amount of (invert-sugar present in liquid glucose which has been produced due to hydrolysis of starch DE for low conversion liquid glucose is 28.37 while for HC it is 58.67.
7. 0.04%
8. 80%
9. 80mg/kg

Check Your Progress - 3

1. To copherol (Vitamin E) and Ascorbic Acid (Vitamin C)
2. BHA 0.0%
3. BHA & BHT
4. Preservation of Food
5. Both
6. Guar gum
7. Gelatin