The Amendment of Standards for Specification, Scope, Application and Limitation of Food Additives

MOHW Food No.1091302006, 29 09, 2020

Appendix 2: Standards for Specification of Food Additives

03. Antioxidants

07. Food quality improvement, fermentation and food processing agents

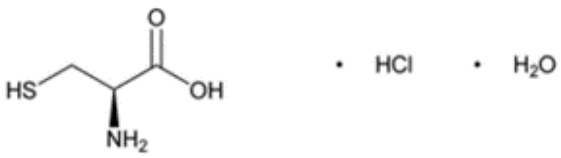
10. Flavoring Agents

§ 03012

§ 07047

§ 10090

L-Cysteine Monohydrochloride

Chemical names	L-2-Amino-3-mercaptopropanoic Acid Monohydrochloride
C.A.S. number	Monohydrate: 7048-04-6 Anhydrous: 52-89-1
Chemical formula	Monohydrate: $C_3H_7NO_2S \cdot HCl \cdot H_2O$ Anhydrous: $C_3H_7NO_2S \cdot HCl$
Structural formula	
Formula weight	Monohydrate: 175.63 Anhydrous: 157.62
Assay	98.0% - 101.5% $C_3H_7NO_2S \cdot HCl$, on the dried basis
Description	White, crystalline powder. It is freely soluble in water and in alcohol. The anhydrous form melts with decomposition at about 175℃.
Identification	The spectrum of the sample exhibits maxima at the same wavelengths as those in the spectrum of the Reference standard.
Lead	Not more than 5 mg/kg

Loss on drying	8.0%~12.0% Room temperature for 24 h in a vacuum desiccator using a suitable desiccant and maintaining a pressure of not more than 5 mmHg
Specific rotation	$[\alpha]_D^{20}$=+5.0° ~ +8.0°, calculated on the dried basis $[\alpha]_D^{25}$=+4.9° ~ +7.9°, calculated on the dried basis
Residue on ignition	Not more than 0.1%
Category	Food additives category (03) (07) (10)
Functional uses	Antioxidants; Food quality improvement, fermentation and food processing agents; Flavoring Agents.

07. Food quality improvement, fermentation and food processing agents

08. Nutritional additives

§ 07022

§ 08064

Magnesium Sulfate

Synonyms	Epsom salt (heptahydrate)；INS No. 518
Definition	Magnesium sulfate occurs naturally in sea water, mineral springs and in minerals such as kieserite and epsomite. It is recovered from them or by reacting sulfuric acid and magnesium oxide. It is produced with one or seven molecules of water of hydration or in a dried form containing the equivalent of between 2 and 3 waters of hydration.
Chemical names	Magnesium sulfate
C.A.S. number	Monohydrate: 14168-73-1 Heptahydrate: 10034-99-8 Dried: 15244-36-7
Chemical formula	Monohydrate: $MgSO_4 \cdot H_2O$

	Heptahydrate: $MgSO_4 \cdot 7H_2O$ Dried: $MgSO_4 \cdot xH_2O$, where x is the average hydration value (between 2 and 3)
Formula weight	Monohydrate: 138.38 Heptahydrate: 246.47
Assay	Not less than 99.0 % and not more than 100.5% on the ignited basis
Description	Colourless crystals, granular crystalline powder or white powder. Crystals effloresce in warm, dry air.
Characteristics	
Identification	
Solubility	Freely soluble in water, very soluble in boiling water, and sparingly soluble in ethanol.
Test for magnesium	Passes test
Test for sulfate	Passes test
Purity	
Loss on ignition	Monohydrate: between 13.0 and 16.0 %, Heptahydrate: between 40.0 and 52.0 %, Dried: between 22.0 and 32.0 % (105℃, 2 h, then 400℃ to constant weight)
pH	Between 5.5 and 7.5 (1 in 20 solution)
Chloride	Not more than 0.03%
Arsenic	Not more than 3 mg/kg
Iron	Not more than 20 mg/kg
Selenium	Not more than 30 mg/kg
Lead	Not more than 2 mg/kg
Category	Food additives category (07) (08)
Functional uses	Food quality improvement, fermentation and food

processing agents; Nutritional additives.

07. Food quality improvement, fermentation and food processing agents

08. Nutritional additives

13. Coagulating Agents

§ 07026

§ 08284

§ 13008

Potassium Dihydrogen Phosphate

Synonyms	Monobasic potassium phosphate, monopotassium monophosphate potassium acid phosphate, potassium biphosphate; INS No. 340(i)
Definition	
Chemical names	Potassium dihydrogenphosphate, monopotassium dihydrogenorthophosphate, monopotassium dihydrogen monophosphate
C.A.S. number	7778-77-0
Chemical formula	KH_2PO_4
Formula weight	136.09
Assay	Not less than 98.0% after drying
Description	Odourless, colourless crystals or white granular or crystalline powder
Characteristics	
Identification	
Solubility	Freely soluble in water; insoluble in ethanol
pH	4.2 - 4.7 (1 in 100 soln)
Test for potassium	Passes test
Test for phosphate	Passes test
Test for	To 5 ml of a 1 in 100 soln of the sample, add silver nitrate

orthophosphate	TS. A yellow precipitate is obtained.
Purity	
Loss on drying	Not more than 2% (105℃, 4 h)
Water insoluble substances	Not more than 0.2%
Fluoride	Not more than 10 mg/kg
Arsenic	Not more than 3 mg/kg
Lead	Not more than 4 mg/kg
Category	Food additives category (7) (8) (13)
Functional uses	Food quality improvement, fermentation and food processing agents; Nutritional additives; Coagulating Agents.

07. Food quality improvement, fermentation and food processing agents

13. Coagulating Agents

§ 07033

§ 13015

Trisodium Phosphate

Synonyms	Tribasic sodium phosphate, sodium phosphate; INS No. 339(iii)
Definition	
Chemical names	Trisodium orthophosphate, trisodium phosphate, trisodium monophosphate
C.A.S. number	7601-54-9
Chemical formula	Anhydrous: Na_3PO_4 Hydrated: $Na_3PO_4 \cdot xH_2O$
Formula weight	Anhydrous: 163.94
Assay	Anhydrous, hemihydrate and monohydrate: Not less than 97.0% calculated on the dried basis

	Dodecahydrate: Not less than 92.0% calculated on the ignited basis
Description	White odourless crystals, granules or a crystalline powder; hydrated forms available include hemi- and monohydrates, hexahydrate, octahydrate, decahydrate and dodecahydrate; the dodecahydrate contains 1/4 mol of sodium hydroxide.
Characteristics	
Identification	
Solubility	Freely soluble in water; insoluble in ethanol
pH	11.5 - 12.5 (1 in 100 soln)
Test for sodium	Passes test.
Test for phosphate	To 5 ml of a 1 in 100 solution of the sample add 1 ml of concentrated nitric acid and 5 ml of ammonium molybdate TS and warm. A bright canary-yellow precipitate is obtained.
Test for orthophosphate	Dissolve 0.1 g of the sample in 10 ml water, acidify slightly with dilute acetic acid TS, and add 1 ml of silver nitrate TS. A yellow precipitate is formed.
Purity	
Loss on ignition	Anhydrous: Not more than 2% (120°C, 2 h, then 800°C, 30 min) Monohydrate: Not more than 11% (120°C, 2 h, then 800°C, 30 min) Dodecahydrate: 45-58% (120°C, 2 h, then 800°C, 30 min)
Water insoluble substances	Not more than 0.2%
Fluoride	Not more than 50 mg/kg
Arsenic	Not more than 3 mg/kg
Lead	Not more than 4 mg/kg

Category	Food additives category (07) (13)
Functional uses	Food quality improvement, fermentation and food processing agents; Coagulating Agents.

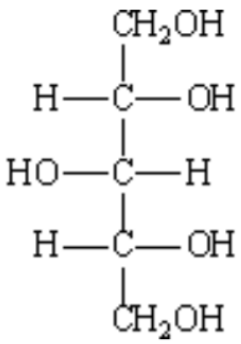
07. Food quality improvement, fermentation and food processing agents

11-1. Sweeteners

§ 07089

§ 11-1-003

Xylitol

Synonyms	INS No. 967
Definition	
Chemical names	Xylitol
C.A.S. number	87-99-0
Chemical formula	$C_5H_{12}O_5$
Structural formula	
Formula weight	152.15
Assay	Not less than 98.5% and not more than 101.0% on the anhydrous basis
Description	White, crystalline powder, practically odourless
Characteristics	
Identification	
Solubility	Very soluble in water, sparingly soluble in ethanol
Melting range	92 - 96℃
Infrared absorption	The infrared spectrum of a potassium bromide dispersion of

	the sample corresponds with the reference infrared spectrum below
Purity	
Water	Not more than 0.5% (Karl Fischer Method)
Sulfated ash	Not more than 0.1%
Nickel	Not more than 2 mg/kg
Reducing sugars	Not more than 0.2%
Other polyols	Not more than 1.0%
Lead	Not more than 1 mg/kg
Category	Food additives category (7)(11-1)
Functional uses	Food quality improvement, fermentation and food processing agents; Sweeteners.

07. Food quality improvement, fermentation and food processing agents

11-1. Sweeteners

§ 07092

§ 11-1-018

Maltitol Syrup

Synonyms	Hydrogenated high maltose-content glucose syrup, hydrogenated glucose syrup, dried maltitol syrup, maltitol syrup powder; INS No. 965(ii)
Definition	A mixture consisting of mainly maltitol with sorbitol and hydrogenated oligo- and polysaccharides. It is manufactured by the catalytic hydrogenation of high maltose-content glucose syrup. The article of commerce is typically supplied as a syrup. It may also be dried and supplied as a solid product
Assay	Not less than 99.0% of total hydrogenated saccharides on the anhydrous basis and not less than 50.0% of maltitol on

	the anhydrous basis
Description	Colourless and odourless, clear viscous liquids or white crystalline masses
Characteristics	
Identification	
Solubility	Very soluble in water, slightly soluble in ethanol
Thin layer chromatography	Passes test
Purity	
Water	Not more than 31% (Karl Fischer)
Sulfated ash	Not more than 0.1%
Chloride	Not more than 50 mg/kg
Sulfate	Not more than 100 mg/kg
Nickel	Not more than 2 mg/kg
Reducing sugars	Not more than 0.3%
Lead	Not more than 1 mg/kg
Category	Food additives category (07) (11-1)
Functional uses	Food quality improvement, fermentation and food processing agents; Sweeteners.

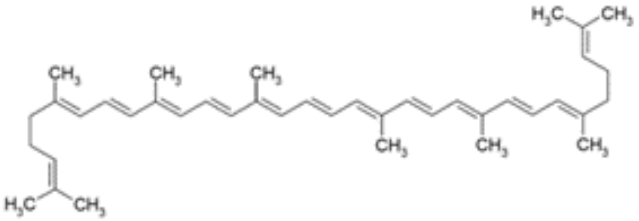
08. Nutritional additives
09. Colors

§ 08139

§ 09034

Lycopene (Synthetic)

Synonyms	INS 160d(i)
Definition	Synthetic lycopene is produced by the Wittig condensation of synthetic intermediates commonly used in the production

	of other carotenoids used in food. Synthetic lycopene consists predominantly of all-*trans*-lycopene together with 5-*cis*-lycopene and minor quantities of other isomers.
Chemical names	ψ,ψ-carotene; all-*trans*-lycopene; (all-E)-lycopene; (all-E)-2,6,10,14,19,23,27,31-octamethyl-2,6,8,10,12,14,16,18,20,22,24,26,30-dotriacontatridecaene
C.A.S. number	502-65-8
Chemical formula	$C_{40}H_{56}$
Structural formula	
Formula weight	536.9
Assay	Not less than 96% total lycopenes; not less than 70% all-*trans*-lycopene
Description	Red crystalline powder
Characteristics	
Identification	
Solubility	Insoluble in water, freely soluble in chloroform
Test for carotenoids	The color of the solution of the sample in acetone disappears after successive additions of a 5% solution of sodium nitrite and 1N sulfuric acid
Solution in chloroform	A 1% solution is clear and has intensive red-orange color
Spectrophotometry	A solution in hexane shows an absorption maximum at approximately 470 nm
Purity	
Loss on drying	Not more than 0.5% (40°C, 4 h at 10 mmHg)
Lead	Not more than 1 mg/kg

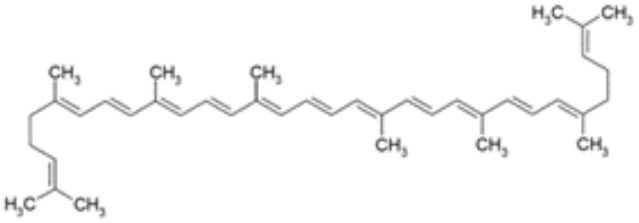
Apo-12'-lycopenal	Not more than 0.15%
Triphenyl phosphine oxide (TPPO)	Not more than 0.01%
Category	Food additives category (08) (09)
Functional uses	Nutritional additive; Colors.

08. Nutritional additives
09. Colors

§ 08322

§ 09040

Lycopene from *Blakeslea trispora*

Synonyms	INS 160d(iii)
Definition	Lycopene from *Blakeslea trispora* is extracted from the fungal biomass and purified by crystallization and filtration. It consists predominantly of all-*trans*-lycopene. It also contains minor quantities of other carotenoids. Isopropanol and isobutyl acetate are the only solvents used in the manufacture.
Chemical names	ψ,ψ-carotene; all-*trans*-lycopene; (all-E)-lycopene; (all-E)-2,6,10,14,19,23,27,31-octamethyl-2,6,8,10,12,14,16,18,20,22,24,26,30-dotriacontatridecaene
C.A.S. number	502-65-8
Chemical formula	$C_{40}H_{56}$
Structural formula	
Formula weight	536.9
Assay	Not less than 95% total lycopenes; not less than 90% all-

	trans-lycopene
Description	Red crystalline powder
Characteristics	
Identification	
Solubility	Insoluble in water, freely soluble in chloroform
Test for carotenoids	The colour of the solution of the sample in acetone disappears after successive additions of a 5% solution of sodium nitrite and 1N sulfuric acid
Solution in chloroform	A 1% solution is clear and has intensive red-orange colour
Spectrophotometry	A solution in hexane shows an absorption maximum at approximately 470 nm
Purity	
Other carotenoids	Not more than 5%
Loss on drying	Not more than 0.5% (40°C, 4 h at 20 mmHg)
Lead	Not more than 1 mg/kg
Residual solvents	Isopropanol: Not more than 0.1% Isobutyl acetate: Not more than 1.0%
Category	Food additives category (08) (09)
Functional uses	Nutritional additive; Colors.

08. Nutritional additives
09. Colors

§ 08143

§ 09014

β-Carotene

Synonyms	From *Blakeslea trispora*: CI Food Orange 5; INS No. 160a(iii) Other sources: CI Food Orange 5; INS No. 160a(i); CI

(1975) No. 40800

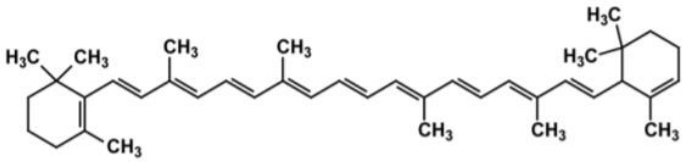
Definition These specifications consist predominantly of all-*trans*-β-carotene and may also contain minor amounts of *cis*-isomers and other carotenoids. Commercial preparations of β-carotene intended for use in food are prepared from β-carotene meeting these specifications and are formulated as suspensions in edible oils or water-dispersible powders. These preparations may have different ratio of trans/cis isomers. The colour is also obtained by a fermentation process using the fungus *Blakeslea trispora*.

Chemical names From *Blakeslea trispora*: β-Carotene, β, β-carotene
Other sources: β-Carotene, β, β-carotene
1,1'-(3,7,12,16-tetramethyl-1,3,5,7,9,11,13,15,17-octadecanonaene-1,18-diyl)bis[2,6,6-trimethylcyclohexene]

C.A.S. number 7235-40-7

Chemical formula $C_{40}H_{56}$

Structural formula All-*trans*-β-carotene (main compound)



Formula weight 536.88

Assay Not less than 96.0% of total colouring matter (expressed as β-carotene)

Description Red to brownish-red crystals or crystalline powder; sensitive to oxygen and light and should therefore be kept in a light-resistant container under inert gas.

Characteristics

Identification

Solubility	Insoluble in water; practically insoluble in ethanol; slightly soluble in vegetable oils.
Test for carotenoids	The colour of a solution of the sample in acetone disappears after successive additions of a 5% solution of sodium nitrite and 0.5 M sulfuric acid.
Spectrophotometry	From *Blakeslea trispora*: Determine the absorbance of the diluted sample solution used in the Method of Assay at 455 nm and 483 nm. The ratio is between 1.14 and 1.19. Determine the absorbance of the diluted sample solution used in the Method of Assay at 455 nm and 340 nm. The ratio is not lower than 0.75. Other sources: Determine the absorbance of the diluted sample solution used in the Method of Assay at 455 nm and 483 nm. The ratio A_{455}/A_{483} is between 1.14 and 1.19. Determine the absorbance of the diluted sample solution used in the Method of Assay at 455 nm and 340 nm. The ratio A_{455}/A_{340} is not lower than 15.

Purity

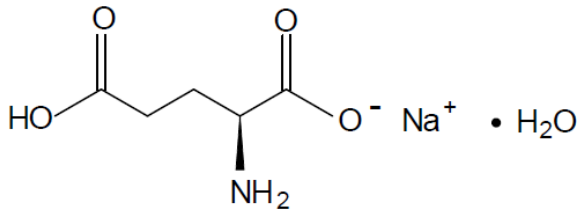
Sulfated ash	From *Blakeslea trispora*: Not more than 0.2% Other sources: Not more than 0.1%
Subsidiary colouring matters	Carotenoids other than β-carotene: Not more than 3% of total colouring matters.
Residual solvent	From *Blakeslea trispora*: Ethanol and Ethyl acetate: Not more than 0.8% singly or in combination

	Isopropanol: Not more than 0.1%
	Isobutyl acetate: Not more than 1.0%
	Other sources:-
Lead	Not more than 2 mg/kg
Category	Food additives category (08) (09)
Functional uses	Nutritional additive; Colors.

11. Seasoning Agents

§ 11014

Monosodium L-Glutamate

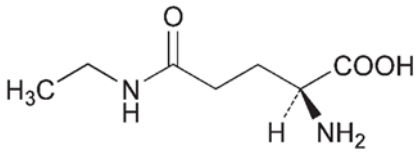
Synonyms	Sodium glutamate, MSG, INS No. 621
Definition	
Chemical names	Monosodium L-glutamate monohydrate, glutamic acid monosodium salt monohydrate
C.A.S. number	142-47-2
Chemical formula	$C_5H_8NNaO_4 \cdot H_2O$
Structural formula	
Formula weight	187.13
Assay	Not less than 99.0% on the dried basis
Description	White, practically odourless crystals or crystalline powder
Characteristics	
Identification	
Solubility	Freely soluble in water; sparingly soluble in ethanol; practically insoluble in ether
Test for glutamate	Passes test
Test for sodium	Passes test

Purity	
Loss on drying	Not more than 0.5% (98℃, 5 h)
pH	6.7 - 7.2 (1 in 20 soln)
Specific rotation	$[\alpha]_D^{20}$ =+24.8～+25.3° (10% (w/v) solution in 2N hydrochloric acid)
Chlorides	Not more than 0.2%
Pyrrolidone carboxylic acid	Passes test
Lead	Not more than 1 mg/kg
Category	Food additives category (11)
Functional uses	Seasoning agents.

11. Seasoning Agents

§ 11059

L-Theanine



Chemical formula: $C_7H_{14}N_2O_3$ Molecular weight: 174.2

Chemical names: (2*S*)-2-Amino-4-(*N*-ethylcarbamoyl)butanoic acid

C.A.S. number: 3081-61-6

1. Assay : Not less than 98.0% and not more than 102.0% on the dried basis
2. Appearance : White crystalline powder, odorless, with a slightly characteristic and sweet taste.
3. Identification : (1) To 5 mL of a solution of L-Theanine (1 in 1000), add 1 mL of ninhydrin solution (1 in 1000), and heat for 3 minutes. A purple color develops.
   (2) Dissolve about 1 g of L-Theanine in 10 mL of diluted

hydrochloric acid (1 in 2), put in a water bath that is equipped with a reflux cooler for 6 hours, and add water to 20 mL. Put 5 mL of the solution into a test tube and add 2 g of sodium hydroxide. Take another piece of red litmus paper to cover the mouth of the test tube after wetting it with water. After the tube is bathed for 5 minutes, the color of the litmus paper turns blue.

4. Specific rotation : $〔\alpha〕_D^{20}$=+7.7～+8.5 (Add 50 mL of water to 2.5 g of the sample)
5. Solution state : Dissolve 1 g of the sample in 20 mL of water. The solution should be colorless and almost clear.
6. pH : 5.0～6.0 (1 in 100 soln)
7. Chloride : Not more than 0.021% (as Cl).
8. Lead : Not more than 2 ppm.
9. Arsenic : Not more than 3 ppm (as As_2O_3).
10. Loss on drying : Dry it at 105°C for 3 hours: it loses not more than 0.5% of its weight.
11. Residue on ignition : Not more than 0.2%.
12. Category : Food Additives Category (11)
13. Uses : Seasoning Agents.

11-1. Sweeteners

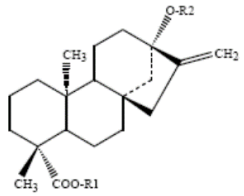
§ 11-1-012

Steviol glycosides from *Stevia rebaudiana* Bertoni

Synonyms INS No. 960

Definition Steviol glycosides consist of a mixture of compounds containing a steviol backbone conjugated to any number or combination of the principal sugar moieties (glucose, rhamnose, xylose, fructose, arabinose, galactose and deoxyglucose) in any of the orientations occurring in the

	leaves of *Stevia rebaudiana* Bertoni. The product is obtained from the leaves of *Stevia rebaudiana* Bertoni. The leaves are extracted with hot water and the aqueous extract is passed through an adsorption resin to trap and concentrate the component steviol glycosides. The resin is washed with a solvent alcohol to release the glycosides and the product is recrystallized from methanol or aqueous ethanol. Ion exchange resins may be used in the purification process. The final product may be spray-dried.
Chemical names	See Appendix 1
C.A.S. number	See Appendix 1
Chemical formula	See Appendix 1
Structural formula	



Steviol (R1 = R2 = H) is the aglycone of the steviol glycosides.

Glc, Rha, Fru, deoxyGlc, Gal, Ara and Xyl represent, respectively, glucose, rhamnose, fructose, deoxyglucose xylose, galactose, arabinose and xylose sugar moieties.

Assay	Not less than 95% of total of steviol glycosides, on the dried basis, determined as the sum of all compounds containing a steviol backbone conjugated to any number, combination or orientation of saccharides (glucose, rhamnose, fructose, deoxyglucose xylose, galactose, arabinose and xylose) occurring in the leaves of *Stevia*

	rebaudiana Bertoni.
Description	White to light yellow powder, odourless or having a slight characteristic odour. About 200 - 300 times sweeter than sucrose.
Characteristics	
Identification	
Solubility	Freely soluble in a mixture of ethanol and water (50:50)
HPLC chromatographic profile	Correspond to steviol glycoside standards
pH	Between 4.5 and 7.0 (1 in 100 solution)
Purity	
Total ash	Not more than 1%
Loss on drying	Not more than 6% (105°C, 2 h)
Residual solvents	Not more than 200 mg/kg methanol and not more than 5000 mg/kg ethanol
Arsenic	Not more than 1 mg/kg
Lead	Not more than 1 mg/kg
Microbiological criteria	Total (aerobic) plate count: Not more than 1,000 CFU/g Yeasts and moulds: Not more than 200 CFU/g *E. coli*: Negative in 1 g *Salmonella*: Negative in 25 g
Category	Food additives category (11-1)
Functional uses	Sweeteners.

Appendix 1:

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Group 1: Steviol + Glucose (SvGn)							
Steviolmonoside	SvG1	H	Glcβ1-	13-[(β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid	60129-60-4	$C_{26}H_{40}O_8$	481
Steviolmonoside A	SvG1	Glcβ1-	H	13-[(hydroxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	64977-89-5	$C_{26}H_{40}O_8$	481
Rubusoside	SvG2	Glcβ1-	Glcβ1-	13-[(β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	64849-39-4	$C_{32}H_{50}O_{13}$	643
Steviolbioside	SvG2	H	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid	41093-60-1	$C_{32}H_{50}O_{13}$	643
Stevioside	SvG3	Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	57817-89-7	$C_{38}H_{60}O_{18}$	805
Stevioside A Or Rebaudioside KA	SvG3	Glcβ(1-2)Glcβ1-	Glcβ1-	13-[(2-O-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid 4')-O-β-D-glucopyranosyl-deoxy-(1,2)-O-[β-(-d-glucopyranosyl ester	127345-20-4	$C_{38}H_{60}O_{18}$	805
Stevioside B	SvG3	Glcβ(1-3)Glcβ1-	Glcβ1-	13-[(2-O-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, O-β-D-glucopyranosyl-deoxy-(1,3)-O-[β-D-glucopyranosyl ester	-	$C_{38}H_{60}O_{18}$	805
Rebaudioside *B*	SvG3	H	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid	58543-17-2	$C_{38}H_{60}O_{18}$	805

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside G	SvG3	Glcβ1-	Glcβ(1-3)Glcβ1	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid(4')-*O*-β-D-glucopyranosyl ester	127345-21-5	$C_{38}H_{60}O_{18}$	805
Rebaudioside *E*	SvG4	Glcβ(1-2)Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(*O*-β- D-glucoopyranosyl-(1,2)-*O*-[β- D-glucopyranosyl)-oxy]-kaur-16-en-18-oic acid (4')-*O*-β-D-glucopyranosyl-deoxy-(1,2)-*O*-[β-D-glucopyranosyl ester	63279-14-1	$C_{44}H_{70}O_{23}$	967
Rebaudioside *A*	SvG4	Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-glucopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	58543-16-1	$C_{44}H_{70}O_{23}$	967
Rebaudioside A2	SvG4	Glcβ1-	Glcβ(1-6)[Glcβ(1-2)]Glcβ1-	13-[(6-O-β-D-glucopyranosyl-2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl ester	1326217-29-1	$C_{44}H_{70}O_{23}$	967
Rebaudioside *D*	SvG5	Glcβ(1-2)Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-glucopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl ester	63279-13-0	$C_{50}H_{80}O_{28}$	1129
Rebaudioside L	SvG5	Glcβ1-	Glcβ(1-6) Glcβ(1-2) [Glcβ(1-3)]Glcβ1-	13-[(6-O-β-D-glucopyranosyl-2-O-β-D-glucopyranosyl-3-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl ester	1220616-38-5	$C_{50}H_{80}O_{28}$	1129

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Steviolmonoside	SvG1	H	Glcβ1-	13-[(β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid	60129-60-4	$C_{26}H_{40}O_8$	481
Steviolmonoside A	SvG1	Glcβ1-	H	13-[(hydroxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	64977-89-5	$C_{26}H_{40}O_8$	481
Rubusoside	SvG2	Glcβ1-	Glcβ1-	13-[(β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	64849-39-4	$C_{32}H_{50}O_{13}$	643
Steviolbioside	SvG2	H	Glcβ(1-2)Glcβ1-	13-[(2-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid	41093-60-1	$C_{32}H_{50}O_{13}$	643
Stevioside	SvG3	Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(2-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	57817-89-7	$C_{38}H_{60}O_{18}$	805
Stevioside A Or Rebaudioside KA	SvG3	Glcβ(1-2)Glcβ1-	Glcβ1-	13-[(2-O-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid 4')-*O*-β-D-glucopyranosyl-deoxy-(1,2)-*O*-[β-(-D-glucopyranosyl ester	127345-20-4	$C_{38}H_{60}O_{18}$	805
Stevioside B	SvG3	Glcβ(1-3)Glcβ1-	Glcβ1-	13-[(2-O-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, *O*-β-D-glucopyranosyl-deoxy-(1,3)-*O*-[β-D-glucopyranosyl ester	-	$C_{38}H_{60}O_{18}$	805
Rebaudioside *B*	SvG3	H	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-glucopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid	58543-17-2	$C_{38}H_{60}O_{18}$	805

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside I	SvG5	Glcβ(1-3) Glcβ1-	Glcβ(1-2) [Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 3-O-β-D-glucopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{28}$	1129
Rebaudioside I2	SvG5	Glcβ1-	Glcα(1-3) Glcβ(1-2) [Glcβ(1-3)]Glcβ1-	13-[(3-O-β-D-glucopyranosyl-2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{28}$	1129
Rebaudioside I3	SvG5	[Glcβ(1-2) Glcβ(1-6)]Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-O-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl-6-O- β-D-glucopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{28}$	1129
Rebaudioside Q	SvG5	Glcβ1-	Glcα(1-4)Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(4-O-β-D-glucopyranosyl-2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{28}$	1129
Rebaudioside Q2	SvG5	[Glcα(1-2) Glcα(1-4)] Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl-4-O-β-D-glucopyranosyl- β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{28}$	1129
Rebaudioside Q3	SvG5	Glcβ1-	Glcα(1-4) Glcβ(1-3) [Glcβ(1-2)]Glcβ1-	13-[(4-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-2-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{28}$	1129

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside *M*	SvG6	Glcβ(1-2)[Glcβ (1-3)]Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(*O*-β- D-glucopyranosyl-(1,2)-*O*-[β- D-glucopyranosyl-(1,3)]-β- D-glucopyranosyl)oxy]-kaur-16-en-18-oic acid (4')-*O*-β- D-glucopyranosyl-(1,2)-*O*-[β- D-glucopyranosyl-(1,3)]-β- D-glucopyranosyl ester	1220616-44-3	$C_{58}H_{90}O_{33}$	1291
Related SvGn#1		-	-	-	-	$C_{21}H_{30}O_{11}$	458
Related SvGn#2		-	-	-	-	$C_{40}H_{70}O_{24}$	982
Related SvGn#3		-	-	-	-	$C_{32}H_{52}O_{15}$	676
Related SvGn#4		-	-	-	-	$C_{50}H_{80}O_{28}$	1129
Related SvGn#5		-	-	-	-	$C_{40}H_{70}O_{24}$	982
Group 2: Steviol + Rhamnose + Glucose (SvR1Gn)							
Dulcoside *A*	SvR1G2	Glcβ1-	Rhaα(1-2)Glcβ1-	13-[(2-O-α–L-rhamnopyranosyl-β–D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	64432-06-0	$C_{38}H_{60}O_{17}$	789
Dulcoside C	SvR1G2	H	Rhaα(1-2)[Glcβ(1-3)] Glcβ1-	13-[(2-O-β-D-rhamnopyranosyl-3-β-D-glucopyranosyl- β-D-glucopyranosyl -oxy]kaur-16-en-18-oic acid		$C_{38}H_{60}O_{17}$	789
Rebaudioside *C*	SvR1G3	Glcβ1-	Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-α–L-rhamnopyranosyl-3-O-β–D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	63550-99-2	$C_{44}H_{70}O_{22}$	951

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside C2	SvR1G3	Rhaα(1-2)Glcβ1	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-rhamnopyranosyl- β-D-glucopyranosyl ester	-	$C_{44}H_{70}O_{22}$	951
Rebaudioside *N*	SvR1G5	Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β- D-glucopyranosyl-(1,2)-*O*-[β- D-glucopyranosyl-(1,3)]-β- D-glucopyranosyl)oxy]-kaur-16-en-18-oic acid (4')-*O*-2-deoxy-L-rhmanopyranosyl-3-*O*-β- D-glucopyranosyl-β- D-glucopyranosyl ester	1220616-46-5	$C_{58}H_{90}O_{32}$	1274
Rebaudioside *O*	SvR1G6	Glcβ(1-3)Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy] ent-kaur-16-en-19-oic acid-[(2-O-(3-O-β-D-glucopyranosyl-α-L-rhamnopyranosyl)-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl) ester]	1220616-48-7	$C_{62}H_{100}O_{37}$	1436
Rebaudioside *O2*	SvR1G6	Glcβ(1-4*)Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(*O*-β-D-glucopyranosyl-(1,2)-*O*-[β-D-glucopyranosyl-(1,3)]-β-D-glucopyranosyl)oxy]-kaur-16-en-18-oic acid (4')-*O*-β-D-glucopyranosyl-(1,4)-*O*-6- deoxy-L-rhmnopyranosyl-(1,2)-*O*-[β-D-glucopyranosyl-(1,3)]-β-D-glucopyranosyl ester	-	$C_{62}H_{100}O_{37}$	1436

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside K	SvR1G4	Glcβ(1-2)Glcβ1-	Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-rhamnopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl-β-D-glucopyranosyl ester	1220616-40-9	$C_{50}H_{80}O_{27}$	1112
Rebaudioside *S*	SvR1G3	Rhaα(1-2)Glcβ1-	Glcα (1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, O-2-deoxy-L-rhamnopyranosyl β-D-glucopyranosyl ester	1931085-11-8	$C_{44}H_{70}O_{22}$	951
Rebaudioside *K2*	SvR1G4	Glcβ(1-6)Glcβ1-	Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-rhamnopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 6-O-β-D-glucopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{80}O_{27}$	1112
Rebaudioside *H*	SvR1G4	Glcβ1-	Glcβ(1-3)Rhaα(1-2)[Glcβ(1-3)]Glcβ1-	13-[(3-*O*-β-D-glucopyranosyl-2-O-β-D-rhamnopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	1220616-36-3	$C_{50}H_{80}O_{27}$	1112
Rebaudioside *J*	SvR1G4	Rhaα(1-2)Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-glucopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]-kaur-16-en-18-oic acid, 2-O-6- deoxy-L-rhmnopyranosyl-β-D-glucopyranosyl ester	1313049-59-0	$C_{50}H_{80}O_{27}$	1112
Group 3: Steviol + Xylose + Glucose (SvX1Gn)							
Stevioside F	SvX1G2	Glcβ1-	Xylβ(1-2)Glcβ1-	13-[(2-O-β-D-xylopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	-	$C_{37}H_{59}O_{17}$	775

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside *F*	SvX1G3	Glcβ1-	Xylβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-*O*-β-D-xylopyranosyl-3-*O*-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	438045-89-7	$C_{43}H_{68}O_{22}$	937
Rebaudioside F2	SvX1G3	Glcβ1-	Glcβ (1-2)[Xylβ (1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-xylopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	-	$C_{43}H_{68}O_{22}$	937
Rebaudioside F3	SvX1G3	Xylβ(1-6) Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 6-O-β-D-xylopyranosyl-β-D-glucopyranosyl ester	-	$C_{43}H_{68}O_{22}$	937
Rebaudioside R	SvX1G3	Glcβ1-	Glcβ(1-2)[Glcβ1-3] Xylβ1	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-xylopyranosyl-3)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	1931083-53-2	$C_{43}H_{68}O_{22}$	937
Rebaudioside *U2*	SvX1G4	Xylβ(1-2*)[Glcβ(1-3)]Glcβ1-	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-xylopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{82}O_{26}$	1099
Rebaudioside *T*	SvX1G4	Xylβ(1-2)Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-xylopyranosyl-β-D-glucopyranosyl ester		$C_{50}H_{82}O_{26}$	1099
Rebaudioside *V2*	SvX1G5	Xylβ (1-2)[Glcβ(1-3)]Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-xylopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl ester	-	$C_{56}H_{92}O_{31}$	1261

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Rebaudioside *V*	SvX1G5	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	Xylβ(1-2*)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-xylopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl ester	-	$C_{56}H_{92}O_{31}$	1261
Group 4: Steviol + Arabinose + Glucose (SvA1Gn)							
Rebaudioside U	SvA1G4	Araα(1-2*)Glcβ1	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O- β -D-glucopyranosyl-3-O β -D-glucopyranosyl- β-D-glucopyranosyl) oxy]ent-kaur-16-en-19-oic acid-(6-O-α--L-arabinopyranosyl- β -D-glucopyranosyl) ester		$C_{50}H_{82}O_{26}$	1098
Rebaudioside W	SvA1G4	Glcβ(1-2)[Araβ(1-3*)]Glcβ1	Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-Dglucopyranosyl-3-O-β-D-arabinopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{82}O_{26}$	1098
Rebaudioside *W2*	SvA1G4	Araβ(1-2*)Glcβ1	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-arabinopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{82}O_{26}$	1098
Rebaudioside *W3*	SvA1G4	Araβ(1-6)Glcβ1-	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 6-O-β-D-arabinopyranosyl-β-D-glucopyranosyl ester	-	$C_{50}H_{82}O_{26}$	1098
Rebaudioside *Y*	SvA1G5	Glcβ(1-2)[Araβ(1-3*)]Glcβ1	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-glucopyranosyl-3-O-β-D-arabinopyranosyl-β-D-glucopyranosyl ester	-	$C_{56}H_{92}O_{31}$	1260

Common Name	Trivial Name	R_1	R_2	Chemical Name	CAS Number	Chemical Formula	Formula Weight
Group 5: Steviol + Galactose + Glucose (SvGa1Gn)							
Rebaudioside T1	SvGa1G4	Galβ(1-2*)Glcβ1	Glcβ(1-2)[Glcβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, 2-O-β-D-galactopyranosyl-β-D-glucopyranosyl ester	-	C50H80O28	1128
Group 6: Steviol + Fructose + Glucose (SvFruGn)							
Rebaudioside *A3*	SbF1G3	Glcβ1-	Glcβ(1-2)[Fruβ(1-3)]Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-fructofuranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	-	$C_{44}H_{70}O_{22}$	951
Group 7: Steviol + -de-oxy glucose + Glucose (SvdG1Gn)							
Stevioside D	SvDg1G2	Glcβ1-	6-deoxy Glcβ(1-2)Glcβ1-	13-[(2-O-β-D-6-deoxyglucopyranosyl-β-D-glucopyranosy)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	-	$C_{38}H_{60}O_{17}$	789
Stevioside E	SvDg1G3	Glcβ1-	6-deoxy Glcβ(1-2)[Glcβ(1-3)] Glcβ1-	13-[(2-O-β-D-6-deoxyglucopyranosyl-3-O-β-D-glucopyranosyl-β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-glucopyranosyl ester	-	$C_{44}H_{70}O_{22}$	951
Stevioside E2	SvDg1G3	6-deoxy Glcβ1-	Glcβ(1-2)[Glcβ(1-3)] Glcβ1-	13-[(2-O-β-D-glucopyranosyl-3-O-β-D-glucopyranosyl- β-D-glucopyranosyl)oxy]kaur-16-en-18-oic acid, β-D-6-deoxyglucopyranosyl-ester	-	$C_{44}H_{70}O_{22}$	951

Steviol (R1 = R2 = H) is the aglycone of the steviol glycosides.
Glc, Rha, Fru, deoxyGlc, Gal, Ara and Xyl represent, respectively, glucose, rhamnose, fructose, deoxyglucose, galctose, arabinose and xylose sugar moieties.

Note: This list is not exhaustive. More steviol glycosides may have been identified in stevia leaf extracts in the literature

12. Pasting Agent

§ 12012

Carrageenan

Synonyms Irish moss gelose (from *Chondrus* spp.); Eucheuman (from *Eucheuma* spp.); Iridophycan (from *Iridaea* spp.); Hypnean (from *Hypnea* spp.); Furcellaran or Danish agar (from *Furcellaria fastigiata*); INS No. 407.

Definition A substance with hydrocolloid properties obtained from certain members of the class *Rhodophyceae* (red seaweeds). The principal commercial sources of carrageenans are the following families and genera of the class of *Rhodophyceae*:

Furcellariacaea such as *Furcellaria*

Gigartinaceae such as *Chondrus*, *Gigartina*, *Iridaea*

Hypnaeceae such as *Hypnea*

Phyllophoraceae such as *Phyllophora*, *Gynmogongrus*, *Ahnfeltia*

Solieriaceae such as *Eucheuma*, *Anatheca*, *Meristotheca*.

Carrageenan is a hydrocolloid consisting mainly of the ammonium, calcium, magnesium, potassium and sodium sulfate esters of galactose and 3, 6-anhydrogalactose polysaccharides. These hexoses are alternately linked α-1,3 and β-1,4 in the copolymer. The relative proportions of cations existing in carrageenan may be changed during processing to the extent that one may become predominant. The prevalent polysaccharides in carrageenan are designated as kappa-, iota-, and lambda-carrageenan. Kappa-carrageenan is mostly the alternating polymer of D-galactose-4-sulfate and 3, 6-anhydro-D-galactose; iota-

carrageenan is similar, except that the 3,6-anhydrogalactose is sulfated at carbon 2. Between kappa-carrageenan and iota-carrageenan there is a continuum of intermediate compositions differing in degree of sulfation at carbon 2. In lambda-carrageenan, the alternating monomeric units are mostly D-galactose-2-sulfate (1,3-linked) and D-galactose-2,6- disulfate (1,4-linked).

Carrageenan is obtained by extraction from seaweed into water or aqueous dilute alkali. Carrageenan may be recovered by alcohol precipitation, by drum drying, or by precipitation in aqueous potassium chloride and subsequent freezing. The alcohols used during recovery and purification are restricted to methanol, ethanol, and isopropanol. Articles of commerce may include sugars for standardization purposes, salts to obtain specific gelling or thickening characteristics, or emulsifiers carried over from drum drying processes.

C.A.S. number 9000-07-1

Description Yellowish or tan to white, coarse to fine powder that is practically odourless.

Characteristics

Identification

Solubility Insoluble in ethanol; soluble in water at a temperature of about 80°C, forming a viscous clear or slightly opalescent solution that flows readily; disperses in water more readily if first moistened with alcohol, glycerol, or a saturated solution of glucose or sucrose in water.

Test for sulfate Dissolve a 100-mg sample in 20 ml of water (with heating if necessary), and add 3 ml of barium chloride TS and 5 ml

	of hydrochloric acid, dilute TS; filter if a precipitate forms. Boil the solution or the filtrate for 5 min. A white, crystalline precipitate appears.
Test for galactose and anhydrogalactose	Galactose and 3, 6-anhydrogalactose should be present.
Identification of hydrocolloid and predominant type of copolymer	Add 4 g of sample to 200 ml of water, and heat the mixture in a water bath at 80°C, with constant stirring, until dissolved. Replace any water lost by evaporation, and allow the solution to cool to room temperature. It becomes viscous and may form a gel. To 50 ml of the solution or gel add 200 mg of potassium chloride, then reheat, mix well, and cool. A short textured ("brittle") gel indicates a carrageenan of a predominantly kappa type, and a compliant ("elastic") gel indicates a predominantly iota type. If the solution does not gel, the carrageenan is of a predominantly lambda type.
Infrared absorption	Passes test
Purity	
Loss on drying	Not more than 12% (105°C to constant weight)
pH	Between 8 and 11 (1 in 100 suspension)
Viscosity	Not less than 5 cp at 75°C (1.5% solution)
Sulfate	Not less than 15% and not more than 40% (as SO_4^{2-}) on the dried basis
Total ash	Not less than 15% and not more than 40% on the dried basis
Acid-insoluble ash	Not more than 1%
Acid-insoluble matter	Not more than 2%

Residual solvents	Not more than 0.1% of ethanol, isopropanol, or methanol, singly or in combination
Microbiological criteria	Initially prepare a 10^{-1} dilution by adding a 50-g sample to 450 ml of Butterfield's phosphate-buffered dilution water and homogenising the mixture in a high-speed blender. Total (aerobic) plate count: Not more than 5000 cfu/g *Salmonella* spp.: Negative per test *E. coli*: Negative in 1 g
Arsenic	Not more than 3 mg/kg
Lead	Not more than 5 mg/kg
Cadmium	Not more than 2 mg/kg
Mercury	Not more than 1 mg/kg
Category	Food additives category (12)
Functional uses	Pasting Agent.

17. Others

§ 17015

Quillaia Extracts

Synonyms	Quillaja extract, Soapbark extract, Quillay bark extract, Bois de Panama, Panama bark extract, Quillai extract; INS No. 999
Definition	Quillaia extract is obtained by aqueous extraction (Type 1) or either by chromatographic separation or ultrafiltration of the aqueous extraction (Type 2) of the milled inner bark or of the wood of pruned stems and branches of *Quillaja saponaria* Molina (family *Rosaceae*). It contains triterpenoid saponins (quillaia saponins, QS) consisting predominantly of glycosides of quillaic acid. Polyphenols and tannins are major components and some sugars and calcium oxalate will be present. Quillaia extract is available commercially as liquid product or as spray-dried powder that may contain carriers such as lactose, maltitol or maltodextrin. The liquid product is usually preserved with sodium benzoate or ethanol.
C.A.S. number	68990-67-0
Formula weight	Monomeric saponins range from ca. 1800 to ca. 2300, consistent with a triterpene with 8-10 monosaccharide residues
Assay	Saponin content: Type 1: not less than 20% and not more than 26% on the dried basis Type 2: not less than 65% and not more than 90% on the dried basis
Description	Type 1: Red-brownish liquid or light brown powder with a

	pink tinge
	Type 2: Light red-brownish liquid or powder
Characteristics	
Identification	
Solubility	Very soluble in water, insoluble in ethanol, acetone, methanol and butanol
Foam	Dissolve 0.5 g of powder extract in 9.5 g of water or 1 ml of liquid extract in 9 ml of water. Add 1 ml of this mixture to 350 ml of water in a 1000-ml graduated cylinder. Cover the cylinder, vigorously shake it 30 times, and allow settling. Record the foam level (ml) after 30 min. Typical values:
	Type 1: 150 ml.
	Type 2: 260 ml.
Chromatography	The retention time of major peak of the sample corresponds to the major saponin peak (QS-18) of the standard.
Colour and turbidity	Powder form only: Dissolve 0.5 g in 9.5 g of water. The solution is not turbid. Determine the absorbance of the solution against water at 520 nm.
	Type 1: The absorbance is less than 1.2.
	Type 1: The absorbance is less than 0.7.
Purity	
Water	Powder form: not more than 6% (Karl Fischer Method)
Loss on drying	Liquid form: (2 g, 105°C, 5 h)
	Type 1: 50 to 80%
	Type 2: 50 to 90%
pH	3.7 -5.5 (4 % solution)
Ash	Type 1: Not more than 14% on a dried basis
	Type 2: Not more than 5% on a dried basis

	Use 1.0 g for powder samples; for liquid samples, use the residue from loss on drying.
Tannins	Not more than 8% on a dried basis
Lead	Not more than 2 mg/kg.
Category	Food additives category (17)
Functional uses	Others.