

EFEMA index of
food emulsifiers

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EFEMA
European Food Emulsifier Manufacturers' Association
Verband Europäischer Hersteller von Nahrungsmittel-Emulgatoren
Association des Fabricants Européens d'Emulsifiants Alimentaires

Brussels, September 2009

The European Food Emulsifier Manufacturers Association (EFEMA) is a non-profit making organisation founded in 1973.

Its objectives are to develop, support and promote food emulsifiers based upon edible fats, oils and their derivatives which are produced for the European food industry. By means of submissions and petitions, EFEMA maintains contact with all authorities involved in the approval of emulsifiers, including the European Commission, the FAO/WHO (Codex Alimentarius) and national authorities.

On behalf of its members, EFEMA takes active part in the preparation and regular updating of product specifications, consistent with good manufacturing practice, safety in use and, above all, protection of the consumer.

Furthermore, EFEMA co-operates with other associations representing similar interests and, of course, with the users of food emulsifiers.

In accordance with the objectives, EFEMA first published monographs for food emulsifiers permitted in Europe in October 1976, with subsequent updates in November 1986, November 1999 and January 2004. This new edition updates, to the best of our knowledge, emulsifier specifications, toxicological data, methods of analysis and provides examples of applications*.

Suggestions concerning any of the information listed in this journal should be addressed to the Secretariat.

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* This information is provided for guidance purposes only and does not necessarily reflect recent changes in EU legislation.

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Lecithins

E Number: E 322

1. Name

English	Lecithins
German	Lecithine
French	Lécithines
Dutch	Lecithinen
Spanish	Lecitinas
Portuguese	Lecitina
Italian	Lecitine
Danish	Lecithiner
Swedish	Lecitin
Finnish	Lesitiinit
Greek	Λεκιθίνες

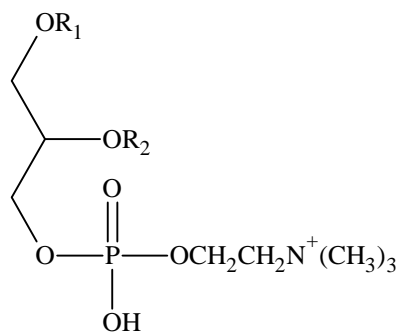
Synonyms

Phosphatides; phospholipids.

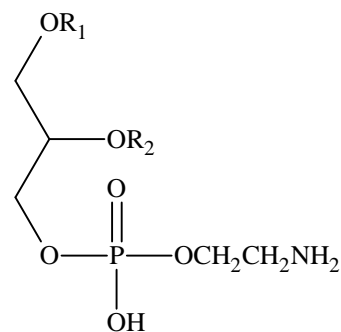
2. Description

2.1. Chemical description and typical process

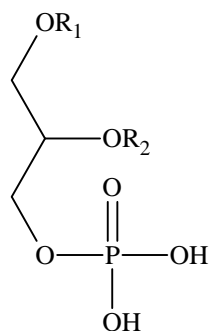
The product is a mixture of phosphatides. The structural formulae of the principal components are:



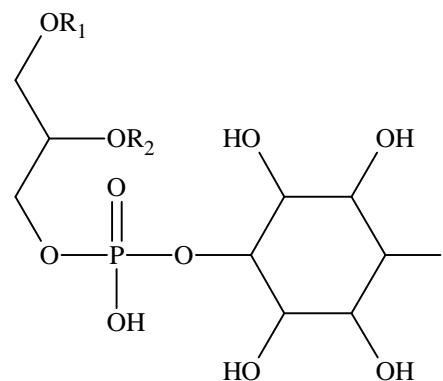
Phosphatidyl choline



Phosphatidyl ethanolamine



Phosphatidic acid



Phosphatidyl inositol

where R represents various saturated and unsaturated fatty acid moieties. At least one R represents a hydrogen moiety in the lysophospholipids.

The distribution of the principal components depends on raw material sources which may be vegetable oils and seeds (e.g. soya, maize) or animal sources (e.g. eggs).

Lecithins are typically extracted from crude vegetable oils through the “degumming” process. They can be further purified, for example by enzymatic hydrolysis, de-oiling or fractionation.

2.2. Appearance

Normally the product is a brown viscous semi-liquid with a characteristic odour. Refined lecithins, with high levels of phospholipid (> 95%), are soft, yellow-brown powders.

2.3. Solubility

The product is typically dispersible but insoluble in water, where it swells on hydration. It is soluble in oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Lecithins have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU lecithins are generally permitted for use in foodstuffs (6).

Lecithins are used principally as emulsifiers, antispattering agents and as synergists for antioxidants. Applications include:

- Baked goods, e.g. bread, cakes, biscuits
- Confectionery, e.g. chocolate, chewing gum, toffees
- Dairy products, e.g. imitation creams, desserts, edible ices
- Fats, e.g. margarines, spreads, shortenings
- Starch, e.g. mashed potatoes, pasta
- Salad dressings and sauces
- Instant drinks

6. Non-food applications

- Pharmaceutical and cosmetic preparations
- Livestock and poultry feed
- Paints

Specifications: E 322

Lecithins

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods α
Acetone insoluble	min. 60.0%	min. 60%	min. 50.0%	(2)
Acetone insoluble*	min. 56.0%	min. 56%		(2)
Loss on drying (105°, 1 h)	max. 2.0%	max. 2%		A 11
Toluene- insoluble matter	max. 0.3%	max. 0.3%		(2)
Hexane-insoluble matter			max. 0.3%	(3)
Acid value	max. 35	max. 36	max. 36	(2)
Acid value*	max. 45	max. 45		(2)
Peroxide value	max. 10	max. 10	max. 100	(2)
Water			max. 1.5%	A 10
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 1 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5

* Specification applies to hydrolysed lecithins only.

α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC of 27 August 2008](#) laying down specific purity criteria on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition):
 - Lecithin: [monograph 1 \(2006\)](#), [monograph 4 \(2007\)](#);
 - Lecithin, partially hydrolyzed: [monograph 1 \(2006\)](#), [monograph 4 \(2007\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 553.
- (4) WHO Food Additives Series No. 5, 1974, page 234-235. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifth Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyoxyethylene (40) stearate

E Number: E 431

1. Name

English	Polyoxyethylene (40) stearate
German	Polyoxyethylen(40)stearat
French	Stéarate de polyoxyéthylène (40)
Dutch	Polyoxyethyleen(40)stearaat
Spanish	Estearato de polioxietileno (40)
Portuguese	Estearato de polioxietileno (40)
Italian	(40) Stearato di poliossietilene
Danish	Polyoxyethylen (40) stearat
Swedish	Polyoxietylen (40) stearat
Finnish	Polyoksyetyleni (40) stearaatti
Greek	Στεατικό πολυοξυαιθυλένιο (40)

Synonyms

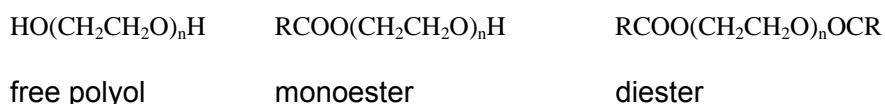
Polyoxyl(40)stearate; polyoxyethylene (40) monostearate; polyoxyethylene stearates.

2. Description

2.1. Chemical description and typical process

The product consists of a mixture of mono- and diesters of edible commercial stearic acid and mixed polyoxyethylene diols together with free polyol.

The structural formulae of the principal components are:



where RCOO is the fatty acid moiety and “n” has an average value of approximately 40. The distribution of polymers is approximately in accordance with the Poisson expression.

The product can be manufactured by reacting ethylene oxide at high temperature with stearic acid derived from food fats.

2.2. Appearance

Polyoxyethylene (40) stearate is cream-coloured and exists as flakes or a waxy solid at 25°C with a faint odour and a waxy, somewhat bitter taste.

2.3. Solubility

The product is soluble in hot and cold water, ethanol, methanol and ethyl acetate. It is insoluble in vegetable and mineral oil.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Polyoxyethylene (40) stearate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw
as total of polyoxyethylene (8) and (40) stearate

5. Typical applications in food

Within the EU polyoxyethylene (40) stearate is only permitted in wine in accordance with Regulation (EEC) No 1873/84 authorising the offer or disposal for direct human consumption of certain imported wines which may have undergone oenological processes not provided for in Regulation (EEC) No 337/79. (5)

6. Non-food applications

The product is a hydrophilic co-emulsifier in pharmaceutical and cosmetic ointments and lotions.

Specifications: E 431

Polyoxyethylene (40) stearate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Content	min. 97.5% (anhydrous base)	97.5-102.5% (anhydrous base)*		A 34
Congealing range	39-44°C	39-44°C		A 35
Acid value	max. 1	max. 1		A 18
Saponification value	25-35	25-35		A 19
Hydroxyl value	27-40	27-40		A 20
Water	max. 3%	max. 3%		A 10
1,4-Dioxane	max. 5 mg/kg			A 9
Ethylene oxide (permitted residue)	max. 0.2 mg/kg			No method available
Ethylene oxide (total amount)		84-88%*		
Ethylene glycols (mono- and di-)	max. 0.25%			A 38
Arsenic	max. 3 mg/kg			A 3
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications

* Not less than 84.0 and not more than 88.0% of oxyethylene groups equivalent to not less than 97.5 and not more than 102.5% of polyoxyethylene (40) stearate calculated on the anhydrous basis.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 laying down specific purity criteria on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 5, 1974, page 264-269. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyoxyethylene sorbitan monolaurate (Polysorbate 20)

E Number: E 432

1. Name

English	Polyoxyethylene sorbitan monolaurate
German	Polyoxyethylen-sorbitan-monolaurat
French	Monolaurate de polyoxyéthylène sorbitane
Dutch	Polyoxyethyleen-20-sorbitaan-monolauraat
Spanish	Monolaurato de sorbitan polioxietileno
Portuguese	Monolaurato de polioxietileno 20 sorbitano
Italian	Monolaurato di poliossietilensorbitano
Danish	Polyoxyethylensorbitanmonolaurat
Swedish	Polyoxietylensorbitanmonolaurat
Finnish	Polyoksyetyleenisorbitaanimonolauraatti
Greek	Μονολαυρική πολυοξυ-αιθυλενο-σορβιτάνη

Synonyms

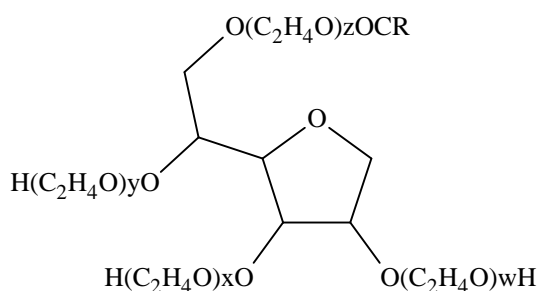
Polysorbate; polyoxyethylene (20) sorbitan monolaurate; sorbitan monododecanoate; poly(oxy-1,2-ethanediyl) derivative.

2. Description

2.1. Chemical description and typical process

Polyoxyethylene sorbitan monolaurate is a mixture of the partial esters of sorbitol and its mono- and dianhydrides with edible commercial lauric acid, condensed with approximately 20 moles of ethylene oxide per mole of sorbitol and its anhydrides.

A nominal formula for polyoxyethylene sorbitan monolaurate is as follows:



where $w + x + y + z =$ approximately 20 and RCO- is the lauric acid moiety.

2.2. Appearance

Polyoxyethylene sorbitan monolaurate is a lemon to amber-coloured oily liquid at 25°C , with a faint characteristic odour and a warm, somewhat bitter taste.

2.3. Solubility

Polyoxyethylene sorbitan monolaurate is soluble in hot and cold water, ethanol, methanol, ethyl acetate and dioxane. It is insoluble in mineral oil and petroleum ether.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Polyoxyethylene sorbitan monolaurate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw evaluation by JECFA
as total polyoxyethylene(20)sorbitan esters

Group ADI: 0-10 mg/kg bw evaluation by SCF

5. Typical applications in food

Polyoxyethylene sorbitan monolaurate is a strongly hydrophilic surface active agent. It is used as an emulsifier, often in combination with sorbitan esters, and its structure also enables it to fulfil other functions, such as the modification of fat crystallisation.

Within the EU polyoxyethylene sorbitan monolaurate is permitted in (6):

- Fine bakery wares
- Fat emulsions for baking purposes
- Milk and cream analogues
- Edible ices
- Desserts
- Sugar confectionery
- Emulsified sauces
- Soups
- Chewing gum
- Dietary food supplements
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours, fat-soluble antioxidants and anti-foaming agents

6. Non-food applications

- Pharmaceuticals
- Cosmetics
- Animal feed
- Industrial applications

Specifications: E 432

Polyoxyethylene sorbitan monolaurate (Polysorbate 20)

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Content	min. 97.3% (anhydrous base)	97.3-103.0% (anhydrous base)	97.3-103.0% (anhydrous base)	A 34
Oxyethylene content	min. 70%	70.0-74.0%	70.0-74.0%	A 34
Acid value	max. 2	max. 2	max. 2	A 18
Saponification value	40-50	40-50	40-50	A 19
Hydroxyl value	96-108	96-108	96-108	A 20
Water	max. 3%	max. 3%	max. 3.0%	A 10
1,4-Dioxane	max. 5 mg/kg		max. 10 mg/kg	A 9
Ethylene oxide	max. 0.2 mg/kg			No method available
Ethylene glycols (mono- and di-)	max. 0.25%			A 38
Sulphated ash		max. 0.25%		A 6
Lauric acid			15-17 g / 100 g	(3)
Residue on ignition			max. 0.25%	A 6
Arsenic	max. 3 mg/kg			A 3
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

[⌘] do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 786.
- (4) WHO Food Additives Series No. 5, 1974, page 254-263. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifteenth Series, 1985.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyoxyethylene sorbitan monooleate (Polysorbate 80)

E Number: E 433

1. Name

English	Polyoxyethylene sorbitan monooleate
German	Polyoxyethylen-sorbitan-monooleat
French	Monooléate de polyoxyéthylène sorbitane
Dutch	Polyoxyethyleen-20-sorbitaan-mono-oleaat
Spanish	Monooléato de sorbitan polioxietilénado
Portuguese	Monooléato de polioxietileno 20 sorbitano
Italian	Monooléato di poliossietilensorbitano
Danish	Polyoxyethylensorbitanmonooleat
Swedish	Polyoxietylensorbitanmonooleat
Finnish	Polyoksyetyleenisorbitaanimono-oleaatti
Greek	Μονοελαϊκή πολυοξυ-αιθυλενο-σορβιτάνη

Synonyms

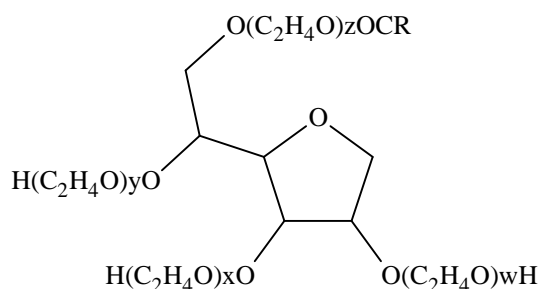
Polysorbate; polyoxyethylene (20) sorbitan monooleate; sorbitan mono 9-octa-decenoate; poly(oxy-1,2-ethanediyl) derivative.

2. Description

2.1. Chemical description and typical process

Polyoxyethylene sorbitan monooleate is a mixture of the partial esters of sorbitol and its mono- and dianhydrides with edible commercial oleic acid, condensed with approximately 20 moles of ethylene oxide per mole of sorbitol and its anhydrides.

A nominal formula for polyoxyethylene sorbitan monooleate is as follows:



where $w + x + y + z =$ approximately 20 and $RCO-$ is the oleic acid moiety.

2.2. Appearance

Polyoxyethylene sorbitan monooleate is a lemon to amber- coloured oily liquid at $25^\circ C$, with a faint characteristic odour and a waxy, somewhat bitter taste

2.3. Solubility

Polyoxyethylene sorbitan monooleate is soluble in hot and cold water, ethanol, methanol, ethyl acetate and toluene. It is insoluble in mineral oil and petroleum ether.

3. Analysis and specifications

See attached specification sheet.

Specifications: E 433

Polyoxyethylene sorbitan monooleate (Polysorbate 80)

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Content	min. 96.5% (anhydrous base)	96.5-103.5% (anhydrous base)	96.5-103.5% (anhydrous base)	A 34
Oxyethylene content	min. 65%	65.0-69.5%	65.0-69.5%	A 34
Acid value	max. 2	max. 2	max. 2	A 18
Saponification value	45-55	45-55	45-55	A 19
Hydroxyl value	65-80	65-80	65-80	A 20
Water	max. 3%	max. 3%	max. 3.0%	A 10
1,4-Dioxane	max. 5 mg/kg		max. 10 mg/kg	A 9
Ethylene oxide	max. 0.2 mg/kg			No method available
Ethylene glycols (mono- and di-)	max. 0.25%			A 38
Sulphated ash		max. 0.25%		A 6
Oleic acid			22-24 g / 100 g	(3)
Residue on ignition			max. 0.25%	A 6
Arsenic	max. 3 mg/kg			A 3
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

[⌘] do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 790.
- (4) WHO Food Additives Series No. 5, 1974, page 254-263. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifteenth Series, 1985.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners*.

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyoxyethylene sorbitan monopalmitate (Polysorbate 40)

E Number: E 434

1. Name

English	Polyoxyethylene sorbitan monopalmitate
German	Polyoxyethylen-sorbitan-monopalmitat
French	Monopalmitate de polyoxyéthylène sorbitane
Dutch	Polyoxyethyleen-20-sorbitaan-monopalmitaat
Spanish	Monopalmitato de sorbitan polioxietileno
Portuguese	Monopalmitato de polioxietileno 20 sorbitano
Italian	Monopalmitato di poliossietilensorbitano
Danish	Polyoxyethylensorbitanmonopalmitat
Swedish	Polyoxietylensorbitanmonopalmitat
Finnish	Polyoksyetyleenisorbitaanimonopalmitaatti
Greek	Μονοπαλμιτική πολυοξυ-αιθυλενο-σορβιτάνη

Synonyms

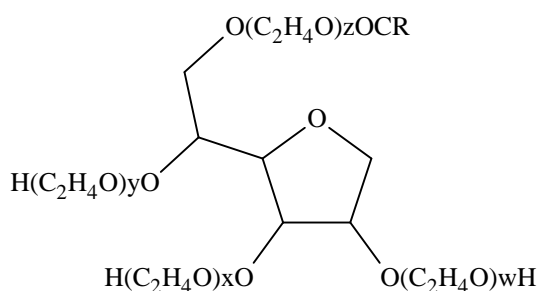
Polysorbate; polyoxyethylene (20) sorbitan monopalmitate.

2. Description

2.1. Chemical description and typical process

Polyoxyethylene sorbitan monopalmitate is a mixture of the partial esters of sorbitol and its mono- and dianhydrides with edible commercial palmitic acid, condensed with approximately 20 moles of ethylene oxide per mole of sorbitol and its anhydrides.

A nominal formula for polyoxyethylene sorbitan monopalmitate is as follows:



where $w + x + y + z =$ approximately 20 and RCO- is the palmitic acid moiety.

2.2. Appearance

Polyoxyethylene sorbitan monopalmitate is a lemon to orange-coloured oily liquid or semi-gel at 25°C, with a faint characteristic odour and a warm, somewhat bitter taste.

2.3. Solubility

Polyoxyethylene sorbitan monopalmitate is soluble in cold and hot water, ethanol, methanol, ethyl acetate and acetone. It is insoluble in mineral oil.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Polyoxyethylene sorbitan monopalmitate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw as total polyoxyethylene(20)sorbitan esters evaluation by JECFA

Group ADI: 0-10 mg/kg bw evaluation by SCF

5. Typical applications in food

Polyoxyethylene sorbitan monopalmitate is a strongly hydrophilic surface active agent. It is used as an emulsifier, often in combination with sorbitan esters, and its structure also enables it to fulfil other functions, such as the modification of fat crystallisation.

Within the EU polyoxyethylene sorbitan monopalmitate is permitted in (6):

- Fine bakery wares
- Fat emulsions for baking purposes
- Milk and cream analogues
- Edible ices
- Desserts
- Sugar confectionery
- Emulsified sauces
- Soups
- Chewing gum
- Dietary food supplements
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours, fat-soluble antioxidants and anti-foaming agents

6. Non-food applications

- Cosmetics
- Animal feed
- Plastics industry

Specifications: E 434

Polyoxyethylene sorbitan monopalmitate (Polysorbate 40)

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Content	min. 97% (anhydrous base)	97.0-103.0% (anhydrous base)		A 34
Oxyethylene content	min. 66%	66.0-70.5%		A 34
Acid value	max. 2	max. 2		A 18
Saponification value	41-52	41-52		A 19
Hydroxyl value	90-107	90-107		A 20
Water	max. 3%	max. 3%		A 10
1,4-Dioxane	max. 5 mg/kg			A 9
Ethylene oxide	max. 0.2 mg/kg			No method available
Ethylene glycols (mono- and di-)	max. 0.25%			A 38
Sulphated ash		max. 0.25%		A 6
Arsenic	max. 3 mg/kg			A 3
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 5, 1974, page 254-263. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifteenth Series, 1985.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyoxyethylene sorbitan monostearate (Polysorbate 60)

E Number: E 435

1. Name

English	Polyoxyethylene sorbitan monostearate
German	Polyoxyethylen-sorbitan-monostearat
French	Monostéarate de polyoxyéthylène sorbitane
Dutch	Polyoxyethyleen-20-sorbitaan-monostearaat
Spanish	Monoestearato de sorbitan polioxietileno
Portuguese	Monoestearato de polioxietileno 20 sorbitano
Italian	Monostearato di poliossietilensorbitano
Danish	Polyoxyethylensorbitanmonostearat
Swedish	Polyoxietylensorbitanmonostearat
Finnish	Polyoksyetyleenisorbitaanimonostearaatti
Greek	Μονοστεατική πολυοξυ-αιθυλενο-σορβιτάνη

Synonyms

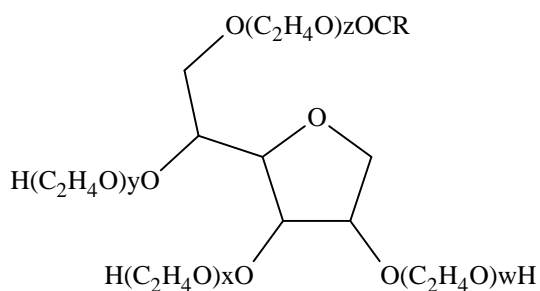
Polysorbate; polyoxyethylene (20) sorbitan monostearate; sorbitan mono-octa-decanoate; poly(oxy-1,2-ethanediyl) derivative.

2. Description

2.1. Chemical description and typical process

Polyoxyethylene sorbitan monostearate is a mixture of the partial esters of sorbitol and its mono- and dianhydrides with edible commercial stearic acid, condensed with approximately 20 moles of ethylene oxide per mole of sorbitol and its anhydrides.

A nominal formula for polyoxyethylene sorbitan monostearate is as follows:



where $w + x + y + z =$ approximately 20 and RCO- is the stearic acid moiety.

2.2. Appearance

Polyoxyethylene sorbitan monostearate is a lemon to orange- coloured oily liquid or semi-gel at 25°C , with a faint characteristic odour and a warm, somewhat bitter taste.

2.3. Solubility

Polyoxyethylene sorbitan monostearate is soluble in cold and hot water, ethyl acetate and toluene. It is insoluble in mineral and vegetable oil.

3. Analysis and specifications

See attached specification sheet.

Specifications: E 435

Polyoxyethylene sorbitan monostearate (Polysorbate 60)

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Content	min. 97% (anhydrous base)	97.0-103.0% (anhydrous base)	97.0-103.0% (anhydrous base)	A 34
Oxyethylene content	min. 65%	65.0-69.5%	65.0-69.5%	A 34
Acid value	max. 2	max. 2	max. 2	A 18
Saponification value	45-55	41-52	45-55	A 19
Hydroxyl value	81-96	90-107	81-96	A 20
Water	max. 3%	max. 3%	max. 3.0%	A 10
1,4-Dioxane	max. 5 mg/kg	max. 10 mg/kg	max. 10 mg/kg	A 9
Ethylene oxide	max. 0.2 mg/kg			No method available
Ethylene glycols (mono- and di-)	max. 0.25%			A 38
Sulphated ash		max. 0.25%		A 6
Residue on ignition			max. 0.25%	A 6
Stearic and palmitic acids			21.5-26.0 g / 100 g	(3)
Arsenic	max. 3 mg/kg			A 3
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

[⌘] do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 787.
- (4) WHO Food Additives Series No. 5, 1974, page 254-263. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifteenth Series, 1985.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyoxyethylene sorbitan tristearate (Polysorbate 65)

E Number: E 436

1. Name

English	Polyoxyethylene sorbitan tristearate
German	Polyoxyethylen-sorbitan-tristearat
French	Tristéarate de polyoxyéthylène sorbitane
Dutch	Polyoxyethyleen-20-sorbitaan-tristearaat
Spanish	Triestearato de sorbitan polioxietileno
Portuguese	Triestearato de polioxietileno 20 sorbitano
Italian	Triestearato di poliossietilensorbitano
Danish	Polyoxyethylensorbitantristearat
Swedish	Polyoxietylensorbitantristearat
Finnish	Polyoksyetyleenisorbitaanitristearaatti
Greek	Τριστεατική πολυοξυ-αιθυλενο-σορβιτάνη

Synonyms

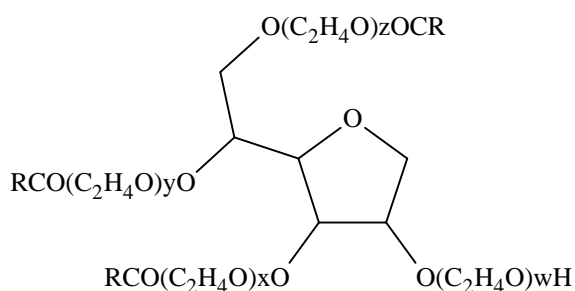
Polysorbate; polyoxyethylene (20) sorbitan tristearate.

2. Description

2.1. Chemical description and typical process

Polyoxyethylene sorbitan tristearate is a mixture of the partial esters of sorbitol and its mono- and dianhydrides with edible commercial stearic acid, condensed with approximately 20 moles of ethylene oxide per mole of sorbitol and its anhydrides.

A nominal formula for polyoxyethylene sorbitan tristearate is as follows:



where $w + x + y + z =$ approximately 20 and $RCO-$ is the stearic acid moiety.

2.2. Appearance

Polyoxyethylene sorbitan tristearate is a tan-coloured, waxy solid at $25^\circ C$, with a faint characteristic odour and a waxy, somewhat bitter taste.

2.3. Solubility

Polyoxyethylene sorbitan tristearate is dispersible in cold and hot water. It is soluble in mineral and vegetable oil, petroleum ether, acetone, ether, dioxane, ethanol and methanol.

3. Analysis and specifications

See attached specification sheet.

Specifications: E 436

Polyoxyethylene sorbitan tristearate (Polysorbate 65)

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Content	96% (anhydrous base)	96.0-104.0% (anhydrous base)	96.0-104.0% (anhydrous base)	A 34
Oxyethylene content	min. 46%	46.0-50.0%	46.0-50.0%	A 34
Congealing range	29-33°C	29-33°C		A 35
Acid value	max. 2	max. 2	max. 2	A 18
Saponification value	88-98	88-98	88-98	A 19
Hydroxyl value	40-60	40-60	44-60	A 20
Water	max. 3%	max. 3%	max. 3.0%	A 10
1,4-Dioxane	max. 5 mg/kg	max. 10 mg/kg	max. 10 mg/kg	A 9
Ethylene oxide	max. 0.2 mg/kg			No method available
Ethylene glycols (mono- and di-)	max. 0.25%			A 38
Sulphated ash		max. 0.25%		A 6
Residue on ignition			max. 0.25%	A 6
Stearic and palmitic acids			42-44 g / 100 g	(3)
Arsenic	max. 3 mg/kg			A 3
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 789.
- (4) WHO Food Additives Series No. 5, 1974, page 254-263. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifteenth Series, 1985.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Ammonium phosphatides

E Number: E 442

1. Name

English	Ammonium phosphatides
German	Ammoniumsalze von Phosphatidsäuren
French	Phosphatides d'ammonium
Dutch	Ammoniumfosfatiden
Spanish	Fosfátidos de amonio
Portuguese	Fosfatidatos de amónio
Italian	Fosfati d'ammonio
Danish	Ammoniumphosphatider
Swedish	Ammoniumfosfatider
Finnish	Ammoniumfosfatidit
Greek	Φωσφατίδια του αμμωνίου

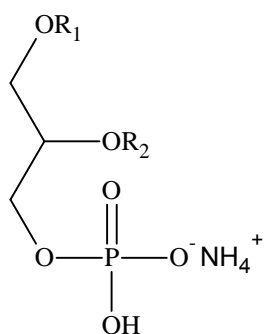
Synonyms

Ammonium salts of phosphatidic acid; mixed ammonium salts of phosphorylated glycerides; EMULSIFIER YN.

2. Description

2.1. Chemical description and typical process

The product consists of a mixture of the ammonium compounds of phosphatidic acids derived from edible fat and oil (usually partially hardened rapeseed oil) together with unreacted fat and oil. The structural formula of the principal components is:



where R_1 , R_2 or both represent a fatty acid moiety and the other may represent a fatty acid moiety or hydrogen. Moreover, two phosphorus esters may be linked together as phosphatidyl phosphatides.

The product is produced by phosphorylating partial fatty esters of glycerol. Ammonium salts are then formed by neutralisation with ammonia.

2.2. Appearance

The product is an unctuous semi-solid at 25°C .

2.3. Solubility

The product is insoluble in water, partially soluble in ethanol and acetone and soluble in fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Ammonium phosphatides have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-30 mg/kg bw

5. Typical applications in food

Ammonium phosphatides are used to control the viscosity of molten chocolate as a flavour-free substitute for soya lecithin.

Within the EU ammonium phosphatides are permitted in (6):

- Cocoa and chocolate products as defined in Directive 73/241/EEC including fillings
- Confectionery based on these products

6. Non-food applications

No specific application.

Specifications: E 442

Ammonium phosphatides

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Phosphorus content	3-3.4%	3.0-3.4%		(2)
Ammonium content calculated as nitrogen (N)	1.2-1.5%	1.2-1.5%		(2)
Petroleum ether insoluble matter	max. 2.5%			A 13
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

[⌘] do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 6, 1975, page 160-163. Toxicological evaluation of some food colours, enzymes, flavours enhancers, thickening agents, and certain other food additives.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sodium, potassium and calcium salts of fatty acids

E Number: E 470a

1. Name

English	Sodium, potassium and calcium salts of fatty acids
German	Natrium-, Kalium- und Calciumsalze von Speisefettsäuren
French	Sels de sodium, de potassium et de calcium d'acides gras
Dutch	Natrium-, kalium- en calciumzouten van vetzuren
Spanish	Sales sódicas, potásicas y cálcicas de ácidos grasos
Portuguese	Sais de cálcio, potássio e sódio de ácidos gordos
Italian	Sali di sodio, di potassio e di calcio degli acidi grassi
Danish	Natrium-, kalium- og calciumsalte af fedtsyrer
Swedish	Natrium-, kalium- och kalciumsalter av fettsyror
Finnish	Rasvahappojen natrium-, kalium- ja kalsiumsuolat
Greek	Άλατα λιπαρών οξέων με νάτριο, κάλιο και ασβέστιο

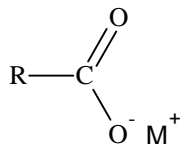
Synonyms

Salts of myristic, palmitic and stearic acids; salts of fatty acids; “soaps”; “stearates”.

2. Description

2.1. Chemical description and typical process

The structural formula of the principal components is:



M = Na, K or $\frac{1}{2}\text{Ca}$

RCOO represents a fatty acid moiety.

The salts are prepared by the interaction of sodium, potassium or calcium hydroxides or carbonates with edible oils or fats or food grade distilled fatty acids derived from such oils or fats.

2.2. Appearance

Sodium, potassium and calcium salts of fatty acids occur as white or creamy white to yellow solids or semi-solids.

2.3. Solubility

Sodium and potassium salts are soluble in water. Calcium salts are insoluble in water.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sodium, potassium and calcium salts of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU sodium, potassium and calcium salts of fatty acids are generally permitted for use in foodstuffs (6).

Sodium, potassium and calcium salts of fatty acids are used either alone or together with other fatty acid based emulsifiers, either by direct addition or, as a result of the manufacturing process, as co-emulsifiers. Applications include:

- Baked goods, e.g. bread, cakes, biscuits, rusks
- Confectionery, e.g. chewing gum, toffees, sugar confectionery
- Dairy products, e.g. imitation creams, desserts, edible ices
- Fats, e.g. margarines, spreads, shortenings
- Starch, e.g. mashed potatoes, pasta
- Salad dressings and sauces

6. Non-food applications

- Pharmaceutical and cosmetic preparations
- General washing and cleaning
- Paints
- Binding agents

Specifications: E 470a

Sodium, potassium and calcium salts of fatty acids

	EU (1)	FAO/WHO (2)	FCC ** (3)	Recommended Analytical Methods α
Fatty acid salts (anhydrous basis)	min. 95%	min. 95%		(2)
Unsaponifiable matter	max. 2%	max. 2%		(2)
Free fatty acids	max. 3% (as oleic acid)	max. 3%	max. 3.0% (as stearic acid)	A 15
Free alkali	max. 0.1% (as NaOH)			A 7 + A 8 ***
Matter insoluble in alcohol	max. 0.2%*			A 12
Sodium	9-14% (as Na ₂ O)			A 31
Potassium	13-21.5% (as K ₂ O)			A 30
Calcium	8.5-13% (as CaO)		9.0-10.5% (as CaO)	(3)
Loss on drying (105°, 1 h)			max. 4.0%	A 11
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Sodium and potassium salts only.

** Calcium salts only.

*** Free alkali in sodium salts - A 7
Free alkali in potassium salts - A 8
Free alkali in calcium salts - no official method.

α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): INS No 470 "Salts of Fatty Acids" - [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 151.
- (4) WHO Food Additives Series No. 5, 1974, page 19-20. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Twenty-fifth Series, 1990.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Magnesium salts of fatty acids

E Number: E 470b

1. Name

English	Magnesium salts of fatty acids
German	Magnesiumsalze von Speisefettsäuren
French	Sels de magnésium d'acides gras
Dutch	Magnesiumzouten van vetzuren
Spanish	Sales magnésicas de ácidos grasos
Portuguese	Sais de magnésio de ácidos gordos
Italian	Sali di magnesio degli acidi grassi
Danish	Magnesiumsalte af fedtsyrer
Swedish	Magnesiumsalter av fettsyror
Finnish	Rasvahappojen magnesiumsuolat
Greek	Άλατα λιπαρών οξέων με μαγνήσιο

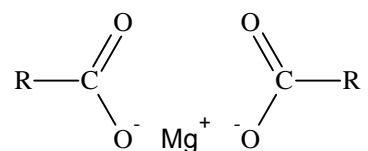
Synonyms

Magnesium salts of myristic, palmitic and stearic acids; magnesium salts of fatty acids; magnesium "soaps"; magnesium stearate.

2. Description

2.1. Chemical description and typical process

The structural formula of the principal components is:



RCOO represents a fatty acid moiety

The salts are prepared by the interaction of magnesium hydroxide or carbonate with edible oils or fats or food grade distilled fatty acids derived from such oils or fats.

2.2. Appearance

Magnesium salts of fatty acids occur as white or creamy-white light powders, flakes or semi-solids.

2.3. Solubility

Magnesium salts are insoluble in water and partially soluble in ethanol and ether.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Magnesium salts of fatty acids have been evaluated by the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU magnesium salts of fatty acids are generally permitted for use in foodstuffs (6).

Magnesium salts of fatty acids are used as anticaking and binding agents. In addition, they can also be used together with other fatty acid based emulsifiers, either by direct addition or, as a result of the manufacturing process, as co-emulsifiers. Applications include:

- Baked goods, e.g. bread, cakes, biscuits
- Confectionery, e.g. chewing gum, toffees, sugar confectionery
- Dairy products, e.g. milk powders, desserts, edible ices
- Fats, e.g. margarines, spreads, shortenings
- Starch, e.g. mashed potatoes, pasta
- Salad dressings and sauces
- Instant drinks

6. Non-food applications

- Pharmaceutical and cosmetic preparations
- Anticaking agent
- Binding and tableting agent.

Specifications: E 470b

Magnesium salts of fatty acids

	EU (1)	FAO/WHO (2)	FCC* (3)	Recommended Analytical Methods \square
Fatty acid salts (anhydrous basis)	min. 95%			No official method
Unsaponifiable matter	max. 2%			A 14
Free fatty acids	max. 3% (as oleic acid)			A 15
Free alkali	max. 0.1% (as MgO)			No official method
Magnesium	6.5-11% (as MgO)		6.8-8.3% (as MgO)	(3)
Loss on drying (105°, 1 h)			max 4.0%	A 11
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg		max. 5 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Magnesium stearate.

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) No FAO/WHO specifications available.
- (3) Food Chemicals Codex, 6th Edition, 2008, page 568.
- (4) No WHO evaluation available.
- (5) Reports of the Scientific Committee for Food, Twenty-fifth Series, 1990.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Mono- and diglycerides of fatty acids

E Number: E 471

1. Name

English	Mono- and diglycerides of fatty acids
German	Mono- und Diglyceride von Speisefettsäuren
French	Mono- et diglycérides d'acides gras
Dutch	Mono- en diglyceriden van vetzuren
Spanish	Mono- y diglicéridos de ácidos grasos
Portuguese	Mono e diglicéridos de ácidos gordos
Italian	Mono- e digliceridi degli acidi grassi
Danish	Mono- og diglycerider af fedtsyrer
Swedish	Mono- och diglycerider av fettsyror
Finnish	Rasvahappojen mono- ja diglyseridit
Greek	Μono- και δι-γλυκερίδια λιπαρών οξέων

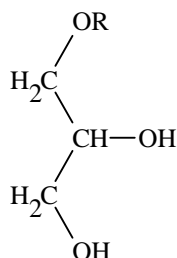
Synonyms

Glyceryl monostearate, glyceryl monopalmitate, glyceryl monooleate, etc.; monostearin, monopalmitin, monoolein, etc.; GMS (for glycerol monostearate).

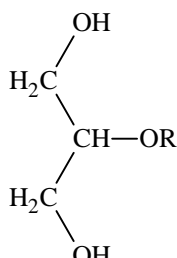
2. Description

2.1. Chemical description and typical process

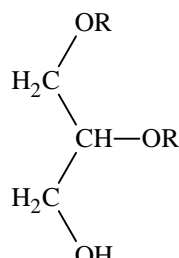
These products consist of the mono and diesters formed between glycerol and fatty acids occurring in food oils and fats. The structural formulae of the principal components are:



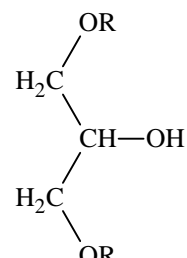
1-monoester
 α -monoester



2-monoester
 β -monoester



1,2-diester
 α,β -diester



1,3-diester
 α,α -diester

R represents a fatty acid moiety.

The products are produced either by heating oils or fats with an excess of glycerol or by direct esterification of glycerol with fatty acids.

The proportion of monoester thus produced is dependent on the proportion of glycerol and the temperature of reaction and is usually in the range of 30-60%. Products with more than 90% monoester content are produced by high vacuum distillation or other techniques.

2.2. Appearance

The product varies from a pale straw to brown oily liquid to a white or slightly off-white waxy solid. The solids may be in the form of flakes, powders or small beads.

2.3. Solubility

The product is typically insoluble in water but can form stable hydrated dispersions.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Mono- and diglycerides of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU mono- and diglycerides of fatty acids are generally permitted for use in foodstuffs (6).

Mono- and diglycerides of fatty acids are used principally as emulsifiers, starch-complexing agents and aerating agents and they are widely used. Applications include:

- Baked goods, e.g. bread, cakes
- Confectionery, e.g. chewing gum, toffees, caramels
- Dairy products, e.g. imitation creams, desserts, edible ices
- Fats, e.g. margarines, shortenings
- Starch, e.g. mashed potatoes, pasta

6. Non-food applications

- Cosmetic creams
- Pharmaceutical preparations
- Cement and concrete additives
- Polishes
- Shoe waxes
- Plastics industry

Specifications: E 471

Mono- and diglycerides of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Mono- and diesters	min. 70%			A 27
α -monoglyceride content		min. 30%		A 28
Total glycerol	16-33%			A 22
Free glycerol	max. 7%	max. 7%	max. 7.0%	A 16
Polyglycerols **	max. 4% + 1%			A 26
Soap (as sodium oleate)		max. 6%		(2)
Sulphated ash	max. 0.5%			A 6
Acid value	max. 6	max. 6	max. 6	A 18
Water	max. 2%	max. 2.0%		A 10
Residue on ignition			max. 0.5%	A 6
Arsenic	max. 3 mg/kg		max. 3 mg/kg	A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

** Not more than 4% diglycerol and not more than 1% higher polyglycerols both based on total glycerol content.

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC of 27 August](#) on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 655.
- (4) WHO Food Additives Series No. 5, 1974, page 238-240. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Fifth Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Acetic acid esters of mono- and diglycerides of fatty acids

E Number: E 472a

1. Name

English	Acetic acid esters of mono- and diglycerides of fatty acids
German	Essigsäureester von Mono- und Diglyceriden von Speisefettsäuren
French	Esters acétiques des mono- et diglycérides d'acides gras
Dutch	Mono- en diglyceriden van vetzuren veresterd met azijnzuur
Spanish	Ésteres acéticos de los mono- y diglicéridos de los ácidos grasos
Portuguese	Ésteres acéticos de mono e diglicéridos de ácidos gordos
Italian	Esteri acetici di mono- e digliceridi degli acidi grassi
Danish	Eddikesyreestere af mono- og diglycerider af fedtsyrer
Swedish	Mono- och diglyceriders ättiksyrastrar
Finnish	Rasvahappojen mono- ja diglyseridien etikkahappoesterit
Greek	Εστέρες του οξικού οξέος με μονο- και δι-γλυκερίδια λιπαρών οξέων

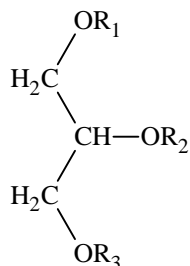
Synonyms

ACETEM; acetic acid esters of mono- and diglycerides; acetoglycerides; acetylated mono- and diglycerides; acetic and fatty acid esters of glycerol; acetylated monoglycerides.

2. Description

2.1. Chemical description and typical process

The product is a mixture of esters of acetic acid and fatty acids occurring in food fats with glycerol. The structural formula of the principal components is:



where at least one of R₁, R₂ or R₃ represents an acetic acid moiety, one represents a fatty acid moiety, and the remainder may represent acetic acid, fatty acid or hydrogen.

The distribution of the principal components is dependent on the proportion of acetic acid, fatty acids and glycerol and the reaction conditions used.

The product may be manufactured by reacting mono- and diglycerides of edible fatty acids with acetic anhydride or by transesterification of edible fats with triacetin.

2.2. Appearance

The product is a colourless to ivory, oily to waxy material with a consistency determined by the fatty acids and the proportion of acetic acid.

2.3. Solubility

The product is typically insoluble in cold and hot water and dispersible to soluble in edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Acetic acid esters of mono- and diglycerides of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU acetic acid esters of mono- and diglycerides are generally permitted for use in foodstuffs (6).

Acetic acid esters of mono- and diglycerides have excellent aerating and foam stabilising properties. They are also used as lubricants and release agents. Applications include:

- Topping powders
- Chewing gum base
- Coatings
- Cakes

6. Non-food applications

- Emulsifier in cosmetic preparations
- Plasticiser and slip agent for waxes on paper products
- Solvating plasticiser for polyvinyl chloride and other plastics

Specifications: E 472a

Acetic acid esters of mono- and diglycerides of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Total acetic acid	9-32%			A 23
Total glycerol	14-31%			A 22
Free glycerol	max. 2%			A 16
Free fatty acids (and acetic acid) (as oleic acid)	max. 3%			A 15
Sulphated ash	max. 0.5%			A 6
Acid value			max. 6	A 18
Reichert-Meissl value			75-200	A 32
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 18.
- (4) WHO Food Additives Series No. 5, 1974, page 210-213. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Lactic acid esters of mono- and diglycerides of fatty acids

E Number: E 472b

1. Name

English	Lactic acid esters of mono- and diglycerides of fatty acids
German	Milchsäureester von Mono- und Diglyceriden von Speisefettsäuren
French	Esters lactiques des mono- et diglycérides d'acides gras
Dutch	Mono- en diglyceriden van vetzuren veresterd met melkzuur
Spanish	Ésteres lácticos de los mono- y diglicéridos de los ácidos grasos
Portuguese	Ésteres lácticos de mono e diglicéridos de ácidos gordos
Italian	Esteri lattici di mono- e digliceridi degli acidi grassi
Danish	Mælkesyreestere af mono- og diglycerider af fedtsyrer
Swedish	Mono- och diglyceriders mjölksyraestrar
Finnish	Rasvahappojen mono- ja diglyseridien maitohappoesterit
Greek	Εστέρες του γαλακτικού οξέος με μονο- και δι-γλυκερίδια λιπαρών οξέων

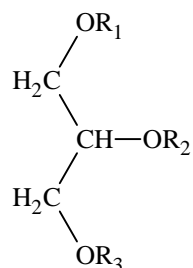
Synonyms

LACTEM; lactic acid esters of mono- and diglycerides; lactoglycerides; lactic and fatty acid esters of glycerol; mono- and diglycerides of fatty acids esterified with lactic acid; glyceryl-lacto esters of fatty acids; lactated mono-diglycerides; GLP.

2. Description

2.1. Chemical description and typical process

The product consists of esters of glycerol with lactic acid and fatty acids occurring in food fats. The structural formula of the principal components is:



where at least one of R_1 , R_2 or R_3 represents a lactic acid moiety, one represents a fatty acid moiety, and the remainder may represent lactic acid, fatty acid or hydrogen.

The distribution of the principal components is dependent on the proportion of lactic acid, fatty acids and glycerol and the reaction conditions used.

The product may be manufactured by the esterification of glycerol with lactic acid and edible fatty acids or by lactylation of a mixture of mono- and diglycerides of edible fatty acids.

2.2. Appearance

The product is a light yellow to amber-coloured, oily to waxy material with a consistency determined by the fatty acids and the proportion of lactic acid.

2.3. Solubility

The product is typically dispersible in hot water, indispersible in cold water and soluble in edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Lactic acid esters of mono- and diglycerides of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU lactic acid esters of mono- and diglycerides are generally permitted for use in foodstuffs (6).

Lactic acid esters of mono- and diglycerides are used to improve aeration and foam stability as well as texture and volume. Applications include:

- Topping powders
- Non-dairy creams
- Dairy and recombined creams
- Fine bakery wares
- Shortening
- Chocolate compounds

6. Non-food applications

No specific applications.

Specifications: E 472b

Lactic acid esters of mono- and diglycerides of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods α
Total lactic acid	13-45%			A 24
Total glycerol	13-30%			A 22
Free glycerol	max. 2%			A 16
Free fatty acids (and lactic acid) (as oleic acid)	max. 3%			A 15
Sulphated ash	max. 0.5%			A 6
Unsaponifiable matter			max. 2.0%	A 14
Residue on ignition			max. 0.1%	A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 0.5 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 524.
- (4) WHO Food Additives Series No. 5, 1974, page 231-233. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Citric acid esters of mono- and diglycerides of fatty acids

E Number: E 472c

1. Name

English	Citric acid esters of mono- and diglycerides of fatty acids
German	Citronensäureester von Mono- und Diglyceriden von Speisefettsäuren
French	Esters citriques des mono- et diglycérides d'acides gras
Dutch	Mono- en diglyceriden van vetzuren veresterd met citroenzuur
Spanish	Ésteres cítricos de los mono- y diglicéridos de los ácidos grasos
Portuguese	Ésteres cítricos de mono e diglicéridos de ácidos gordos
Italian	Esteri citrici di mono- e digliceridi degli acidi grassi
Danish	Citronsyreestere af mono- og diglycerider af fedtsyrer
Swedish	Mono- och diglyceriders citronsyrastrar
Finnish	Rasvahappojen mono- ja diglyseridien sitruunahappoesterit
Greek	Εστέρες του κιτρικού οξέος με μονο- και δι-γλυκερίδια λιπαρών οξέων

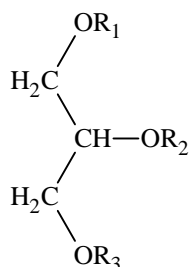
Synonyms

CITREM; citric acid esters of mono- and diglycerides; citroglycerides; citric and fatty acid esters of glycerol; mono- and diglycerides of fatty acids esterified with citric acid.

2. Description

2.1. Chemical description and typical process

The product is a mixture of esters of citric acid and edible fatty acids with glycerol. The structural formula of the principal components is:



where at least one of R_1 , R_2 or R_3 represents a citric acid moiety, one represents a fatty acid moiety, and the remainder may represent citric acid, fatty acid or hydrogen.

The distribution of the principal components is dependent on the proportion of citric acid, fatty acids and glycerol and the reaction conditions used. The product can be partially or wholly neutralised to the corresponding sodium or potassium salts.

The esters may be produced by the esterification of glycerol with citric acid and edible fatty acids or by reaction of a mixture of mono- and diglycerides of edible fatty acids with citric acid.

2.2. Appearance

The product is a white to ivory-coloured, oily to waxy material of a consistency determined by the fatty acids.

2.3. Solubility

The product is typically dispersible in hot water, insoluble in cold water and soluble in edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Citric acid esters of mono- and diglycerides of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): not specified

5. Typical applications in food

Within the EU citric acid esters of mono- and diglycerides of fatty acids are generally permitted for use in foods (6).

The product is widely used within the food industry, e.g. as an emulsifier, stabiliser, antispattering agent, flour improver, protein-binding agent and as a synergist for antioxidants. The following should only be considered as typical major applications:

- In fats for stabilising, also as synergists for antioxidants
- In baking fat emulsions, bakery margarines and shortening for stabilising
- In flour for improving the baking performance of “ready-to-use” flours
- In bread dough or other yeast doughs for improving baking performance
- In margarine as emulsifiers and antispattering agents
- In mayonnaise, salad dressings, sauces etc. as emulsifiers and stabilisers
- In sausages for enhancing the binding effects of meat
- In low-calorie food for fats, shortenings and baking fat emulsions with high water content to lower the fat intake

6. Non-food applications

- Pharmaceutical preparations and cosmetic creams
- As blending agent in coatings for cellophane food-contact film

Specifications: E 472c

Citric acid esters of mono- and diglycerides of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Total citric acid	13-50%	13-50%		(2)
Total glycerol	8-33%	8-33%		(2)
Free glycerol	max. 2%	max. 4%		A 16
Free fatty acids (as oleic acid)	max. 3%			No official method
Total fatty acids (as oleic acid)		37-81%		(2)
Sulphated ash	max. 0.5% max10%**	max. 0.5% max. 10%**		A 6
Arsenic				A 3
Heavy metals (as Pb)				A 1
Lead	max. 2 mg/kg	max. 2 mg/kg		A 2
Mercury				A 5
Cadmium				A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

** Not neutralised products: max. 0.5%; partially or wholly neutralised products: max. 10%.

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 5, 1974, page 220-221. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Mono- and diacetyl tartaric acid esters of mono- and diglycerides of fatty acids

E Number: E 472e

1. Name

English	Mono- and diacetyl tartaric acid esters of mono- and diglycerides of fatty acids
German	Mono- und Diacetylweinsäureester von Mono- und Diglyceriden von Speisefettsäuren
French	Esters monoacétyltartrique et diacétyltartrique des mono- et diglycérides d'acides gras
Dutch	Mono- en diglyceriden van vetzuren veresterd met mono- en diacetylwijnsteenzuur
Spanish	Ésteres monoacetil y diacetil tartárico de los mono- y diglicéridos de los ácidos grasos
Portuguese	Ésteres monoacetiltartáricos e diacetiltartáricos de mono e diglicéridos de ácidos gordos
Italian	Esteri mono- e diacetiltartarici di mono- e digliceridi degli acidi grassi
Danish	Mono- og diacetylvinsyreestere af mono- og diglycerider af fedtsyrer
Swedish	Mono- och diglyceriders mono- och diacetylvinsyra-estrar
Finnish	Rasvahappojen mono- ja diglyseridien mono- ja diasetyyliviinihappoesterit
Greek	Εστέρες του μονο- και δι-ακετυλο-τρυγικού οξέος με μονο- και δι-γλυκερίδια λιπαρών οξέων

Synonyms

DATEM; diacetyltartaric acid esters of mono- and diglycerides; mono- and diglycerides of fatty acids esterified with mono- and diacetyltartaric acid; diacetyltartaric and fatty acid esters of glycerol.

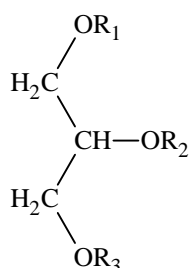
2. Description

2.1. Chemical description and typical process

Mono- and diacetyl tartaric acid esters of mono- and diglycerides can be described as esters of glycerol with mono- and diacetyl tartaric acids and fatty acids occurring in food fats and oils.

The products are obtained either by reacting mono- and diglycerides of fatty acids with diacetyl tartaric acid anhydride in the presence of acetic acid or by esterification of mono- and diglycerides with tartaric acid and acetic acid in the presence of acetic acid anhydride.

Due to inter and intra-molecular acyl group exchange, both methods of production lead to the same essential components that can be described as follows:



in which one or two of R_1 , R_2 or R_3 is a fatty acid moiety. The remainder is either

- a) diacetylated tartaric acid moiety
- b) monoacetylated tartaric acid moiety
- c) tartaric acid moiety
- d) acetic acid moiety
- e) hydrogen

The distribution of the components described above depends on the relative proportions of the basic raw materials and the reaction conditions used. The products may contain small amounts of free glycerol, free fatty acids, free tartaric and acetic acids and their combinations and free glycerides.

2.2. Appearance

The product varies from sticky viscous liquids through a fat-like consistency to yellow waxes in flake or powder form, which hydrolyse in moist air to liberate acetic acid.

2.3. Solubility

The product is typically dispersible in cold and hot water and soluble in methanol, ethanol and acetone.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Mono- and diacetyl tartaric acid esters of mono- and diglycerides of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-50 mg/kg bw - evaluation by JECFA

Acceptable daily intake (ADI): 0-25 mg/kg bw (temp.) - evaluation by SCF

5. Typical applications in food

Within the EU mono- and diacetyl tartaric acid esters of mono- and diglycerides are generally permitted for use in foodstuffs (6).

Mono- and diacetyl tartaric acid esters of mono- and diglycerides are used as dough conditioners for all baked products, particularly yeast-leavened products, white bread and rusks, and in ready-mixed flours, particularly for use in the "all-in" method. Other applications include:

- Beverage whiteners
- Cream analogues
- Chewing gum
- Meat and poultry products
- Emulsified sauces
- Canned coffee or tea
- Carriers or solvents for colours and food antioxidants

6. Non-food applications

No specific applications.

Specifications: E 472e

Mono- and diacetyl tartaric acid esters of mono- and diglycerides of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Total tartaric acid	10-40%	10-40%	17.0-20.0 g / 100 g	(2)
Total acetic acid	8-32%	8-32%	14.0-17.0 g / 100 g	(2)
Total glycerol	11-28%	11-28%	12.0 g / 100 g	(2)
Free glycerol	max. 2%	max. 2.0%		A 16
Free fatty acids (as oleic acid)	max. 3%	max. 3%		No official method
Total fatty acids			min. 56.0 g / 100 g	A 21
Sulphated ash	max. 0.5%	max. 0.5%		A 6
Acid value			62-76	A 18
Residue on ignition			max. 0.01%	A 6
Saponification value			380-425	A 19
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): INS 472e and 472 f “Diacetyl tartaric and fatty acid esters of Glycerol” - [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 256.
- (4) WHO Food Additives Series No. 5, 1974, page 222-224. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.

SUMMARY AND CONCLUSIONS. JECFA 61. meeting Rome, 10-19 June 2003.
- (5) Minutes of the 107th Meeting of the Scientific Committee for Food, 1997.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Mixed acetic and tartaric acid esters of mono- and diglycerides of fatty acids

E Number: E 472f

1. Name

English	Mixed acetic and tartaric acid esters of mono- and diglycerides of fatty acids
German	Gemischte Essig- und Weinsäureester von Mono- und Diglyceriden von Speisefettsäuren
French	Esters mixtes acétiques et tartriques des mono- et diglycérides d'acides gras
Dutch	Mono- en diglyceriden van vetzuren veresterd met een mengsel van azijnzuur en wijnsteenzuur
Spanish	Ésteres mixtos acéticos y tartáricos de los mono- y diglicéridos de los ácidos grasos
Portuguese	Ésteres mistos acéticos e tartáricos de mono e diglicéridos de ácidos gordos
Italian	Esteri misti acetici-tartarici di mono- e digliceridi degli acidi grassi
Danish	Blandede eddike- og vinsyreestere af mono- og diglycerider af fedtsyrer
Swedish	Blandning av mono- och diglyceriders ättiksyra- och vinsyrastrar
Finnish	Rasvahappojen mono- ja diglyseridien sekoitetut etikka- ja viinihappoesterit
Greek	Μικτοί εστέρες του οξικού και τρυγικού οξέος με μονο- και δι-γλυκερίδια λιπαρών οξέων

Synonyms

MATEM; mono- and diglycerides of fatty acids esterified with acetic acid and tartaric acid; tartaric, acetic and fatty acid esters of glycerol, mixed.

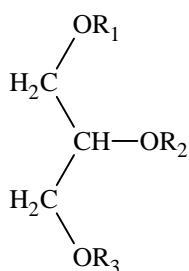
2. Description

2.1. Chemical description and typical process

Mixed acetic and tartaric acid esters of mono- and diglycerides of fatty acids can be described as esters of glycerol with acetic and tartaric acids and fatty acids occurring in food fats and oils.

The products are obtained either by reacting mono- and diglycerides of fatty acids with tartaric acid anhydride in the presence of acetic acid or by esterification of mono- and diglycerides with tartaric acid and acetic acid in the presence of acetic acid anhydride.

Due to inter and intra-molecular acyl group exchange, both methods of production result in the same essential components. These can be described as follows:



in which one or two of R_1 , R_2 or R_3 is a fatty acid moiety. The remainder is either

- a) tartaric acid moiety
- b) acetic acid moiety
- c) hydrogen
- d) diacetylated tartaric acid moiety
- e) monoacetylated tartaric acid moiety

The distribution of the components described above depends on the relative proportions of the basic raw materials and the reaction conditions used. The products may contain small amounts of free glycerol, free fatty acids, free tartaric and acetic acids and free glycerides. The product may contain mono- and diacetyltartaric esters of mono- and diglycerides of fatty acids.

2.2. Appearance

The product varies from sticky liquids to solids, from white to pale-yellow in colour.

2.3. Solubility

The product is typically dispersible in water and soluble in methanol, ethanol and acetone.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Mixed acetic and tartaric acid esters of mono- and diglycerides of fatty acids have been evaluated by the Scientific Committee for Food (4). This emulsifier has also been considered by the Joint FAO/WHO Expert Committee on Food Additives in conjunction with DATEM (5).

Evaluation status

Acceptable daily intake (ADI): not specified - evaluation by SCF

Acceptable daily intake (ADI): 0-50 mg/kg bw - evaluation by JECFA

5. Typical applications in food

Within the EU mixed acetic and tartaric acid esters of mono- and diglycerides are generally permitted for use in foodstuffs (6).

Mixed acetic and tartaric acid esters of mono- and diglycerides are used as dough conditioners for all baked products, particularly yeast-leavened products, white bread and rusks, and in ready-mixed flours, particularly for use in the "all-in" method. Other applications include:

- Beverage whiteners
- Cream analogues
- Chewing gum
- Meat and poultry products
- Emulsified sauces
- Canned coffee or tea
- Carriers or solvents for colours and food antioxidants

6. Non-food applications

No specific applications.

Specifications: E 472f

Mixed acetic and tartaric acid esters of mono- and diglycerides of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Total tartaric acid	20-40%	10-40%		(2)
Total acetic acid	10-20%	8-32%		(2)
Total glycerol	12-27%	11-28%		(2)
Free glycerol	max. 2%	max. 2.0%		A 16
Free fatty acids (as oleic acid)	max. 3%	max. 3%		No official method
Sulphated ash	max. 0.5%	max. 0.5%		A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): INS 472e and 472 f “Diacetyl tartaric and fatty acid esters of Glycerol” - [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (5) SUMMARY AND CONCLUSIONS. JECFA 61. meeting Rome, 10-19 June 2003.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sucrose esters of fatty acids

E Number: E 473

1. Name

English	Sucrose esters of fatty acids
German	Zuckerester von Speisefettsäuren
French	Sucroesters d'acides gras
Dutch	Sucrose-vetzuuresters
Spanish	Sucroésteres de ácidos grasos
Portuguese	Ésteres de sacarose de ácidos gordos
Italian	Esteri di saccarosio degli acidi grassi
Danish	Saccharoseestere af fedtsyrer
Swedish	Sackarosestrar av fettsyror
Finnish	Rasvahappojen sakkaroosiesterit
Greek	Εστέρες λιπαρών οξέων με σακχαρόζη

Synonyms

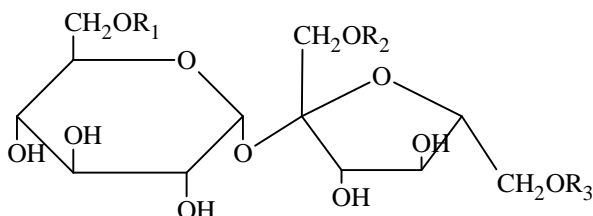
Sucroesters; sugar esters; sucrose fatty acid esters.

2. Description

2.1. Chemical description and typical process

Sucrose esters of fatty acids are essentially the mono-, di- and triesters of sucrose with fatty acids occurring in food fats and oils.

The structural formula of the principal components is:



where at least one of R₁, R₂ or R₃ represents a fatty acid moiety and the remainder may represent fatty acid or hydrogen.

The products may be prepared from sucrose and the methyl and ethyl esters of food fatty acids or by extraction from sucroglycerides.

Depending on the food legislation applicable the following organic solvents are used in their production: dimethylsulphoxide, dimethylformamide, ethyl acetate, propane-2-ol, 2-methyl-1-propanol, propylene glycol, methyl ethyl ketone or isobutanol.

2.2. Appearance

Products based on saturated fatty acids are white to slightly greyish powders.

Products based on unsaturated fatty acids are yellowish, pasty to waxy substances.

2.3. Solubility

The products are sparingly soluble in water and soluble in ethanol. They are insoluble in vegetable oils.

The more fatty acids are linked to saccharose, the higher the fat solubility and the lower the swelling ability in water.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sucrose esters of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4).

Evaluation status

Acceptable daily intake (ADI): 0-30 mg/kg bw
(Group ADI for sucrose esters of fatty acids and sucroglycerides)

5. Typical applications in food

Sucrose esters of fatty acids are used, for instance, as aerating and starch-complexing agents. They are also used to improve fat dispersion and stability.

Within the EU sucrose esters of fatty acids are permitted in (5):

- Canned liquid coffee
- Heat-treated meat products
- Fat emulsions for baking purposes
- Fine bakery wares
- Beverage whiteners
- Edible ices
- Chewing gum
- Sugar confectionery
- Desserts
- Cream analogues
- Sterilised cream
- Sauces
- Soups and broths
- Fresh fruits, surface treatment
- Non-alcoholic aniseed-based drinks
- Non-alcoholic coconut and almond drinks
- Spirituous beverages (excluding wine and beer)
- Powders for the preparation of hot beverages
- Dairy-based drinks
- Dietary food supplements
- Dietetic foods intended for medical purposes
- Carriers and solvents for colours and fat-soluble antioxidants

6. Non-food applications

In cosmetics and pharmaceuticals as emulsifiers in creams, lotions, cleansing lotions and ointments.

Specifications: E 473

Sucrose esters of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Content	min. 80%	min. 80%	min. 80.0%	(2)
Free sugar	max. 5%	max. 5%	max. 5.0%	(2)
Free fatty acids (as oleic acid)	max. 3%			A 15
Sulphated ash	max. 2%	max. 2%		A 6
Dimethyl formamide	max. 1 mg/kg	max. 1 mg/kg		(2)
Dimethyl sulphoxide	max. 2 mg/kg	max. 2 mg/kg	max. 2 mg/kg	(2)
Methanol	max. 10 mg/kg	max. 10 mg/kg	max. 10 mg/kg	(2)
2-methyl-1- propanol	max. 10 mg/kg			No official method
Ethyl acetate, propane-2-ol, propylene glycol	max. 350 mg/kg singly or in combination	max. 350 mg/kg singly or in combination		(2)
Ethyl acetate			max. 350 mg/kg	(2)
Methyl ethyl ketone	max. 10 mg/kg	max. 10 mg/kg	max. 10 mg/kg	(2)
Isobutanol		max. 10 mg/kg	max. 10 mg/kg	(2)
Acid value		max. 6	max. 6	A 18
Residue on ignition			max. 2.0%	A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#); [monograph 4 \(2007\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 935.
- (4) WHO Food Additives Series No. 40, 1998, page 79-81. Safety evaluation of certain food additives and contaminants.
- (5) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sucroglycerides

E Number: E 474

1. Name

English	Sucroglycerides
German	Zuckerglyceride
French	Sucroglycérides
Dutch	Sucroglyceriden
Spanish	Sucroglicéridos
Portuguese	Sacaridoglicéridos
Italian	Sucrogliceridi
Danish	Saccharoseestere i blanding med mono- og diglycerider af fedtsyrer
Swedish	Mono- och diglyceriders sackarosestrar
Finnish	Sokeriglyseridit
Greek	Σακχαρογλυκερίδια

Synonyms

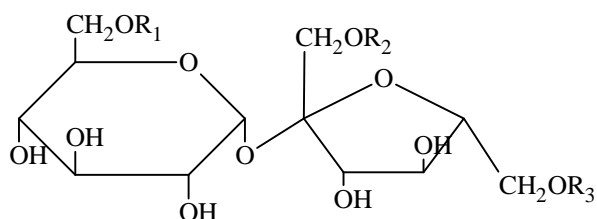
Sugar glycerides.

2. Description

2.1. Chemical description and typical process

Sucroglycerides are produced by reacting sucrose with an edible fat or oil to produce a mixture of essentially mono-, di- and triesters of sucrose and fatty acids together with residual mono-, di- and triglycerides from fat or oil.

The structural formula of the principal components is:



where at least one of R₁, R₂ or R₃ represents a fatty acid moiety and the remainder may represent fatty acid or hydrogen.

Depending on the food legislation applicable the following organic solvents are used in their production: dimethylformamide, ethyl acetate, propane-2-ol, 2-methyl-1-propanol, cyclohexane.

2.2. Appearance

Soft solid masses, stiff gels or white to off-white powders.

2.3. Solubility

Soluble in ethanol, insoluble in cold water.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sucroglycerides have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4).

Evaluation status

Acceptable daily intake (ADI): 0-30 mg/kg bw
(Group ADI for sucrose esters of fatty acids and sucroglycerides)

5. Typical applications in food

Sucroglycerides are used, for instance, as aerating and starch-complexing agents. They are also used to improve fat dispersion and stability.

Within the EU sucroglycerides are permitted in (5):

- Canned liquid coffee
- Heat-treated meat products
- Fat emulsions for baking purposes
- Fine bakery wares
- Beverage whiteners
- Edible ices
- Chewing gum
- Sugar confectionery
- Desserts
- Cream analogues
- Sterilised cream
- Sauces
- Soups and broths
- Fresh fruits, surface treatment
- Non-alcoholic aniseed-based drinks
- Non-alcoholic coconut and almond drinks
- Spirituous beverages (excluding wine and beer)
- Powders for the preparation of hot beverages
- Dairy-based drinks
- Dietary food supplements
- Dietetic foods intended for medical purposes
- Carriers and solvents for colours and fat-soluble antioxidants

6. Non-food applications

In cosmetics and pharmaceuticals as emulsifiers in creams, lotions, cleansing lotions and ointments.

Specifications: E 474

Sucroglycerides

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods \square
Sucrose fatty acid esters	40-60%	40-60%		(2)
Free sugar	max. 5%	max. 5%		(2)
Free fatty acids (as oleic acid)	max. 3%			A 15
Sulphated ash	max. 2%	max. 2%		A 6
Dimethyl formamide	max. 1 mg/kg	max. 1 mg/kg		(2)
Methanol	max. 10 mg/kg			(2)
2-methyl-1-propanol, cyclohexane	max. 10 mg/kg singly or in combination			(2)
Cyclohexane, isobutanol		max. 10 mg/kg singly or in combination		(2)
Ethyl acetate, propane-2-ol	max. 350 mg/kg singly or in combination	max. 350 mg/kg singly or in combination		(2)
Acid value		max. 6		A 18
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate)

\square do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 40, 1998, page 79-81. Safety evaluation of certain food additives and contaminants.
- (5) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyglycerol esters of fatty acids

E Number: E 475

1. Name

English	Polyglycerol esters of fatty acids
German	Polyglycerinester von Speisefettsäuren
French	Esters polyglycériques d'acides gras
Dutch	Polyglycerolesters van vetzuren
Spanish	Ésteres poliglicéridos de ácidos grasos
Portuguese	Ésteres de poliglicerol de ácidos gordos
Italian	Esteri poliglicerici degli acidi grassi
Danish	Polyglycerolestere af fedtsyrer
Swedish	Polyglycerolestrar av fettsyror
Finnish	Rasvahappojen polyglyseroliesterit
Greek	Πολυγλυκερίδια λιπαρών οξέων

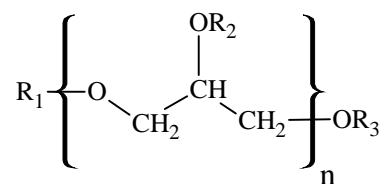
Synonyms

Polyglycerol fatty acid esters; polyglycerin esters of fatty acid esters; PGE.

2. Description

2.1. Chemical description and typical process

The product is a mixture of esters of polyglycerol and edible fatty acids. The structural formula of the principal components is:



where R_1 , R_2 and R_3 can be a fatty acid moiety or hydrogen and where the average value of n is greater than one.

The esters may be formed from a reaction between polyglycerols and edible fats, oils or fatty acids. The products can contain minor amounts of mono-, di-, and triglycerides together with free glycerol and polyglycerols and free fatty acids. Salts of fatty acids may also be present.

2.2. Appearance

The product is a light yellow to amber-coloured, oily to hard waxy material of a consistency determined by the fatty acids.

2.3. Solubility

The product is typically dispersible in water and soluble in edible oils.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Polyglycerol esters of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw

5. Typical applications in food

Polyglycerol esters are widely used in foods as aerating agents, crystal modifiers, starch-complexing agents, dough conditioners, humectants, defoaming agents and anti-spattering agents.

Within the EU polyglycerol esters of fatty acids are permitted in (6):

- Fine bakery wares
- Emulsified liqueurs
- Egg products
- Beverage whiteners
- Chewing gum
- Fat emulsions
- Milk and cream analogues
- Sugar confectionery
- Granola-type breakfast cereals
- Desserts
- Dietary food supplements
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control intended to replace total daily food intake or an individual meal
- Carriers and solvents for colours and fat-soluble antioxidants

6. Non-food applications

Pharmaceutical industries: as emulsifiers for ointment bases, creams and lotions as well as solubilisers and bases for controlled release tablets and suppositories.

Cosmetic industries: as emulsifiers for ointment bases, creams, lotions, shampoos, dyes, fragrances.

Various industries: e.g. as spin finishes for polymeric textiles.

Specifications: E 475

Polyglycerol esters of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods α
Total fatty acid ester content	min. 90%			No official method
Free fatty acids (as oleic acid)	max. 6%			A 15
Total glycerol and polyglycerol	18-60%			A 26
Free glycerol and polyglycerol	max. 7%			A 17
Sulphated ash	max. 0.5%			A 6
Polyol composition	**	***		A 26
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

** The polyglycerol moiety is predominantly di-, tri- and tetraglycerol and contains not more than 10% of polyglycerol equal to or higher than heptaglycerol.

*** The polyglycerol moiety shall be composed of not less than 70% of di-, tri- and tetraglycerols and shall contain not more than 10% of polyglycerols equal to or higher than heptaglycerol.

α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, Fifth Edition, 2004, page 343.
- (4) WHO Food Additives Series No. 5, 1974, page 241-245. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Polyglycerol polyricinoleate

E Number: E 476

1. Name

English	Polyglycerol polyricinoleate
German	Polyglycerin-Polyricinoleat
French	Polyricinoléate de polyglycérol
Dutch	Polyglycerol-polyricinoleaat
Spanish	Poliricinoleato de poliglicerol
Portuguese	Poliricinoleato de poliglicerol
Italian	Poliricinoleato di poliglicerolo
Danish	Polyglycerolpolyricinoleat
Swedish	Polyglycerolpolyricinoleat
Finnish	Polyglyserolipolyrisiiniioleaatti
Greek	Πολυγλυκερίδια του πολυρυκινελαϊκού οξέος

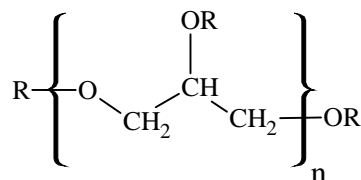
Synonyms

Glycerol esters of condensed castor oil fatty acids; polyglycerol esters of polycondensed fatty acids from castor oil; polyglycerol esters of interesterified ricinoleic acid; PGPR; glyceran esters of condensed castor oil fatty acids.

2. Description

2.1. Chemical description and typical process

The product is a complex mixture of partial esters of polyglycerol with linear esterified fatty acids derived from castor oil. The structural formula of the principal components is:



where

R = H or a fatty acyl group derived from polycondensed ricinoleic acid

n = degree of polymerisation of glycerol (average >1)

The product is prepared by the esterification of condensed castor oil fatty acids with polyglycerol. Polyglycerol is made by heating glycerol under vacuum with a catalyst. Condensed castor oil fatty acids are made by heating castor oil fatty acids in an inert atmosphere and condensing to an average of about five fatty acid residues per molecule.

The polyglycerol moiety is predominantly di-, tri- and tetraglycerol.

2.2. Appearance

The product exists as a highly viscous light brown liquid at 25°C; it does not crystallise at 0°C.

2.3. Solubility

The product is insoluble in cold and hot water, soluble in edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Polyglycerol polyricinoleate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-7.5 mg/kg bw

5. Typical applications in food

Polyglycerol polyricinoleate is used principally as a viscosity modifier. It is also used to maintain stable emulsions of oil and water systems at high water content.

Within the EU polyglycerol polyricinoleate is permitted in (6):

- Spreadable fats as defined in Annexes A, B and C of Regulation (EC) No 2991/94 having a fat content of 41% or less
- Similar spreadable products with a fat content of less than 10% fat
- Dressings
- Cocoa-based confectionery, including chocolate

6. Non-food applications

- Pharmaceutical and cosmetic preparations
- Oil and water emulsions
- Release agents

Specifications: E 476

Polyglycerol polyricinoleate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods α
Hydroxyl value	80-100		80-100	A 20
Iodine value			72-103	A 39
Refractive index (n^{65})	1.4630-1.4665		1.463-1.467	A 29
Saponification value			170-210	A 19
Acid value	max. 6		max. 6	A 18
Polyglycerols	*	*	*	A 26
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 1 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

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

α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 783.
- (4) WHO Food Additives Series No. 5, 1974, page 246-253. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Propane-1,2-diol esters of fatty acids

E Number: E 477

1. Name

English	Propane-1,2-diol esters of fatty acids
German	Propylenglycolester von Speisefettsäuren
French	Esters de propane-1,2-diol d'acides gras
Dutch	Propyleenglycolesters van vetzuren
Spanish	Ésteres de propano-1,2-diol de ácidos grasos
Portuguese	Ésteres de propilenoglicol de ácidos gordos
Italian	Esteri dell'1.2 propandiolo degli acidi grassi
Danish	Propylenglycolestere af fedtsyrer
Swedish	1,2-Propylenglykolestrar av fettsyror
Finnish	Rasvahappojen propyleeniglykoliesterit
Greek	Εστέρες λιπαρών οξέων με προπανοδιόλη-1,2

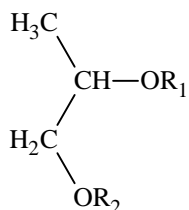
Synonyms

Propylene glycol esters of fatty acids; propylene glycol mono- and diester; propylene glycol mono- and diesters of fatty acids; propylene glycol monostearate (or other appropriate ester); PGME.

2. Description

2.1. Chemical description and typical process

The product consists mainly of propane-1,2-diol mono- and diesters of fatty acids occurring in food fats and oils. The structural formula of the principal components is:



where one of R₁ or R₂ represents a fatty acid moiety. The remainder may represent a fatty acid or hydrogen.

The distribution of the principal components depends on the proportion of the fatty acids and propylene glycol and the reaction conditions used.

The product is produced either by the direct esterification of 1,2 propylene glycol with fatty acids or by transesterification of 1,2 propylene glycol with fats and oils. The process may be followed by molecular distillation or other separation techniques to separate the monoesters.

2.2. Appearance

The product is white to yellowish-white. The consistency is determined by the fatty acids.

2.3. Solubility

The product is typically dispersible in hot water, indispersible in cold water and soluble in edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Propane-1,2-diol esters of fatty acids have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw
(calculated as propylene glycol)

5. Typical applications in food

The product imparts excellent aerating and foam stabilising properties.

Within the EU propane-1,2-diol esters of fatty acids are permitted in (6):

- Fine bakery wares
- Fat emulsions for baking purposes
- Milk and cream analogues
- Beverage whiteners
- Edible ices
- Sugar confectionery
- Desserts
- Whipped dessert toppings other than cream
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control

6. Non-food applications

No specific application.

Specifications: E 477

Propane-1,2-diol esters of fatty acids

	EU * (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Total fatty acid ester content	min. 85%	min. 85%		(2)
Total propane-1,2-diol	11-31%	min. 11%		(2)
Free propane-1,2-diol	max. 5%	max. 1.5%	max. 1.5%	(2)
Dimer and trimer of propylene glycol	max. 0.5%	max. 0.5%		A 25
Free fatty acids (as oleic acid)	max. 6%			A 15
Sulphated ash	max. 0.5%	max. 0.5%		A 6
Acid value		max. 4	max. 4	A 18
Soap (as potassium stearate)		max. 7%	max. 7.0%	(2)
Residue on ignition			max. 0.5%	A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

* Purity criteria apply to the additive free of sodium, potassium and calcium salts of fatty acids, however these substances may be present up to a maximum level of 6% (expressed as sodium oleate).

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 830.
- (4) WHO Food Additives Series No. 5, 1974, page 275-277. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Thermally oxidised soya bean oil interacted with mono- and diglycerides of fatty acids

E Number: E 479b

1. Name

English	Thermally oxidised soya bean oil interacted with mono- and diglycerides of fatty acids
German	Thermooxidiertes Sojaöl mit Mono- und Diglyceriden von Speisefettsäuren
French	Huile de soja oxydée par chauffage ayant réagi avec des mono- et diglycérides d'acides gras
Dutch	Thermisch geoxideerde sojaolie verkregen door reactie met mono- en diglyceriden van vetzuren
Spanish	Aceite de soja oxidado térmicamente y en interacción con mono- y diglicéridos de ácidos grasos
Portuguese	Produto da reacção de óleo de soja oxidado por via térmica com mono e diacilgliceróis
Italian	Prodotto di reazione dell'olio di soia ossidato termicamente con mono- e digliceridi degli acidi grassi
Danish	Thermisk oxideret sojaolie omsat med mono- og diglycerider af fedtsyrer
Swedish	Termiskt oxiderad sojabönsolja blandad med mono- och diglycerider av fettsyror
Finnish	Termisesti hapetettu ja polymeroitu soijaöljy
Greek	Θερμικώς οξειδωμένο σογιέλαιο που έχει αντιδράσει με μονο- και δι-γλυκερίδια λιπαρών οξέων

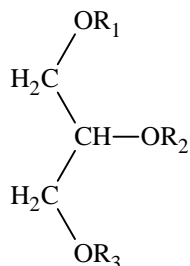
Synonyms

TOSOM.

2. Description

2.1. Chemical description and typical process

The product consists of esters of glycerol and fatty acids occurring in food fats and fatty acids from thermally oxidised soya bean oil. It may contain small quantities of free glycerol and free fatty acids. The structural formula of the principal components is:



where at least one of R₁, R₂ or R₃ represents a normal fatty acid moiety or a thermally oxidised fatty acid. The remainder may represent the fatty acids or hydrogen.

The distribution of the principal components within the ester depends on the proportion of glycerol and fatty acids and the reaction conditions used.

The product is made from 10% thermally oxidised soya bean oil - oxidised with air at 190-200°C - and 90% mono- and diglycerides of food fatty acids by interaction and deodorisation under vacuum at 130°C .

2.2. Appearance

The product is light brown with a waxy to solid consistency.

2.3. Solubility

The product is typically dispersible in hot water, non-dispersible in cold water and soluble in edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Thermally oxidised soya bean oil interacted with mono- and diglycerides have been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-30 mg/kg bw evaluation by JECFA

Acceptable daily intake (ADI): 0-25 mg/kg bw evaluation by SCF

5. Typical applications in food

The product provides excellent frying and anti-spattering properties.

Within the EU thermally oxidised soya bean oil interacted with mono- and diglycerides of fatty acids is permitted in (6):

- Fat emulsions for frying purposes

6. Non-food applications

No specific application.

Specifications: E 479b

Thermally oxidised soya bean oil interacted with mono- and diglycerides of fatty acids.

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Free fatty acids (as oleic acid)	max. 1.5%	max. 1.5%		(2)
Free glycerol	max. 2%	max. 2%		(2)
Total glycerol	16-22%	16-22%		(2)
Total fatty acids	83-90%	83-90%		(2)
Fatty acids insoluble in petroleum ether	max. 2%	max. 2%		(2)
Fatty acid methyl esters, not forming adduct with urea	max. 9%	max. 9.0%		(2)
Melting range	55-65°C	55-65°C		A 33
Peroxide value	max. 3	max. 3		(2)
Epoxides	max. 0.03% oxirane oxygen	max. 0.03% oxirane oxygen		(2)
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 30, 1993, page 3-12. Toxicological evaluation of certain food additives and naturally occurring toxicants.
- (5) Reports of the Scientific Committee for Food, Twenty-first Series, 1989.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sodium stearoyl-2-lactylate

E Number: E 481

1. Name

English	Sodium stearoyl-2-lactylate
German	Natriumstearoyl-2-lactylat
French	Stéaroyl-2-lactylate de sodium
Dutch	Natriumstearoyl-2-lactylaat
Spanish	Estearoil-2-lactilato sódico
Portuguese	Oleostearilo-2-lactilato de sódio
Italian	Stearoil-2-lattilato di sodio
Danish	Natriumstearoyllactylat
Swedish	Natriumstearoyl-2-laktylat
Finnish	Natriumstearoli-2-laktylaatti
Greek	Στεατοϋλο-2-γαλακτυλικό νάτριο

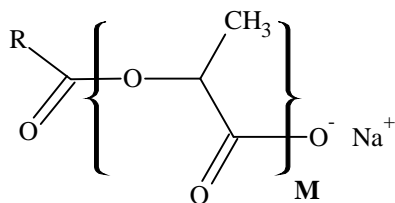
Synonyms

Sodium stearoyl lactylate; sodium stearoyl lactate; SSL.

2. Description

2.1. Chemical description and typical process

The structural formula of the principal components is:



M normally average 2
RO is a fatty acid moiety.

The distribution of the principal components depends on the relative proportion of lactic acid, fatty acid and the amount of sodium salt used in the neutralisation process.

Other components present in the product may include sodium salts of fatty acids, sodium lactate, unneutralised stearyl lactic acid, free fatty acids, free lactic acid or polymers thereof.

Sodium stearyl-2-lactylate is the partially neutralised esterification product of lactic acid and a fatty acid.

2.2. Appearance

Normally the product is a white to ivory-coloured, waxy material of a consistency determined by the fatty acids.

2.3. Solubility

The product is typically dispersible in warm water and soluble in hot edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sodium stearoyl-2-lactylate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-20 mg/kg bw
(group ADI)

5. Typical applications in food

Sodium stearoyl-2-lactylate is used principally in bakery applications to increase the softness and crumb structure of bread and rolls and maintain softness during storage. It is also used in coffee creamers to ensure good dispersion and whitening power and in fine bakery wares as a fat replacer.

Within the EU sodium stearoyl-2-lactylate is permitted in (6):

- Fine bakery wares
- Quick-cook rice
- Breakfast cereals
- Emulsified liqueur
- Spirits with less than 15% alcohol by volume
- Fat emulsions
- Desserts
- Sugar confectionery
- Chewing gum
- Beverage whiteners
- Powders for the preparation of hot beverages
- Cereal- and potato-based snacks
- Minced and diced canned meat products
- Dietetic foods
- Bread

6. Non-food applications

- Pharmaceutical and cosmetic preparations

Specifications: E 481

Sodium stearoyl-2-lactylate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Total lactic acid	15-40%	15-40%	23.0-34.0%	(2)
Sodium content	2.5-5%	2.5-5.0%	3.5-5.0%	(2)
Ester value	90-190	90-190	120-190	(2)
Acid value	60-130	60-130	60-80	(2)
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, Fifth Edition, 2004, page 434-436.
- (4) WHO Food Additives Series No. 5, 1974, page 505-511. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Calcium stearoyl-2-lactylate

E Number: E 482

1. Name

English	Calcium stearoyl-2-lactylate
German	Calciumstearoyl-2-lactylat
French	Stéaroyl-2-lactylate de calcium
Dutch	Calciumstearoyl-2-lactylaat
Spanish	Estearoil-2-lactilato cálcico
Portuguese	Oleostearilo-2-lactilato de cálcio
Italian	Stearoil-2-lattilato di calcio
Danish	Calciumstearoyllactylat
Swedish	Kalciumstearoyl-2-laktylat
Finnish	Kalsiumstearoli-2-laktylaatti
Greek	Στεατοϋλο-2-γαλακτυλικό ασβέστιο

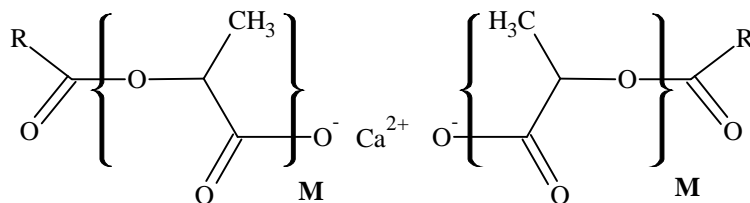
Synonyms

Calcium stearoyl lactylate; calcium stearoyl lactate; CSL.

2. Description

2.1. Chemical description and typical process

The structural formula of the principal components is:



M normally average 2
RO is a fatty acid moiety.

The mean value of M depends on the proportion of lactic acid present.

The distribution of the principal components depends on the relative proportion of lactic acid, fatty acid and the amount of calcium salt used in the neutralisation process.

Other components present in the product may include calcium salts of fatty acids, calcium lactate, unneutralised stearyl lactic acid, free fatty acids, free lactic acid or polymers thereof.

Calcium stearyl-2-lactylate is the partially neutralised esterification product of lactic acid and a fatty acid.

2.2. Appearance

Normally the product is a white to ivory-coloured, waxy material of a consistency determined by the fatty acids.

2.3. Solubility

The product is typically dispersible in warm water and soluble in warm edible oils and fats.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Calcium stearoyl-2-lactylate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-20 mg/kg bw
(group ADI)

5. Typical applications in food

Calcium stearoyl-2-lactylate is used principally in bakery applications to increase the softness and crumb structure of bread and rolls and maintain softness during storage. It is also used in fine bakery wares as a fat replacer.

Within the EU calcium stearoyl-2-lactylate is permitted in (6):

- Fine bakery wares
- Quick-cook rice
- Breakfast cereals
- Emulsified liqueur
- Spirits with less than 15% alcohol by volume
- Fat emulsions
- Desserts
- Sugar confectionery
- Chewing gum
- Beverage whiteners
- Powders for the preparation of hot beverages
- Cereal- and potato-based snacks
- Minced and diced canned meat products
- Dietetic foods
- Bread

6. Non-food applications

- Pharmaceutical and cosmetic preparations

Specifications: E 482

Calcium stearoyl-2-lactylate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Total lactic acid	15-40%	15-40%	32.0-38.0%	(2)
Calcium content	1-5.2%	1.0-5.2%	4.2-5.2%	(2)
Ester value	125-190	125-190	125-164	(2)
Acid value	50-130	50-130	50-86	(2)
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

[⌘] do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 152.
- (4) WHO Food Additives Series No. 5, 1974, page 505-511. Toxicological evaluation of some food additives including anticaking agents, antimicrobials, antioxidants, emulsifiers and thickening agents.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sorbitan monostearate

E Number: E 491

1. Name

English	Sorbitan monostearate
German	Sorbitanmonostearat
French	Monostéarate de sorbitane
Dutch	Sorbitaanmonostearaat
Spanish	Monoestearato de sorbitano
Portuguese	Monoestearato de sorbitano
Italian	Monostearato di sorbitano
Danish	Sorbitanmonostearat
Swedish	Sorbitanmonostearat
Finnish	Sorbitaanimonostearaatti
Greek	Μονοστεατική σορβιτάνη

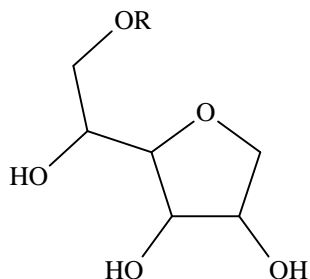
Synonyms

Sorbitan esters; SMS.

2. Description

2.1. Chemical description and typical process

The nominal formula of the principal components is:



where R represents a stearic acid moiety.

Sorbitan monostearate is a mixture of the partial esters of sorbitol and its anhydrides with stearic acid. It is produced by the esterification of sorbitol with commercial stearic acid derived from food fats and oils and consists of approximately 95% of a mixture of the esters of sorbitol and its mono- and dianhydrides.

2.2. Appearance

Sorbitan monostearate is a light cream to tan-coloured, hard, waxy solid with a slight characteristic odour and bland taste.

2.3. Solubility

The product is insoluble in cold water and dispersible in hot water. It is soluble above its melting point in edible oils, adding a hazy appearance.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sorbitan monostearate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw as the sum of sorbitan esters of lauric, oleic, palmitic and stearic acid evaluation by JECFA

Group ADI: 0-25 mg/kg bw (for E 491, 492, 495) evaluation by SCF

5. Typical applications in food

Sorbitan monostearate is a lipophilic surface-active agent. It is often used as an emulsifier in combination with polysorbates. It is also used to modify crystallisation of fats.

Within the EU sorbitan monostearate is permitted in (6):

- Fine bakery wares
- Toppings and coatings for fine bakery wares
- Fat emulsions
- Milk and cream analogues
- Beverage whiteners
- Liquid tea concentrates and liquid fruit and herbal infusion concentrates
- Edible ices
- Desserts
- Sugar confectionery
- Emulsified sauces
- Dietary food supplements
- Yeast for baking
- Chewing gum
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours and anti-foaming agents

6. Non-food applications

- Pharmaceuticals and cosmetics
- Plastic food wrap

Specifications: E 491

Sorbitan monostearate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Sorbitol, sorbitan and isosorbide esters content	min. 95%	min. 95%		A 36
Acid value	max. 10	5-10	5-10	A 18
Saponification value	147-157	147-157	147-157	A 19
Hydroxyl value	235-260	235-260	235-260	A 20
Water	max. 2%	max. 1.5%	max. 1.5%	A 10
Sulphated ash	max. 0.5%			A 6
Congealing range	50-52°C	50-52°C		
Polyols (as sorbitol and its mono- and dianhydrides)			27.0-34.0 g / 100 g	(3)
Fatty acids (on the anhydrous basis)			68-76 g / 100g	(3)
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg	max. 2 mg/kg	A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) Food Chemicals Codex, 6th Edition, 2008, page 918.
- (4) WHO Food Additives Series No. 17, 1982, page 218-228. Toxicological evaluation of certain food additives.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sorbitan tristearate

E Number: E 492

1. Name

English	Sorbitan tristearate
German	Sorbitantristearat
French	Tristéarate de sorbitane
Dutch	Sorbitaantristearaat
Spanish	Triestearato de sorbitano
Portuguese	Triestearato de sorbitano
Italian	Triestearato di sorbitano
Danish	Sorbitantristearat
Swedish	Sorbitantristearat
Finnish	Sorbitaanitristearaatti
Greek	Τριστεατική σορβιτάνη

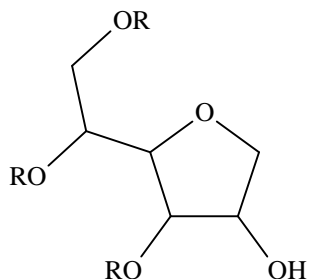
Synonyms

Sorbitan esters; STS.

2. Description

2.1. Chemical description and typical process

The nominal formula of the principal components is:



where R represents a stearic acid moiety.

Sorbitan tristearate is a mixture of the partial esters of sorbitol and its anhydrides with stearic acid. It is produced by the esterification of sorbitol with commercial stearic acid derived from food fats and oils and consists of approximately 95% of a mixture of the esters of sorbitol and its mono- and dianhydrides.

2.2. Appearance

Sorbitan tristearate is a light cream to tan-coloured, hard, waxy solid with a slight characteristic odour and bland taste.

2.3. Solubility

The product is insoluble in cold water and dispersible in edible oils.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sorbitan tristearate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw as the sum of sorbitan esters of lauric, oleic, palmitic and stearic acid evaluation by JECFA

Group ADI: 0-25 mg/kg bw (for E 491, 492, 495) evaluation by SCF

5. Typical applications in food

Sorbitan tristearate is a lipophilic surface-active agent. It is often used as an emulsifier in combination with polysorbates. It is also used to modify crystallisation of fats.

Within the EU sorbitan tristearate is permitted in (6):

- Fine bakery wares
- Toppings and coatings for fine bakery wares
- Fat emulsions
- Milk and cream analogues
- Beverage whiteners
- Liquid tea concentrates and liquid fruit and herbal infusion concentrates
- Edible ices
- Desserts
- Sugar confectionery
- Cocoa-based confectionery, including chocolate
- Emulsified sauces
- Dietary food supplements
- Yeast for baking
- Chewing gum
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours and anti-foaming agents

6. Non-food applications

- Pharmaceuticals and cosmetics
- Plastic food packaging

Specifications: E 492

Sorbitan tristearate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Sorbitol, sorbitan and isosorbide esters content	min. 95%	min. 95%		(2)
Acid value	max. 15	max. 15		A 18
Saponification value	176-188	176-188		A 19
Hydroxyl value	66-80	66-80		A 20
Water	max. 2%	max. 1.5%		A 10
Sulphated ash	max. 0.5%	max. 0.5%		A 6
Congealing range	47-50°C	47-50°C		
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

⌘ do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 17, 1982, page 218-228. Toxicological evaluation of certain food additives.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sorbitan monolaurate

E Number: E 493

1. Name

English	Sorbitan monolaurate
German	Sorbitanmonolaurat
French	Monolaurate de sorbitane
Dutch	Sorbitaanmonolauraat
Spanish	Monolaurato de sorbitano
Portuguese	Monolaurato de sorbitano
Italian	Monolaurato di sorbitano
Danish	Sorbitanmonolaurat
Swedish	Sorbitanmonolaurat
Finnish	Sorbitaanimonolauraatti
Greek	Μονολαυρική σορβιτάνη

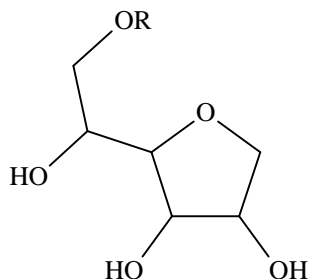
Synonyms

Sorbitan esters; SML.

2. Description

2.1. Chemical description and typical process

The nominal formula of the principal components is:



where R represents a lauric acid moiety.

Sorbitan monolaurate is a mixture of the partial esters of sorbitol and its anhydrides with lauric acid. It is produced by the esterification of sorbitol with commercial lauric acid derived from food fats and oils and consists of approximately 95% of a mixture of the esters of sorbitol and its mono- and dianhydrides.

2.2. Appearance

Sorbitan monolaurate is an amber-coloured oily liquid with a slight characteristic odour.

2.3. Solubility

The product is dispersible in both hot and cold water.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sorbitan monolaurate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw as the sum of sorbitan esters of lauric, oleic, palmitic and stearic acid evaluation by JECFA

Group ADI: 0-5 mg/kg bw (for E 493 and E 494) evaluation by SCF

5. Typical applications in food

Sorbitan monolaurate is a lipophilic surface active agent. It is often used as an emulsifier in combination with polysorbates. It is also used to modify crystallisation of fats.

Within the EU sorbitan monolaurate is permitted in (6):

- Fine bakery wares
- Toppings and coatings for fine bakery wares
- Jelly marmalade
- Fat emulsions
- Milk and cream analogues
- Beverage whiteners
- Liquid tea concentrates and liquid fruit and herbal infusion concentrates
- Edible ices
- Desserts
- Sugar confectionery
- Emulsified sauces
- Dietary food supplements
- Yeast for baking
- Chewing gum
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours and anti-foaming agents

6. Non-food applications

- Pharmaceuticals and cosmetics
- Plastic food wrap
- Textile lubricant

Specifications: E 493

Sorbitan monolaurate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Sorbitol, sorbitan and isosorbide esters content	min. 95%	min. 95%		(2)
Acid value	max. 7	max. 7		A 18
Saponification value	155-170	155-170		A 19
Hydroxyl value	330-358	330-358		A 20
Water	max. 2%	max. 2%		A 10
Sulphated ash	max. 0.5%	max. 0.5%		A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

⌘ do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 17, 1982, page 218-228. Toxicological evaluation of certain food additives.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sorbitan monooleate

E Number: E 494

1. Name

English	Sorbitan monooleate
German	Sorbitanmonooleat
French	Monooléate de sorbitane
Dutch	Sorbitaanmonooleaat
Spanish	Monooleato de sorbitano
Portuguese	Monooleato de sorbitano
Italian	Monooleato di sorbitano
Danish	Sorbitanmonooleat
Swedish	Sorbitanmonooleat
Finnish	Sorbitaanimonoo-oleaatti
Greek	Μονοελαϊκή σορβιπάνη

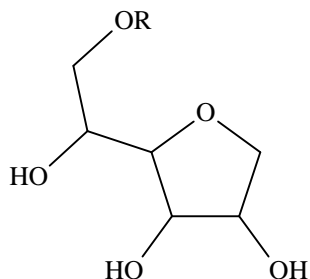
Synonyms

Sorbitan esters; SMO.

2. Description

2.1. Chemical description and typical process

The nominal formula of the principal components is:



where R represents an oleic acid moiety.

Sorbitan monooleate is a mixture of the partial esters of sorbitol and its anhydrides with oleic acid. It is produced by the esterification of sorbitol with commercial oleic acid derived from food fats and oils and consists of approximately 95% of a mixture of the esters of sorbitol and its mono- and dianhydrides.

2.2. Appearance

Sorbitan monooleate is an amber-coloured oily liquid with a slight characteristic odour.

2.3. Solubility

The product is dispersible in both hot and cold water.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sorbitan monooleate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw as the sum of sorbitan esters of lauric, oleic, palmitic and stearic acid evaluation by JECFA

Group ADI: 0-5 mg/kg bw (for E 493 and E 494) evaluation by SCF

5. Typical applications in food

Sorbitan monooleate is a lipophilic surface-active agent. It is often used as an emulsifier in combination with polysorbates. It is also used to modify crystallisation of fats.

Within the EU sorbitan monooleate is permitted in (6):

- Fine bakery wares
- Toppings and coatings for fine bakery wares
- Fat emulsions
- Milk and cream analogues
- Beverage whiteners
- Liquid tea concentrates and liquid fruit and herbal infusion concentrates
- Edible ices
- Desserts
- Sugar confectionery
- Emulsified sauces
- Dietary food supplements
- Yeast for baking
- Chewing gum
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours and anti-foaming agents

6. Non-food applications

- Pharmaceuticals and cosmetics
- Plastic food wrap
- Textile lubricant

Specifications: E 494

Sorbitan monooleate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods ^α
Sorbitol, sorbitan and isosorbide esters content	min. 95%	min. 95%		(2)
Acid value	max. 8	max. 8		A 18
Saponification value	145-160	145-160		A 19
Hydroxyl value	193-210	193-210		A 20
Water	max. 2%	max. 2%		A 10
Sulphated ash	max. 0.5%	max. 0.5%		A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

^α do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 17, 1982, page 218-228. Toxicological evaluation of certain food additives.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Sorbitan monopalmitate

E Number: E 495

1. Name

English	Sorbitan monopalmitate
German	Sorbitanmonopalmitat
French	Monopalmitate de sorbitane
Dutch	Sorbitaanmonopalmitaat
Spanish	Monopalmitato de sorbitano
Portuguese	Monopalmitato de sorbitano
Italian	Monopalmitato di sorbitano
Danish	Sorbitanmonopalmitat
Swedish	Sorbitanmonopalmitat
Finnish	Sorbitaanimonopalmitaatti
Greek	Μονοπαλμική σορβιτάνη

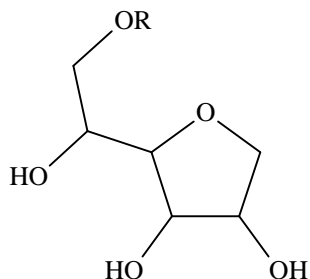
Synonyms

Sorbitan esters; SMP.

2. Description

2.1. Chemical description and typical process

The nominal formula of the principal components is:



where R represents a palmitic acid moiety.

Sorbitan monopalmitate is a mixture of the partial esters of sorbitol and its anhydrides with palmitic acid. It is produced by the esterification of sorbitol with commercial palmitic acid derived from food fats and oils and consists of approximately 95% of a mixture of the esters of sorbitol and its mono- and dianhydrides.

2.2. Appearance

Sorbitan monopalmitate is a light cream to tan-coloured, hard waxy solid with a slight characteristic odour and bland taste.

2.3. Solubility

The product is insoluble in cold water and dispersible in hot water. It is soluble above its melting point in edible oils, adding a hazy appearance.

3. Analysis and specifications

See attached specification sheet.

4. Safety in use

Sorbitan monopalmitate has been evaluated by the Joint FAO/WHO Expert Committee on Food Additives (4) and the Scientific Committee for Food (5).

Evaluation status

Acceptable daily intake (ADI): 0-25 mg/kg bw as the sum of sorbitan esters of lauric, oleic, palmitic and stearic acid evaluation by JECFA

Group ADI: 0-25 mg/kg bw (for E 491, 492, 495) evaluation by SCF

5. Typical applications in food

Sorbitan monopalmitate is a lipophilic surface-active agent. It is often used as an emulsifier in combination with polysorbates. It is also used to modify crystallisation of fats.

Within the EU sorbitan monopalmitate is permitted in (6):

- Fine bakery wares
- Toppings and coatings for fine bakery wares
- Fat emulsions
- Milk and cream analogues
- Beverage whiteners
- Liquid tea concentrates and liquid fruit and herbal infusion concentrates
- Edible ices
- Desserts
- Sugar confectionery
- Emulsified sauces
- Dietary food supplements
- Yeast for baking
- Chewing gum
- Dietetic foods intended for special medical purposes
- Dietetic formulae for weight control
- Carriers and solvents for colours and anti-foaming agents

6. Non-food applications

- Pharmaceuticals and cosmetics
- Lubricant and co-emulsifier in the plastics industry

Specifications: E 495

Sorbitan monopalmitate

	EU (1)	FAO/WHO (2)	FCC (3)	Recommended Analytical Methods [⌘]
Sorbitol, sorbitan and isosorbide esters content	min. 95%	min. 95%		(2)
Acid value	max. 7.5	4.0-7.5		A 18
Saponification value	140-150	140-150		A 19
Hydroxyl value	270-305	270-305		A 20
Water	max. 2%	max. 1.5%		A 10
Congealing range	45-47°C	45-47°C		
Sulphated ash	max. 0.5%			A 6
Arsenic	max. 3 mg/kg			A 3
Heavy metals (as Pb)	max. 10 mg/kg			A 1
Lead	max. 5 mg/kg	max. 2 mg/kg		A 2
Mercury	max. 1 mg/kg			A 5
Cadmium	max. 1 mg/kg			A 4

[⌘] do not necessarily reflect the official methods used for the stated specifications.

References

- (1) [Commission Directive 2008/84/EC](#) of 27 August 2008 on food additives other than colours and sweeteners.
- (2) Combined Compendium of Food Additive Specifications (online edition): [monograph 1 \(2006\)](#).
- (3) No Food Chemicals Codex specifications available.
- (4) WHO Food Additives Series No. 17, 1982, page 218-228. Toxicological evaluation of certain food additives.
- (5) Reports of the Scientific Committee for Food, Seventh Series, 1978.
- (6) [European Parliament and Council Directive No. 95/2/EC](#) of 20 February 1995 on food additives other than colours and sweeteners.*

*: Replaced by [Regulation \(EC\) No 1333/2008](#) of 16th December 2008 on food additives. Annexes of Dir. 95/2/EC continue to apply until they are transferred into Regulation 1333/2008 in January 2011.

Recommended analytical methods – Reference list

No.	Title (Subject)	Reference
A 1	Metallic impurities, heavy metals	FAO JECFA Monographs No. 1, Vol. 4, p. 62-70
A 2	Metallic impurities, lead	FAO JECFA Monographs No. 1, Vol. 4, p. 62-70
A 3	Limit test for Arsenic	FAO JECFA Monographs No. 1, Vol. 4, p. 51
A 4	Metallic impurities, cadmium	FAO JECFA Monographs No. 1, Vol. 4, p. 62-70
A 5	Metallic impurities, mercury	FAO JECFA Monographs No. 1, Vol. 4, p. 62-70
A 6	Sulphated ash/Residue on ignition	FAO JECFA Monographs No. 1, Vol. 4, p. 54
A 7	Free alkali (sodium salts)	AOCS Official Method Da 4a-48
A 8	Free alkali (potassium salts)	AOCS Official Method Da 5-44
A 9	1,4 dioxane content	FAO JECFA Monographs No. 1, Vol. 4, p. 80
A 10	Water content	FAO JECFA Monographs No. 1, Vol. 4, p. 75
A 11	Loss on drying	FAO JECFA Monographs No. 1, Vol. 4, p. 61
A 12	Alcohol insoluble substances	AOCS Official Method Da 3-48
A 13	Petroleum ether insoluble substances	AOCS Official Method Ja 3-55
A 14	Unsaponifiable matter	Food Chemicals Codex VI, p. 1146
A 15	Free fatty acids	AOCS Official Method Ca 5a - 40
A 16	Free glycerol	FAO JECFA Monographs No. 1, Vol. 4, p. 173
A 17	Free glycerol and polyglycerol	AOCS Official Method Cd 11b-91
A 18	Acid value	FAO JECFA Monographs No. 1, Vol. 4, p. 161
A 19	Saponification value	FAO JECFA Monographs No. 1, Vol. 4, p. 184
A 20	Hydroxyl value	FAO JECFA Monographs No. 1, Vol. 4, p. 168
A 21	Total fatty acids	DGF Einheitsmethoden C-III 2 (97)
A 22	Total glycerol	Food Chemicals Codex VI, p. 256
A 23	Total acetic acid	Food Chemicals Codex VI, p. 18
A 24	Total lactic acid	Food Chemicals Codex VI, p. 524
A 25	Total dimer and trimer of 1,2 propanediol	FAO JECFA Monographs No. 1, Vol. 4, p. 182
A 26	Polyglycerol determination in polyglycerol esters	FAO JECFA Monographs No. 1, Vol. 4, p. 180
A 27	Total mono- and diglycerides	AOCS, 5 Edition, Cd 11b - 91
A 28	1-monoglycerides	FAO JECFA Monographs No. 1, Vol. 4, p. 173
A 29	Refractive index	FAO JECFA Monographs No. 1, Vol. 4, p. 38
A 30	Potassium content as potassium oxide	AOCS Official Method Da 27-48
A 31	Sodium content as sodium oxide	AOCS Official Method Da 27-48
A 32	Reichert-Meissl value	Food Chemicals Codex IV, p. 826-827
A 33	Melting range	FAO JECFA Monographs No. 1, Vol. 4, p. 38
A 34	Oxyethylene content	FAO JECFA Monographs No. 1, Vol. 4, p. 221
A 35	Congeaing range	FAO JECFA Monographs No. 1, Vol. 4, p. 167
A 36	Sorbitan esters content	FAO JECFA Monographs No. 1, Vol. 4, p. 185
A 38	Ethylene glycols (mono and di)	DGF Einheitsmethoden H16a (94) (only monoethylene glycol)
A 39	Iodine value	FAO Food and Nutrition Paper 5, Rev. 2, p. 194