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(71) Applicant (for AE, AG, AU, BB, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, KE, LC, LK, LS, MN, MW, NA, NG, NZ, OM, PG, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only): **UNILEVER PLC** [GB/GB]; Unilever House, Blackfriars, London Greater London EC4P 4BQ (GB).

(71) Applicant (for AL, AM, AT, AZ, BA, BE, BF, BG, BJ, BR, BY, CF, CG, CH, CI, CM, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, FR, GA, GE, GN, GQ, GR, GW, HR, HU, ID, IS, IT, JP, KG, KM, KP, KR, KZ, LR, LT, LU, LV, MA, MC, MD, MG, MK, ML, MR, MX, MZ, NE, NI, NL, NO, PH, PL, PT, RO, RU, SE, SI, SK, SM, SN, SY, TD, TG, TJ, TM, TN, TR, UA, UZ, VN, YU only): **UNILEVER NV** [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL).

(71) Applicant (for IN only): **HINDUSTAN LEVER LIMITED** [IN/IN]; Hindustan Lever House, 165/166 Backbay Reclamation, Maharashtra, Mumbai 400 020 (IN).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **BERRY, Mark,**

John [GB/GB]; Unilever R & D Colworth, Sharnbrook, Bedfordshire Bedfordshire MK44 1LQ (GB). **QUAIL, Patricia Jill** [GB/GB]; Unilever R & D Colworth, Sharnbrook, Bedfordshire Bedfordshire MK44 1LQ (GB). **WILKINSON, Joy, Elizabeth** [GB/GB]; Unilever R & D Colworth, Sharnbrook, Bedfordshire Bedfordshire MK44 1LQ (GB).

(74) Agent: **HUGOT, Alain, Eric, Philippe**; Unilever Patent Group, Colworth House, Sharnbrook, Bedford Bedfordshire MK44 1LQ (GB).

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(54) Title: ICE CONFECTION

(57) Abstract: An ice confection containing; i) at least 2% by wt. polyunsaturated fat; ii) at least 3% by wt. of protein; iii) at least 5% by wt. of a sugar or sugars; iv) 50% to 88% by wt. of water characterized in that at least 50% of the fat is present as oil bodies.

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ICE CONFECTION

Technical field of the invention

- 5 The invention relates to ice confections, in particular to healthy ice confections which contain oil bodies.

Background to the invention

10 Frozen confections or "ice confections" such as ice cream are well known. Typically ice cream will contain, by weight of the composition, 10–18 % fat, 7–11.5 % milk solids not fat (MSNF, which contains casein micelles, whey proteins and lactose), 15–18% sugars and other ingredients such as stabilisers, emulsifiers and flavourings, and is aerated to an overrun of typically 100%.

15 The fats normally used in ice cream, for example butterfat or coconut oil, contain high levels of saturated fatty acids. It would be advantageous if the saturated fats commonly found in ice confection products could be replaced with polyunsaturated fats which are believed to be more healthy. WO 97/30600 discloses unaerated frozen desserts made with sunflower oil which is high in polyunsaturated fats.

20 However, it is difficult to make ice confections with fats which are high in polyunsaturated fatty acids because polyunsaturated fats are liquid at the processing temperature. This can result in an unstable air phase and hence a poor quality ice cream. Japanese Patent Application 57/036944 describes the production of aerated ice cream with oils such as safflower oil and sunflower oil. It was found necessary to emulsify the oil with a specific emulsifier, namely a sucrose fatty acid ester. However, such additives can detract from the natural and healthy perception of the product by consumers.

25 There is therefore a need for ice confections which contain polyunsaturated fats but which do not suffer from the drawbacks of poor aeration or the need for additives. It has now been discovered that the use of oil bodies in ice confection products can provide this.

Tests and definitions

35 Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art. Definitions and

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descriptions of various terms and techniques used in frozen confectionery manufacture are found in "Ice Cream", Fourth Edition by W.S. Arbuckle, Pub. Van Nostrand Reinhold, New York, 1986.

- 5 All percentages, unless otherwise stated, refer to the percentage by weight of the total composition, with the exception of percentages cited in relation to the overrun.

Oil Bodies

10 The fat in the seeds of oilseed crops, such as soy bean, rapeseed, sunflower and palm, is naturally emulsified in discrete subcellular structures known as oil bodies (alternatively oleosomes, lipid bodies or spherosomes). The fat is encapsulated by a monolayer of phospholipids in which proteins (known as oleosins) are embedded. The extraction of oil bodies from a range of plant seeds is known in the art, for example, Deckers et al. (US 6,146,645) and Wakabayashi et al. (EP 0 883 997).

15 The term 'oil body' as used herein refers to the lipid-oleosin protein complex. The term 'oil body' does not include the oil droplets in conventional ice cream emulsions in which the fat is emulsified with emulsifiers and / or proteins (such as mono-/di-glycerides and milk proteins) that are not present in the seeds.

20 The term 'oil body preparation' as used herein refers to the product of a process of extraction of intact oil bodies from a natural source, as in Example 1 below. The terms 'oil body' and 'oil body preparation' do not include the seeds per se.

25 Overrun

The overrun of an aerated ice confection is defined as

$$\text{overrun \%} = \frac{\text{density of mix} - \text{density of ice confection}}{\text{density of ice confection}} \times 100$$

30 The density of an ice cream (or other aerated ice confection) is measured by making use of the Archimedes' principle as described in "A-level Physics", Third Edition, by R. Muncaster, Pub. Stanley Thornes Ltd., Cheltenham, 1989. First a sample of ice cream is weighed in air to determine its mass. Then the volume of the same sample is determined. The sample of ice cream is held carefully in a beaker of chilled water just

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- below the surface of the water by a fork (or a knife) inserted into the end of the sample. The beaker is placed on a balance throughout the experiment and the increase in weight on immersing the sample is recorded. By Archimedes' principle, the increase in weight is equal to the upthrust and hence to the weight of water displaced. Taking the density of water as 1 gcm^{-3} , the weight of water displaced is used to determine the volume of water displaced and thus the volume of the ice cream sample immersed in the beaker. From the mass and volume of the product, the density of the ice cream is calculated (density = mass/volume). A minimum of three repeat measurements is taken.
- 10 The density of the unaerated mix is measured as follows. First the ice cream is melted until the air-phase is lost. Then a standard overrun cup (of known mass and volume) is filled with unaerated mix at approximately 4°C and weighed. Subtracting the mass of the cup and dividing by the known volume of the cup gives the density of the mix. A minimum of three repeat measurements is taken.
- 15 With a knowledge of the density of both unaerated mix and aerated ice cream, the overrun is calculated using the above equation.

Method for determining fat content

- 20 Fat content is determined by the "Weibul" acid hydrolysis procedure. This is a recognised BS Method (No.4401) Ref. Official, Standardised and Recommended Methods of Analysis SAC, 1973 2nd Ed. p 160. The sample is boiled with approximately 6M hydrochloric acid to release 'bound' fat and the digest is filtered through a double filter paper using filter aid. Fat is retained by the filter paper and aid. After washing and
- 25 drying, the residue is extracted with light petroleum spirit using a Soxhlet extractor. Descriptions of the performance of the method and a comparison with other methods can be found in the following references
- a) Weibul, Staatsbled van het Koninkrijk Der Hederlander pl – 16, 1919, No. 581.
 - 30 b) W Stoldt, Z Untersuchung & Lebensmittel, 1937, 73. 329.
 - c) Nottbolm &, Baumann, Z Untersuchung & Lebensmittel 1931, 62. 164.
 - d) ISO 1143-1973

Method for determining protein content

Protein content is determined by measuring the nitrogen present in the sample. This is done by using equipment that is manufactured for the purpose: the "Macro N" (Foss-Heraeus). In this procedure, the sample under test is completely burned at temperatures
5 in excess of 1000°C in the presence of oxygen. The resultant combustion gases are swept through a series of absorption tubes by a stream of carbon dioxide; this procedure removes unwanted gases, finally the carbon dioxide and nitrogen mixture are passed through a thermal conductivity detector where the nitrogen is quantified. Nitrogen content is converted to protein content using a conversion factor based on the average nitrogen
10 content of the amino acids found in particular foods.

A suitable conversion factor to use for analysing the protein content in ice confections that are made according to this invention is 6.25, although other conversion factors could be used - based on the particular protein source that is being analysed. The procedure is
15 published in the following article.

- e) Ian D Smith, Analytical Proceedings, 1991, 28. 320 - 324. "Evaluation of the Foss-Heraeus Macro N for the Determination of Nitrogen in a Wide Range of Foodstuffs, Ingredients and Biological Materials and Comparison with the
20 Kjelfoss".

Method for determining water content

The method involves the measurement of weight loss due to evaporation of water. A fan
25 assisted, thermostatically controlled air oven is used at a temperature of 100°C. The procedure described is similar to Official and Standardised methods recommended by:

- f) The Association of Official Agricultural Chemists USA, 'Official Methods of Analysis' 12th Edition, 1975,
30 g) The Fertiliser and Feedingstuffs Regulations HMSO, Statutory Inst. No 840, 1976.
h) ISO 1026-1982, ISO 1442-1973.

15-20 gram of dry sand and a small glass rod are placed in an aluminium foil cup. This assembly is weighed (= W1). A sample (approximately 5 gram) of e.g. melted ice cream
35 is added to the cup and weighed again (= W2). The melted ice cream is then mixed into

- 5 -

the sand with the glass rod. The cup is then placed on a steam bath and evaporated to dryness (takes 30 minutes); the sample is stirred with the rod throughout this procedure. The sample is then placed in an oven for 2.5 hours that has been pre-set at 100°C. The cup is then placed in a dessicator to cool before weighing (= W3).

5

Water content is given by:

$$\% \text{Water w/w} = \frac{W2 - W3}{W2 - W1} \times 100$$

Where: W1 = Weight of cup (including sand and glass rod).

10

W2 = Weight of cup + wet sample.

W3 = Weight of cup + dried sample.

Detection of oil bodies

15

The presence of oil bodies is detected in ice confections by the presence of oleosin protein (which is usually not present in refined fats such as sunflower oil). The presence of sunflower oil is detected by the presence of triacylglycerols and other characteristic components. Suitable methods are described below.

Detection of oleosin by amino acid sequencing

20

Amino acid sequences for oleosins from sunflower seeds and other oil seeds have been published and are available through sequence databases such as SwissProt and PIR (1). The sequences of oleosins from different species are related, in particular the central, hydrophobic domain is the region most conserved between species (2). Therefore, the oleosin protein can be identified by amino acid sequencing. Fragments of amino acid sequence obtained from the product (as described below) are compared with the published sequences using database searching and sequence comparison facilities that are well-known in the art, such as ExPasy or SRS. If the stretches of sequence from the product closely match a published sequence, it indicates that oleosin from that oil seed is present in the product.

25

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The protein component of an ice cream product is separated from the other ingredients as follows:

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In order to extract intact oil bodies from the ice cream, 1-2g of the confection is placed in an eppendorf tube and allowed to melt. The sample is then centrifuged at 13,500rpm for 5 minutes. The resulting 'fat pad' on the surface of the sample is transferred into a fresh eppendorf tube.

5

In order to remove non-oleosin proteins (such as sunflower seed proteins and milk proteins) the sample is washed with urea. 1ml of 9M urea is added to the fat pad, mixed by vortexing thoroughly and incubated in the fridge for 2 hours. The sample is then centrifuged and the fat pad is skimmed off. Two further urea washes are performed.

10

In order to remove the fat from the intact oil bodies and to precipitate the oleosins, 1ml of acetone chilled to -25°C is added to the fat pad, and the sample is incubated on ice for 1 hour. The sample is then centrifuged at 13500rpm. The precipitate is retained and the supernatant is discarded. Two further washes with chilled acetone are then carried out and the pellet is left to air-dry overnight.

15

In order to prepare the sample for SDS-PAGE (Polyacrylamide gel electrophoresis), 0.001g of the dry powder is re-solubilised in 0.5ml sample buffer, and incubated at room temperature for 30 minutes. The sample reducing agent is then added and the sample is boiled for 2 minutes. The sample can then be run on SDS-PAGE alongside molecular weight standards, and the protein bands visualised with a stain such as coomassie blue. 25µl of the oleosin sample solution is loaded into to each of 8 wells of a 10% bis-tris NuPAGE gel. The gel is then run using MES running buffer. Using this procedure, two oleosin protein bands are typically seen. These bands correspond to the two oleosin isomers (approximate molecular weights 19.5kD and 20.5kD).

20

25

As the oleosin proteins are blocked to N-terminal sequencing (3), the protein bands are digested using an in-gel digestion technique and a suitable proteolytic enzyme such as trypsin or endoproteinase Lys-C. The protein fragments are then separated from each other using reverse phase chromatography, and the individual fragments sequenced using standard protein sequencing equipment. The short pieces of internal amino acid sequence thus obtained are compared with the published oleosin protein sequences as described above.

30

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A general review article describing commonly used methods for preparing proteins for sequencing, including the strategies outlined above can be found in ref. (4).

1. Examples of sunflower seed oleosin sequences include the following accession
5 numbers: SwissProt P29529 and PIR S70453.
2. Napier J.A., Beadoin F., Tatham A.S., Alexander L.G., Shewry P.R. (2001) Adv. in Bot. Res. **35** 111-138.
3. Millichip M., Tatham A.S., Jackson F., Griffiths G., Shewry P.R., Stobart A.K. (1996) Biochem. J. **314** 333-337.
- 10 4. Patterson S.D., (1994) Anal. Biochem. **221** 1-15.

Detection of triacylglycerol and other components that are characteristic of sunflower oil

Triacylglycerol profiles for sunflower oil are easily determined by GC analysis. In addition, phospholipid (PL) profiles are determined using HPLC. For data on fatty
15 acids/triacylglycerols/ PL/minor components in sunflower oil see the Lipid Handbook by F.D. Gunstone, J. Harwood and F.B. Padley, Pub. Chapman and Hall, 1986, Chap. 3.3, **35**, p 101; and also for sunflower oil fatty acid profiles see Codex Alimentarius Commission, Codex Committee on oils and fats. For the determination of seed oil content and fatty acid composition in sunflower oil through the analysis of intact seeds, husked
20 seeds, meal and oil by near IR reflectance spectroscopy: Perez-Vich B., Velasco L., Fernandez-Martinez J.M., J. Am. Oil Chem. Soc., **75** (5), 547 – 555. For Phospholipid (PL) Profiles see Chapman G.W., J. Am. Oil Chem. Soc., **59**, 299.

The levels of sterols, triterpene alcohols and tocopherols which are found in sunflower oil
25 can all be determined by GC/HPLC and with Mass Spectrometry detection. Data on sterols are found in the Lipid Handbook by F.D. Gunstone, J. Harwood and F.B. Padley, Pub. Chapman and Hall, 1986, Table 3.163 (adapted from Itoh et al. J. Am. Oil Chem. Soc. 1973). Tocopherols may be found in the Lipid Handbook table 3.167, p 129, or in Analysis of oilseeds, fats and fatty foods, Elsevier, London, p 315.

30

Brief description of the invention

We have found that frozen confections can be formulated with polyunsaturated fats without the use of additives by using oil bodies as a source of the fat. Thus, in a first
35 aspect, the present invention provides an ice confection containing;

- i) at least 2% by wt. polyunsaturated fat;

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- ii) at least 3% by wt. of protein;
- iii) at least 5% by wt. of a sugar or sugars;
- iv) 50% to 88% by wt. of water

characterized in that at least 50% of the fat is present as oil bodies.

5

Oil bodies provide a source of healthy polyunsaturated fats for ice confection products. Furthermore liquid fats obtained from sources such as sunflower oil are normally refined in order to remove pro-oxidants, which would otherwise increase the tendency of the fat to become rancid over time, especially if the fat is in proximity to air, as is the case in ice cream. However, refining also reduces the amount of desirable ingredients, for example, vitamin E. In contrast oil bodies, which are an unrefined source of oil, retain these desirable natural ingredients, providing a further health aspect. The resultant ice confection products also have a highly acceptable taste and do not become rancid on storage. Preferably at least 80%, more preferably at least 95%, most preferably all of the fat is present as oil bodies.

15

Preferably the ice confection has an overrun of more than 20%, more preferably more than 50%, most preferably more than 75%. Equally preferably the ice confection has an overrun of less than 200%, more preferably less than 150%, most preferably less than 120%. It has been found that when the fat is present as oil bodies, aerated ice confections that have a stable air structure are produced even though the fat is liquid at standard processing temperatures.

20

Preferably, the ice confection comprises at least one emulsifier. Examples of known emulsifiers include mono- and di-glycerides of saturated or unsaturated fatty acids (for example monoglyceryl palmitate), polyoxyethylene derivatives of hexahydric alcohols (usually sorbitol), glycols, glycol esters, polyglycerol esters, sorbitan esters, stearyl lactylate, lactic acid esters, citric acid esters, acetylated monoglyceride, diacetyl tartaric acid esters, polyoxyethylene sorbitan esters, lecithin and egg yolk and mixtures thereof. It has been found that the presence of emulsifier improves the storage stability and meltdown of the ice confection.

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Preferably the emulsifier is a mono-/diglyceride of saturated fatty acids with a monoglyceride content of at least 40%.

35

Preferably the emulsifier is present at between 0.1 and 1.5% by weight.

Preferably the oil bodies are derived from a source selected from the group consisting of the seeds of sunflower, rapeseed, soybean, oil palm, cotton seed, ground nut, castor, safflower, mustard, coriander, squash, linseed, brazil nut, jojoba, maize, sesame, chick pea, avocado; or from avocado fruit, or any mixture thereof. More preferably the oil bodies are derived from a source selected from the group consisting of the seeds of sunflower, soybean, avocado or rapeseed, or from avocado fruit, or any mixture thereof. Most preferably the oil bodies are derived from sunflower seed.

Preferably the ice confection contains oil bodies at a level of 0.5 % to 20 %, more preferably 2 % to 11 % by weight of the ice confection.

Preferably, the oil bodies used in this invention have an oil/protein ratio (=lipid/protein ratio) by weight of greater than 3.5, and preferably less than 20.

Proteins which may be present in the ice confection (in addition to oleosin proteins) include milk proteins, soy protein, wheat protein, barley protein, lupin protein and mixtures thereof. Particularly preferred are milk proteins owing to their superior flavour, heat stability and surface activity. Suitable sources of milk protein include milk, concentrated milk, milk powders, whey, whey powders and whey protein concentrates/isolates. In order to aid in emulsification and/or aeration during manufacture of the frozen confection it is preferable that the protein content (in addition to oleosin proteins) is greater than 3% by weight of the frozen confection, more preferably greater than 4%. In order to prevent the texture of the confection from becoming chalky, it is also preferable that the protein content (in addition to oleosin proteins) is less than 8%, more preferably less than 7% by weight of the frozen confection.

Sugars are present in the ice confections of the invention. The sugar is typically a mono-, di-, or oligo-saccharide or sugar alcohol for instance, sucrose, dextrose, fructose, lactose (for example from milk solids), purified lactose, lactose monohydrate, glucose syrup, invert sugar, corn syrup, fructose, erythritol, arabitol, xylitol, sorbitol, glycerol, mannitol, lactitol and maltitol or mixtures thereof. In order to provide freezing point depression and contribute to the sweetness of the confection it is preferred that the confection comprises at least 5% sugars, more preferably at least 8% and most preferably at least 10% by

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weight of the frozen confection. To avoid the confection being too sweet, it is preferred that the confection comprises at most 25% sugars, more preferably at most 20% and most preferably at most 18% by weight of the frozen confection. Where large freezing point depression is required, so that the ice confection produced is soft, low molecular weight molecules such as fructose may be selected. Some or all of the sugar may be provided from fruit puree. Preferably a blend of sugars is used; more preferably one of the sugars is sucrose.

Stabilisers may be included in the ice confections of the invention. Stabilisers that may be used include proteins such as gelatin; plant extrudates such as gum arabic, gum ghatti, gum karaya, gum tragacanth; seed gums such as locust bean gum, guar gum, psyllium seed gum, quince seed gum or tamarind seed gum; seaweed extracts such as agar, alginates, carrageenan or furcelleran; pectins such as low methoxyl or high methoxyl-type pectins; cellulose derivatives such as sodium carboxymethyl cellulose, microcrystalline cellulose, methyl and methylethyl celluloses, or hydroxypropyl and hydroxypropylmethyl celluloses; and microbial gums such as dextran, xanthan or β -1,3-glucan. Preferably, the stabiliser is selected from locust bean gum, kappa carrageenan, guar gum or mixtures thereof. Preferably the stabilisers are present at a level of 0.05-1 wt% of the composition.

In addition, the ice confection may contain flavouring and/or colouring. Typical flavourings include mint, vanilla, chocolate, coffee, or fruit flavours. Preferably, the flavouring or colouring will be present at a level of less than 1 wt% of the composition. Pieces of nut, chocolate, ginger, biscuit, fruit, fruit puree, or other ingredients or additives commonly added to ice cream or other ice confections may also be included.

Detailed Description of the invention

The present invention will be further described in the following examples and by reference to the drawing, wherein Figure 1 represents a plot of the meltdown results for ice creams containing 5% oil bodies with and without emulsifier. In the following examples, compositions demonstrating various facets of the invention were prepared.

Example 1. A method for producing an oil body preparation

A total of 1.7 kg of de-hulled sunflower seeds was ground in a food-processor until no large particles were present. The ground seeds were homogenised in two volumes of cold grinding buffer (0.6 M sucrose and 1.0 M NaCl) using a Waring blender (a commercial heavy duty blender) at low speed. The homogenate was filtered through a 500µm pore size sieve to remove large particles and seed skins. After sieving, the homogenate was centrifuged at 10,000xg for 30 minutes at 4°C in order to remove large particles, insoluble proteins and separate the oil bodies from the aqueous soluble seed proteins. The floating oil body layer was skimmed off by using a metal spatula and added to one volume of floating buffer (0.6 M sucrose).

After homogenisation in the Waring blender at low speed, the mixture was sieved through a 150µm pore-size sieve to obtain an emulsion with oil bodies less than 150µm in size. The homogenised oil bodies were centrifuged again as described above. The skimmed oil bodies were washed twice in one volume of floating buffer and after each wash step centrifuged as described. The final oil body preparation was placed in a sealed plastic container and stored at 4°C until used.

Approximately 1kg of oil body preparation was produced. This was determined to have a water content of approximately 35% using the method described above. Therefore the "dry" oil body content of the preparation was approximately 65% by weight. It is important to measure this for each oil body preparation so that it is known how much oil body is added to each mix (see below). When the method for producing oil bodies was repeated several times it was found that the water content in different oil body preparations varied slightly (between 30% and 40%). Therefore the "dry" oil body content varied between 60% and 70%.

Example 2. Production of frozen confections with oil bodies as the only source of fat

Ice cream mixes were prepared as shown in Table 1, based on a standard ice cream formulation taken from Ice Cream, Fourth Edition by W.S. Arbuckle, Pub. Van Nostrand Reinhold, New York, 1986.

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Table 1: Ice cream formulations (amounts are expressed as dry weight %)

Ingredient				
Skimmed milk powder	11.5	11.5	11.5	11.5
Sucrose	15.0	15.0	15.0	15.0
Locust bean gum	0.144	0.144	0.144	0.144
Carrageenan L100	0.016	0.016	0.016	0.016
Vanillin	0.012	0.012	0.012	0.012
Oil bodies	5.0	5.0	10.0	10.0
HP 40	0	0.3	0	0.3
Water	to 100%	to 100%	to 100%	to 100%

HP40 is a saturated mono-diglyceride (40% monoglyceride) supplied by Danisco.

- 5 The mixes were prepared as follows: the ingredients other than the oil body preparation were mixed, stirred and heated to 60-70 °C. The oil body preparation was then added, so that the amount of oil bodies in the final mix was 5% or 10% as required. Since water is present in the oil body preparation an allowance was made when calculating the mass of oil body added to an ice confection. For example, to make a mix containing 5% oil bodies
- 10 an amount of 7.7% oil body preparation (which consists of 65% oil bodies and 35% water) was used. Similarly the amount of water in the oil body preparation was taken into account when preparing the mix, so that the required concentrations were achieved after the oil body preparation was added.
- 15 Then the mix was heated to approximately 80°C to pasteurise it and dispersed using a homogeniser (Silverson L4R). The mix was then left to cool overnight at approximately 4°C. The oil body mix was re-homogenised (using the Silverson homogeniser) immediately prior to freezing.
- 20 The mixes were aerated and frozen in a Technohoy MF75 scraped surface heat exchanger fitted with a C29800 open dasher. The mixes were extruded at between -5°C and -6°C with 100% overrun through a fluted nozzle into pots or 500 ml cardboard boxes. The products were blast frozen at -35°C for 3-4 hours then stored at -25°C. Ice creams were produced satisfactorily both with and without the emulsifier.

The ice creams had an acceptable texture. The ice creams with 10% oil bodies were thicker and had more body than those with 5%.

Example 3

- 5 The ability of products to resist melting and serum leakage when exposed to ambient temperatures for an extended period of time was measured as follows. A block of ice cream (500 ml) was taken from a -25°C cold store, placed on a wire mesh (3.0 mm square holes, 1.0 mm thick wire) on a balance and the mass of the block was recorded. The mesh with the block was then placed above a funnel and collection container in a
- 10 controlled temperature environment at $+20^{\circ}\text{C}$. The mass collected in the container (i.e. mass lost from the product) was measured automatically by computer every minute for 250 minutes. 3 repeats of each sample were measured simultaneously. The results were plotted as average percentage mass loss as a function of time.
- 15 The meltdown results for the 5% oil body samples with and without emulsifier are shown in Figure 1. The effect of the emulsifier on the oil body ice cream was to reduce the percentage mass lost over 250 minutes thereby improving the meltdown.

Example 4: Effect of temperature abuse

- 20 Samples produced as described in Example 2 were temperature abused by cycling them between -10°C and -20°C in a temperature controlled cabinet every 12 hours for 3 weeks.

Samples with no emulsifier lost some air during abuse: the ice cream had visibly shrunk

25 away from the edge of the pot and had decreased in height. However, samples with emulsifier retained their shape during temperature cycling and did not lose overrun. Thus the presence of the emulsifier improved the storage stability of the ice cream. No rancidity was detected on tasting in samples with or without emulsifier.

- 30 The various features of the embodiments of the present invention referred to in individual sections above apply, as appropriate, to other sections *mutatis mutandis*. Consequently features specified in one section may be combined with features specified in other sections as appropriate.

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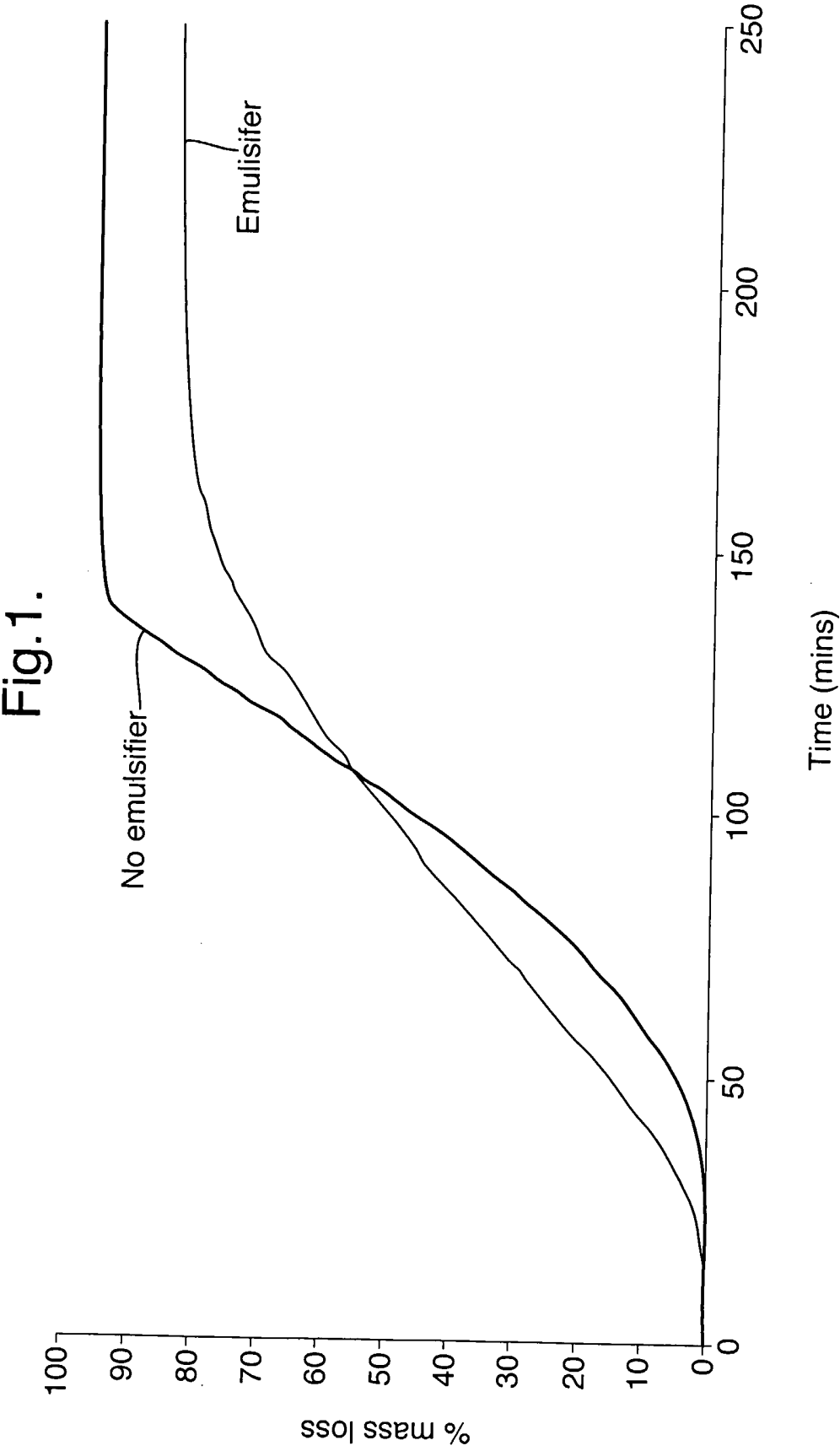
All publications mentioned in the above specification are herein incorporated by reference. Various modifications and variations of the described methods and products of the invention will be apparent to those skilled in the art without departing from the scope of the invention. Although the invention has been described in connection with
5 specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are apparent to those skilled in the relevant fields are intended to be within the scope of the following claims.

Claims

1. An ice confection containing;
 - i) at least 2% by wt. polyunsaturated fat;
 - 5 ii) at least 3% by wt. of protein;
 - iii) at least 5% by wt. of a sugar or sugars;
 - iv) 50% to 88% by wt. of watercharacterized in that at least 50% of the fat is present as oil bodies.
- 10 2. The ice confection of claim 1 wherein at least 80% of the fat is present as oil bodies.
3. The ice confection of claim 1 or claim 2 wherein the overrun is more than 20%.
- 15 4. The ice confection of claim 3, wherein overrun is less than 200%.
5. The ice confection of claim 4 wherein the confection has an overrun of more than 75% and less than 120%.
- 20 6. The ice confection of any preceding claim which further comprises at least one emulsifier.
7. The ice confection of claim 6 wherein the emulsifier is present at between 0.1 and 1.5% by weight.
- 25 8. The ice confection of any preceding claim wherein the oil bodies are derived from a source selected from the group consisting of the seeds of sunflower, rapeseed, soybean, oil palm, cotton seed, ground nut, castor, safflower, mustard, coriander, squash, linseed, brazil nut, jojoba, maize, sesame, chick pea and avocado; or
30 from avocado fruit, or any mixture thereof.
9. The ice confection of claim 9 wherein the oil bodies are derived from sunflower seeds.

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10. The ice confection of any preceding claim wherein the oil bodies are present at a level of 0.5 % to 20 % by weight of the ice confection.



INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2005/010165

A. CLASSIFICATION OF SUBJECT MATTER

A23G9/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1996, no. 04, 30 April 1996 (1996-04-30) -& JP 07 313066 A (KAO CORP), 5 December 1995 (1995-12-05) abstract	1-10
A	----- PATENT ABSTRACTS OF JAPAN vol. 006, no. 106 (C-108), 16 June 1982 (1982-06-16) -& JP 57 036944 A (LOTTE CO LTD), 27 February 1982 (1982-02-27) cited in the application abstract ----- -/--	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *G* document member of the same patent family

Date of the actual completion of the international search

23 January 2006

Date of mailing of the international search report

08/02/2006

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Boddaert, P

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2005/010165

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 146 645 A (DECKERS ET AL) 14 November 2000 (2000-11-14) cited in the application column 12; claims -----	1-10
A	US 6 558 729 B1 (RIVIERE PHILIPPE ET AL) 6 May 2003 (2003-05-06) cited in the application the whole document -----	1-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2005/010165

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