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(54) Title: EDIBLE EMULSIONS WITH MINERAL

(57) Abstract: Edible emulsion comprising a mineral salt having or causing an undesired flavour, 0.1 to 1 wt% polyglycerol polyricinoleate and 15 to 85 wt% fat, wherein the mineral salt is present in an amount that gives an undesired flavour in the emulsion without polyglycerol polyricinoleate.

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**Edible emulsions with mineral****Field of the invention**

5 The invention relates to an edible emulsion comprising a source of mineral and polyglycerol polyricinoleate.

**Background to the invention**

Dietary or essential minerals are chemical elements required by  
10 living organisms, other than the four elements Carbon, Hydrogen, Nitrogen, and Oxygen which are ubiquitous in organic molecules. They can be either bulk minerals (required in relatively large amounts) or trace minerals (required only in very small amounts).

15

Minerals can be naturally occurring in food or added in elemental or mineral form, such as calcium carbonate or sodium chloride. Some of these additives come from natural sources such as ground oyster shells. Sometimes minerals are added to  
20 the diet separately from food, as vitamin and mineral supplements.

Appropriate intake levels of each dietary mineral must be sustained to maintain physical health.

25

In Human nutrition, the dietary bulk mineral elements (RDA > 200 mg/day) are Calcium, Magnesium, Phosphorus, Potassium, Sodium, and Sulfur.

30 The most important trace mineral elements (RDA < 200 mg/day) are Chromium, Cobalt, Copper, Fluorine, Iodine, Iron, Manganese, Molybdenum, Selenium, Zinc,

Many other minerals have been suggested as required in human nutrition, in varying quantities e.g. Bismuth, Boron, Nickel, Rubidium, Silicon, Strontium, Tellurium, Titanium, Tungsten, Vanadium,

5

A large body of research suggests that humans often can benefit from mineral supplementation. Metals, like Iron, Magnesium, Zinc, Selenium and Calcium are essential minerals.

10 Edible emulsions are used in a variety of ways, e.g. spreadable products, frying products, baking ingredients, drinks, diary type products. They are therefore suitable vehicles for incorporation of minerals.

15 Unfortunately many of these minerals have a bitter taste or metallic taste and the amount of the minerals needed in food products to fortify in order to obtain a beneficial effect from it gives the food product a off-taste which is not liked by consumers.

20

One option is to encapsulate the minerals, like in multi-vitamin and -mineral pills to prevent the contact of the ingredient with the mouth. A drawback of the encapsulation is that a suitable encapsulate should be found that works well in  
25 the food product. Furthermore encapsulates are often more expensive than the bare ingredient it self.

Another way of masking the bad taste of mineral is to add another taste that overtakes the bitter taste. However often a  
30 lot of the masking taste should be added to mask the undesired taste and not much flexibility in taste is left, and another strong taste is left, which leaves out neutral tasting food products.

WO 01/17375 discloses emulsified fat products fortified with calcium. It relates to novel calcium salts and sources and method of preparation and their use in fat spreads with good organoleptic properties. It was found that good organoleptic  
5 properties were obtained if the calcium source was included in both the oil phase and the aqueous phase. No specific disclosure of polyglycerol polyricinoleate as emulsifier was made.

10 US 6,294,207 discloses an oleaginous food with calcium amino acid malic acid chelate complex that is palatable. It is believed that the specific calcium chelate complex avoids the metallic aftertaste of prior known calcium fortified products. Polyglycerol polyricinoleate is not mentioned.

15

Polyglycerol polyricinoleate (PGPR) is a strong water-in-oil emulsifier and has been used in many spread and margarine applications and is commonly used for chocolate compositions. Examples are WO 03/51135, and EP 0997074 however in none of the  
20 applications the use of a mineral salt with an undesired taste is disclosed. EP 0997074 even discloses that emulsions without PGPR taste better than emulsions with PGPR.

WO 01/91570 discloses fat continuous emulsions with an  
25 emulsifier system comprising a stabilising emulsifier and a destabilising emulsifier. Polyglycerol polyricinoleate is mentioned as stabilising emulsifier. The aqueous phase comprises gelling agents which often require a salt such as calcium dichloride. The examples show compositions comprising  
30 0.4 wt% PGPR and 0.08 wt% of Calcium dichloride. The amount of calcium salt is too low to give an undesired taste or flavour in emulsions without polyglycerol polyricinoleate.

WO 02/49443 discloses fat-continuous food products with primary emulsifier polyglycerol polyricinoleate. The examples show compositions comprising 0.3 wt% PGPR and 1.5-3 wt% of an unspecified salt. The use of a mineral salt with an undesired  
5 taste is not disclosed.

WO 03/049548 discloses water-continuous emulsified food compositions comprising water-soluble tastants among which potassium chloride. The compositions of WO 03/049548 are  
10 W1/O/W2 duplex emulsions wherein water phases W1 (dispersed water phase) and W2 (continuous water phase) comprise at least one water-soluble tastant in both of the water phases and are substantially isotonic for the tastant. These duplex emulsions give a reduced taste impression of the tastant when compared to  
15 single water-continuous emulsions. Unfortunately duplex emulsions are inherently more complex than single emulsions. Furthermore at least 2 waterphases need to be prepared each containing the tastant and being isotonic for the tastant. In addition, only water-continuous emulsions are disclosed. The  
20 internal emulsion (W1/O) is stabilised by an emulsifier with hydrophobic lipophilic balance (HLB) of less than or equal to 6. An example of such an emulsifier is polyglycerol polyricinoleate. Example 4 contains potassium sorbate, but in a very low amount (0.021% Potassium sorbate; 0.0054% of potassium  
25 ion; for 30g spread: 1.62 mg of potassium ion) i.e. below the threshold to be able to taste it.

WO 02/089594 discloses all vegetable emulsions wherein the aqueous phase comprises a protein containing cereal base and  
30 the fat phase comprises a fractionated vegetable oil. The examples show comparative spreads with polyglycerol polyricinoleate (PGPR) and an unspecified salt. The use of a mineral salt with an undesired taste is not disclosed. The

spreads were tested by a taste panel. The results show that spreads with fractionated oat oil have better taste feel for salt and sourness in comparison with spread without oat oil but with PGPR. There is however no difference tasted in spreads for 5 rancid, old, metallic and bitterness taste. Furthermore spreads with PGPR and with oat base had a more salty taste than spread without PGPR and without oat base and the same sourness taste for both.

10 WO 03/51136 discloses pourable food products consisting of a lipid matrix containing stably dispersed particles having a size of at least one micron and a density which is 0-25 wt% higher or lower than the density of the lipid. Optionally an emulsifier may be added and polyglycerol polyriconeleate is 15 mentioned as one possible emulsifier. Cooking salt is mentioned as possible particles. No composition comprising polyglycerol polyriconeleate and cooking salt are disclosed. In addition, the use of a mineral salt with an undesired taste is not disclosed.

20

US2003/0108591 discloses ingestable products for lowering blood total cholesterol including isoflavone, soy protein and phytosterol. Spreads are mentioned as a beneficial form for ingestion. Furthermore, polyglycerol polyricinoleate is 25 described as an advantageous emulsifier. Examples do not contain PGPR.

In WO 00/64276 discloses water-in-oil spreads including phytoestrogens and calcium salts. The spreads have good taste 30 despite the presence of often-bitter tasting isoflavones. Polyglycerol polyricinoleate is said to be an optional ingredient. No examples are disclosed containing polyglycerol polyricinoleate. Potassium sorbate is used in very low amounts

for preservative purposes (0.11wt% potassium sorbate; 0.028wt% potassium, 8.4 mg potassium per 30 g spread).

WO 00/64268 discloses water in oil emulsions with a variegate  
5 composition having a pronounced sweet taste. The variegate composition can be based on vegetable extracts or fruit extracts. Polyglycerol polyricinoleate is mentioned in a long list of emulsifiers. No examples are disclosed containing polyglycerol polyricinoleate. Potassium sorbate is used in very  
10 low amounts for preservative purposes (0.11wt% potassium sorbate; 0.028wt% potassium, 8.4 mg potassium per 30 g spread).

WO 2005/004642 discloses fat continuous low fat products with polyglycerol polyricinoleate and potassium sorbate. However the  
15 level of potassium sorbate of 0.05% and 0.1% (i.e. 0.013% and 0.026 % of potassium ion) is so low that the bitter taste of the potassium is not tasted in an emulsion without polyglycerol polyricinoleate.

20 WO 2006/037847 discloses emulsified food products comprising water and 0 to 5 wt% of triglycerides, 0.5 to 60 wt% of plant sterol and/or stanol fatty esters, and optionally one or more emulsifiers. A low energy spread is disclosed with 0.2 wt% of polyglycerol polyricinoleate and an unknown amount of potassium  
25 sorbate, however the spread does not contain fat.

It is therefore an object of the current invention to provide a food product which comprises a mineral salt wherein the undesired taste of the mineral salt is not noticed by  
30 consumers. Further food products with good organoleptic properties are envisioned with the current invention. Another object is to provide a food product that provides at least a part of the recommended daily amount (RDA) of minerals per

serving. Another object of the present invention is to provide a food product that provides at least a part of the recommended daily amount (RDA) of minerals per serving for improved mental health. Yet another object of the present invention is to  
5 provide a food product that provides at least a part of the recommended daily amount (RDA) of minerals per serving for blood pressure lowering.

### **Summary of the invention**

10 One or more of the above objects are attained by an edible emulsion comprising a mineral salt having or causing an undesired flavour, 0.1 to 1 wt% polyglycerol polyricinoleate, and 15 to 85 wt% fat, wherein the mineral salt is present in an amount that gives the undesired flavour in the emulsion without  
15 the polyglycerol polyricinoleate.

It was surprisingly found that emulsions with mineral salts do not have the taste of the mineral salt or develop an off-taste if polyglycerol polyricinoleate (PGPR) is used in the emulsion.

20

### **Detailed description of the invention**

The present invention relates to a mineral salt with an undesired flavour. Flavour is the sensory impression of a food or other substance, and is determined mainly by the chemical  
25 senses of taste and smell. It may be mineral salts that have a bitter taste, rancid taste, off-flavour taste, metallic taste, or old taste, offensive taste. It may also be mineral salts that have a very pronounced taste or flavour which is undesired for the specific type of food product. The flavour of the  
30 mineral salt may be determined by a sensory panel. Common salt or sodium chloride has a taste which is very much liked, therefore sodium chloride does not form a part of the present invention.



The present invention is also related to mineral salt that cause an undesired flavour. Some mineral salts have a bland or even agreeable taste or flavour by themselves but cause by  
5 interaction with other ingredients an undesired flavour, or off-flavour is produced.

The taste or flavour of an ingredient is dependent on the concentration of the ingredient. Therefore the present  
10 invention relates to an emulsion with a mineral salt in an amount that gives the undesired flavour in the emulsion without polyglycerol polyricinoleate.

The emulsion with mineral salt is tested by a sensory panel  
15 that evaluates the flavour of an emulsion with and without polyglycerol polyricinoleate. Mineral salts that show a different in taste or flavour between emulsions with and without polyglycerol polyricinoleate are envisioned by the present invention.

20

The undesired flavour may be selected from the group comprising bitterness, rancid, old, metal, cardboard, oxidized, musty, dusty and astringent.

25 Sensory panels consist of trained human assessors that qualify and quantify sensory properties of foods. The responses made by the sensory panels are recorded and may be analysed by statistical methods e.g. ANOVA, multivariate or univariate data analyses. Within food research, sensory panels are commonly  
30 used to qualify and quantify sensory properties, such as taste, odour or smell, flavour, mouthfeel, and other organoleptic properties. The type of sensory panel will depend on the taste

of the mineral salt and the product format, however these considerations are all within the skills of a skilled person.

Preferably the edible emulsion of the present invention has a  
5 good melting behaviour. Melting behaviour influences the organoleptic properties of an emulsion. If the emulsion doesn't melt fast enough a waxy mouthfeel becomes present and this is not appreciated by consumers.

10 In addition, suitably the edible emulsion of the present invention has overall a good taste impression, suitable for the product, despite the presence of mineral salt with an undesired flavour. The emulsion preferably has a good melting behaviour in the mouth and a creamy and/or dairy taste is appreciated.

15

The present invention is especially suited for mineral salts that give a health effect. Examples are potassium salts that have a blood pressure lowering effect or iron salts that have an effect on brain development. It is known that potassium salt  
20 in the amount needed to obtain a health benefit gives a strong bitter taste to a food product. Many mineral salts need a certain dose in order to give a health benefit, the so-called effective amount. Often these effective amounts are high thereby increasing the undesired taste to the food product they  
25 are in. The present invention is specifically suited for mineral salts in effective amounts.

Preferably the effective amount of the mineral salt is such that it would give a health effect in a daily serving size of  
30 the food product. The daily serving size is the amount of a food product typically eaten in a day. The daily serving size need not to be taken in 1 go, i.e. it may be divided up in several portions a day. Different food products have different

daily serving sizes. Margarine for example has a daily serving size of about 10 to 30 g per day, which may be divided up in 4 portions, together giving the daily serving size.

5 In a suitable embodiment of the present invention, the mineral salt provides a health effect. Preferably the health effect is selected from the group comprising reduction of risk for cardiovascular disease, reduction of blood pressure, reduction of blood cholesterol, increased resistance to disease, improved  
10 immune response, improved brain function, weight loss, weight control, reduction of Body Mass Index (BMI), improved blood flow, lowering plasma triglycerides, anti-inflammatory effect, antirheumatic effect, smooth platelets, inhibition of platelet aggregation, antithrombotic effect and healthy growth for  
15 children.

The invention is especially suited for bitter tasting compounds. Suitably the healthy ingredient is water soluble.

20 The amount of mineral salt may depend on the effective amount and on the daily serving size of the edible emulsion and can be determined by the skilled person. Preferably, the amount is 10 to 200 % of the recommended daily amount (RDA) per daily serving size, more preferably 20 to 150 %, most preferably 30  
25 to 60 % of the RDI. Suitable amounts are 30, 50, 70 and 100 % of the RDA. Preferably the daily serving size is divided into 2 to 4 portions a day.

The present invention is especially suitable for non-  
30 encapsulated mineral salts. The use of polyglycerol polyricinoleate in the edible emulsion of the present invention circumvents the need for encapsulation of mineral salts with an undesired flavour. A preferred embodiment of the present

invention provides for an edible emulsion with a mineral salt with an undesired flavour that is not encapsulated.

The present invention is also very suitable for edible  
5 emulsions with a mineral salt and another tasty ingredient. Even though a taste or flavour of an ingredient might be acceptable to a food product, the addition of another tasting ingredient might give a combination of flavours that is not desired, e.g. a chocolate flavour with an onion flavour.

10 Because the edible emulsion with polyglycerol polyricinoleate somehow masks the taste of the mineral salt, another tasty ingredients with a different taste would still give a food product with an acceptable taste when applying the present invention. A preferred embodiment of the present invention  
15 provides for an edible emulsion with a mineral salt and at least 1 other tasty ingredient. Even more preferred the present invention provides for an edible emulsion with a mineral salt and at least one other tasty ingredient wherein at least one other tasty ingredient gives a health benefit.

20

Another suitable embodiment of the present invention is an emulsion with a neutral taste. The present invention avoids the need of the addition of another flavour to mask the taste, thereby providing an ability to have neutral tasting products.

25 The neutral taste of a food product may be assessed by a sensory panel.

The amount of mineral depends on the amount needed for an effect to be obtained and on the quantity of a serving size and  
30 on the emulsion type and can be determined by the skilled person. Furthermore the amount of mineral depends on the type of salt as it is the amount of the mineral which is the determining factor for establishing the daily recommended

amount. Preferably, the amount is 10 to 200 % of the recommended daily amount (RDA) of the mineral per serving, preferably 20 to 150 %, more preferably 30 to 120%, most preferably, 30 to 60%. Suitable amounts are 30, 50, 70 and 100  
 5 % of the RDA. For example the RDA of iron is 14 mg, this means that 56 mg of ferric pyrophosphate is needed to provide 14 mg of iron.

Suitable minerals are Calcium, Magnesium, Phosphorus,  
 10 Potassium, Sodium, and Sulfur, Chromium, Cobalt, Copper, Fluorine, Iodine, Iron, Manganese, Molybdenum, Selenium, Zinc.

Preferred minerals are Iron, Magnesium, Zinc and Selenium. These minerals have been proven beneficial for mental  
 15 performance.

Calcium is also a preferred mineral as it is vital for bone growth and maintenance.

Mineral	RDA (mg)
Iron	14
iodine	0.150
Zinc	15
Calcium	800
Phosphorus	800
Magnesium	300
Selenium	0.010

20 Suitable iron sources are ferrous carbonate, ferrous citrate, ferrous ammonium citrate, ferrous gluconate, ferrous fumarate, ferric sodium diphosphate, ferrous lactate, ferrous sulphate, ferric diphosphate, ferric pyrophosphate, ferric saccharate, ferrous EDTA, elemental iron.

Suitable magnesium sources are magnesium acetate, magnesium carbonate, magnesium chloride, magnesium salts of citric acid, magnesium gluconate, magnesium glycerophosphate, magnesium salts of orthophosphoric acid, magnesium lactate, magnesium  
5 hydroxide, magnesium oxide, magnesium sulphate.

Suitable Zinc sources are zinc acetate, zinc chloride, zinc citrate, zinc gluconate, zinc lactate, zinc oxide, zinc carbonate, zinc sulphate.

10

Suitable selenium sources are sodium selenate, sodium hydrogen selenite and sodium selenite.

Suitable sources of calcium are calcium carbonate, calcium  
15 chloride, calcium salts of citric acid, calcium gluconate, calcium glycerophosphate, calcium lactate, calcium salts of orthophosphoric acid, calcium hydroxide, calcium oxide, calcium sulphate. Preferably the source of calcium is not calcium amino acid malic acid chelate complex.

20

Preferably the mineral is included in the aqueous phase. In another preferred embodiment the mineral is not included in the fat phase.

25 Suitable daily amount of edible emulsion are 10 to 50 g, more preferably about 20 g to 40 g for spreads. Suitably 1 to 5 servings are consumed to provide the daily dosage of minerals.

Products according to the invention comprise polyglycerol  
30 polyricinoleate which is commercially available amongst others under the name PGPR 90 ex Danisco, and under the name of Admul WOL ex Kerry. This ingredient is generally known to be excellent water-in-oil emulsifier.

The amount of polyglycerol polyricinoleate in the products of the invention is from 0.1 to 1% wt% on total product weight. Higher amounts lead to products which do not easily de-emulsify  
5 in the mouth upon consumption and will hence not show the desired organoleptic properties. Preferably the amount of polyglycerol polyricinoleate in food products according to the invention is from 0.2 to 0.4 wt%.

10 The emulsion of the invention may comprise thickeners. For stability reasons it may be useful to include thickeners in the emulsion, for example very low spreads, with 20 to 30 wt% of fat, often improve by addition of thickeners. Whether or not a thickener should be added and in what amount depends on factors  
15 as stability and application and may be determined by the skilled person.

Thickener may be any known thickener and are preferably selected from the group comprising gums, like xanthan, guar,  
20 and locust bean, carrageenan, polysaccharides, alginate, pectin, starch, modified starch and gelatine.

In preferred food products according to the invention, the aqueous phase comprises a native or a modified fully  
25 gelatinised starch which may be cook-up or pre-gelled, selected from any of the main starch groups: wheat, potato, rice, maize, waxy rice or waxy maize.

Examples of suitable starches include Remyrice<sup>TM</sup>, Resistamyl<sup>TM</sup>,  
30 Merigel<sup>TM</sup>, Purity LFS<sup>TM</sup>.

The amount of starch in the food product according to the invention depends somewhat on the type of chosen starch and is

preferably from 0.2 to 5 wt%, more preferred from 0.7 to 3 wt%, most preferred from 1 to 2 wt%.

In a preferred embodiment the emulsion is fat continuous. In  
5 another preferred embodiment the emulsion is not a duplex emulsion. Even more preferred the emulsion is a single emulsion. A preferred embodiment of the present invention is a spread. Preferably the emulsion of the present invention is not chocolate or a chocolate containing emulsion.

10

The emulsion according to the invention comprises from 15 to 85 wt% of a fat, preferably from 20 to 70 wt% more preferably from 25 to 60 wt%, most preferably from 30 to 40 wt% fat. The fat consists predominantly of triglycerides. The fat can be a  
15 single fat or a combination of fats.

The fat or fat blend may comprise vegetable or animal fats which may be hydrogenated, interesterified or fractionated and combinations thereof. Suitable animal fats may consist of  
20 butterfat or tallow. Suitable vegetable fats can for example be selected from the group comprising bean oil, sunflower oil, palm kernel oil, coconut oil, palm oil, rapeseed oil, cotton seed oil, maize oil, or their fractions, or a combination thereof. Interesterified fat blends of these fats or optionally  
25 with other fats are also encompassed in the invention.

Advantageously, long chain poly unsaturated fatty acids (LC-PUFA), e.g. omega-3 and omega-6 fatty acids are incorporated in the edible emulsion of the present invention. Suitably these  
30 LC-PUFAs come from sources like fish oil and/or algae oil.

To ensure homogeneous distribution of the aqueous phase in the continuous fat phase, the droplet size distribution  $D_{3,3}$  of the



dispersed aqueous phase is preferably less than 8  $\mu\text{m}$ , more preferably from 4 to 8  $\mu\text{m}$ , more preferred even lower than 4  $\mu\text{m}$ . The method to determine  $D_{3,3}$  is illustrated in the examples. It will be appreciated that the droplet size can be controlled  
5 by adjusting the processing conditions in the unit operations: e.g. higher rotational speed in a scraped surface heat exchanger will produce correspondingly smaller water droplet size distributions.

10 In addition to the water-in-oil emulsifier polyglycerol polyricinoleate, the food product according to the invention comprises another emulsifier, the co-emulsifier. This co-emulsifier is preferably also a water-in-oil emulsifier. More preferably this co-emulsifier is selected from the group  
15 comprising distilled monoglycerides, citric acid esters of monoglycerides, di-acetyl acetic acid esters of monoglycerides, lactic acid esters of monoglyceride, mono-diglycerides, polyglycerol esters of fatty acids or sorbitan esters of fatty acids.

20

The most preferred co-emulsifier is a distilled monoglyceride. Even more preferred are monoglycerides with unsaturated fatty acids or combinations of a monoglyceride comprising a saturated fatty acid residue and a monoglyceride comprising an  
25 unsaturated fatty acid residue.

The amount of co-emulsifier depends on the type and effectiveness of the emulsifier selected and can be determined by the person skilled in the art. Other factors influencing the  
30 amount of emulsifier that is required to obtain storage stable products are the amount of fat and the amount of polyglycerol polyricinoleate. As a general guidance the amount of emulsifier

is preferably from 0.05 to 1.5 wt%, more preferred from 0.1 to 0.7 wt%, most preferred from 0.15 to 0.5 wt%.

The pH of the aqueous phase can be set to the desired value, among others to influence acidic or basic taste impression and to influence microbial stability. Preferably the pH of the aqueous phase in food products according to the invention is from 4.3 to 5.5.

10 Optionally some protein is added to the product according to the invention. Protein may be added to beneficially influence the taste, flavour and nutritional value of the food product and also may be added to increase browning of food stuff when the current composition is used as a medium for shallow frying.

15 Preferably the protein source is selected from the group comprising milk powders such as skim milk powder, butter milk powder, sodium caseinate, sour whey, denatured whey, or a combination thereof.

20 Preferably at least 0.3 wt% of protein is present in the emulsion, more preferably from 0.3 to 1 wt%. In a preferred embodiment the emulsion according to the invention does not comprise a protein containing oat base such that the protein content of the emulsion is 0.01-0.2% by weight. In another  
25 preferred embodiment the emulsion is not a water-in-oil spread comprising isoflavones, soy protein, and phytosterols.

The emulsion according to the invention optionally contain other ingredients such as preservatives, vitamins, taste and  
30 flavour components, colorants such as beta-carotene, anti-oxidants.

The emulsion according to the invention can be prepared by any suitable process to prepare such products. For fat continuous emulsions, a preferred process is a so-called inversion process; a fat phase containing polyglycerol polyricinoleate and a waterphase are provided and mixed to obtain a water-continuous pre-mix containing the tasty ingredient with the undesired flavour. The water-continuous premix is later inverted to a fat-continuous emulsion.

10 In some cases to obtain a health effect, the effective amount of the tasty ingredient is large such that a fat-continuous mix of all the ingredients is too thick and the pressure in the system is too high. It was surprisingly found that first a water-continuous premix could be made that did not have the  
15 high pressure issues. Polyglycerol polyricinoleate is a very strong water-in-oil emulsifier (HLB ~1) and it was not expected that a water-continuous premix would not have the pressure

Preferably the emulsion is a food product.

20

#### Experimental:

##### Storage stability test

Food product was stored in a plastic container at 10, 20, 30, 25 35 and 40°C for up to 26 weeks. After storage the amount of phase separation was determined by visual examination of the product surface. Storage stable products show a phase separation of less than 5 wt% upon storage at 35 °C for at least 10 weeks, preferably at least 26 weeks. Preferably the  
30 phase separation is less than 5 wt% upon storage at 40 °C.

D<sub>3,3</sub> value measurements and E-sigma:

Samples were filled to a height of 15 mm in NMR tubes of 10 mm diameter, and thermally equilibrated for 30 min at 20 °C. A restricted diffusion-based droplet size was obtained by means of pfg-NMR using a Bruker Minispec MQ20. The details of the technique are discussed by Goudappel et al (Journal of Colloid and Interface Science 239, (2001) 535-542). A measurement yields values for the volume weighted geometric mean diameter  $d_{3,3}$  and the width of the droplet size distribution when plotted as a function of the logarithm of the diameter  $\sigma$  (E-sigma). Measurements were carried out in triplicate and results are expressed in terms of average  $d_{3,3}$  values. Definitions of droplet sizes are given by Alderliesten (Particle and Particle Systems Characterization 7 (1990) 233-241, and ibid 8 (1991) 237-241).

Processing of examples

In a vessel a mixture was prepared of the fat, monoglyceride, PGPR, antioxidant, and colorant at a temperature of about 60 °C. In another, separate vessel a mixture was made of starch and water which was heated to a temperature of 92 °C for 25 minutes. This mixture was cooled to 60 °C and completed with all the other water soluble ingredients, such as salt, protein, etc. and subsequently mixed with the oil phase in a pre-mix tank at 60 °C as a water-continuous emulsion, followed by cooling and shearing in a series of A- and C-units<sup>tm</sup> where the dimensions and energy requirements are suitable to deliver a fat-continuous end product and achieve a plastic structure which could be easily packed at around 10 °C in a suitable packaging material.

**Example 1-4 and comparative examples A and B**

Ingredients are listed in table 1

Table 1; ingredients in wt%

Ingredient	Ex 1	Ex 2	Ex 3	Comp A	Comp B
fat	28.6	28.6	28.6	29	29
Plant sterols	12.7	12.7	12.7	12.7	12.7
Fish oil concentrate	0.7	0.7	0.7	0.7	0.7
PGPR	0.4	0.4	0.4	0	0
Dimodan HP	0.2	0.2	0.2	0.2	0.2
Beta carotene synthetic	0.1	0.1	0.1	0.1	0.1
flavour	0.3	0.3	0.3	0.3	0.3
Sunlec Z	0.1	0.1	0.1	0.1	0.1
Potassium gluconate	10	5	12.5	10	5
Potassium lactate	0	0	0	0	4.6
Potassium chloride	0	1.6	0	0	0
Potassium sorbate	0.26	0.26	0.26	0.26	0.26
BMP	0.2	0.2	0.2	0.2	0.2
sucralose	0.003	0.003	0	0.003	0.003
Acesulfame-K	0.002	0.002	0	0.002	0.002
Tapioca starch	2.75	2.75	2.75	2.75	2.75
Water	Up to 100	Up to 100	Up to 100	Up to 100	Up to 100
pH	4.5	4.7	4.5	5.0	5.0
%K <sup>+</sup>	1.6	1.6	2.0	1.6	2.2
Taste score	1-2	2	1-2	5	4
D3.3 /e-sigma	3.9 / 1.9	4.2/ 2.2	3.8 / 2.0	5.5 / 2.8	5.2 / 2.3

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**Example 5-8: development of off-flavour**

Ingredients are listed in table 2

Table 2; ingredients in wt%

Ingredient	Ex 5	Ex 6	Ex 7	Ex 8
Fat Blend	38.053	37.653	38.313	37.913
POLYGLYCEROL POLYRICINOLEATE	0	0.4	0	0.4
DIMODAN HP (monoglycerides)	0.2	0.2	0.2	0.2
SUNLEC M (Lecithin)	0.15	0.15	0.15	0.15
Covi-ox (tocopherol mixture)	0.042	0.042	0.042	0.042
VITAMIN PREMIXES (vitamin A, D, flavours)	0.015	0.015	0.015	0.015
DEMI WATER	56.685	56.685	56.685	56.685
TAPIOCA STARCH	3.25	3.25	3.25	3.25
YOGHURT POWDER	0.6	0.6	0.6	0.6

SODIUM CHLORIDE	0.3	0.3	0.3	0.3
POTASSIUM SORBATE	0.12	0.12	0.12	0.12
Flavour	0.025	0.025	0.025	0.025
NaCaEDTA	0.01	0.01	0.01	0.01
VITAMIN PREMIXES (vit, B1, B6, B11, B12)	0.01	0.01	0.01	0.01
FERRIC PYROPHOSPHATE	0	0	0.28	0.28
Fe-EDTA	0.54	0.54	0	0
TOTAL [%]	100	100	100	100

Used fat blend:

32% interesterified mixture of Palm oil and Palm kernel

44 % Linseed/Linola oil

5 12 % Maize oil

10% Soy bean oil

2% Rapeseed oil

Taste is determined each week.

10 Table 3: results of storage tests

CONTENT	STORAGE TEMPERATURE		
	5°C	10°C	15°C
100% RDA FeEDTA Ex 5	3		3
100% RDA FeEDTA Ex 6 + 0.4% PGPR	10*	10*	10*
100% RDA iron Ex 7 pyrophosphate	9*	9*	8
100% RDA iron Ex 8 pyrophosphate + 0.4% PGPR	10*	10*	10*

\* after indicated number of weeks no off-taste observed

Products were tested. Products without PGPR (example 5 and 7)  
15 turn bad already after a few weeks of storage: after 8 and 3  
weeks at 15°C, in contrast the examples with PGPR are still  
good even after 10 weeks of storage at 15°C. Example 5, spread  
with Iron EDTA without PGPR is already bad after 3 weeks of  
storage at 5°C.

**Claims**

1. Edible emulsion comprising a mineral salt having or causing an undesired flavour, 0.1 to 1 wt% polyglycerol polyricinoleate and 15 to 85 wt% fat, wherein the mineral salt is present in an amount that gives an undesired flavour in the emulsion without polyglycerol polyricinoleate.
2. Edible emulsion according to claim 1 wherein the amount of polyglycerol polyricinoleate is from 0.2 to 0.4 wt%.
3. Edible emulsion according to claim 1 or 2 wherein the mineral salt provides a health effect.
4. Edible emulsion according to claim 3 wherein the mineral salt is present in an effective amount.
5. Edible emulsion according to any of claims 1 to 4 wherein the mineral salt is present in an amount of from 10 to 200 % of the recommended daily amount (RDA).
6. Edible emulsion according to any of claims 1 to 5 wherein the undesired flavour is selected from the group of bitterness, rancid, old, metal, cardboard, oxidized, musty, dusty and astringent.
7. Edible emulsion according to any of claims 1 to 6 wherein the mineral salt is selected from the group comprising Calcium, Magnesium, Phosphorus, Potassium, Sodium, and Sulfur, Chromium, Cobalt, Copper, Fluorine, Iodine, Iron, Manganese, Molybdenum, Selenium, and Zinc.

8. Edible emulsion according to claim 7 wherein the mineral salt is selected from the group comprising Calcium, Magnesium, Iron, Selenium, and Zinc.
9. Edible emulsion according to any of claims 1 or 8 wherein the emulsion is fat continuous having a dispersed aqueous phase.
10. Edible emulsion according to any of claims 1 to 9 wherein the amount of fat is between 20 and 70 wt% and wherein the emulsion is a spread.
11. Edible emulsion according to any of claims 1 to 10 wherein the amount of fat is from 25 to 60 wt%, preferably from 30 to 40 wt%.
12. Edible emulsion according to any of claims 9 to 11 wherein the droplet size distribution  $D_{3,3}$  of the dispersed aqueous phase is less than 20  $\mu\text{m}$ , preferably less than 8  $\mu\text{m}$ , more preferably less than 4  $\mu\text{m}$ .
13. Edible emulsion according to any of claims 1 to 12 also comprising a sweetener.
14. Use of 0.1 to 1 wt% polyglycerol polyricinoleate in an edible emulsion comprising 15 to 85 wt% fat and a mineral salt having or causing an undesired flavour to mask the undesired flavour.
15. Use of polyglycerol polyricinoleate in an emulsion according to claim 1 to 13 to mask an undesired flavour.



# INTERNATIONAL SEARCH REPORT

International application No  
PCT/EP2007/062061

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. A23D7/00      A23D7/005      A23L1/29      A23L1/30      A23L1/304

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)  
 A23D A23L

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, FSTA

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 00/64276 A (UNILEVER NV [NL]; UNILEVER PLC [GB]; LEVER HINDUSTAN LTD [IN]) 2 November 2000 (2000-11-02) the whole document	1-11,13
X	WO 03/049548 A (UNILEVER NV [NL]; UNILEVER PLC [GB]; LEVER HINDUSTAN LTD [IN]; APPELQV) 19 June 2003 (2003-06-19) claims 1-7,915-17; example 4	1-11,13
X	WO 02/089594 A (CARLSHAMN MEJERI AB [SE]; LINGERUD CECILIA [SE]; SVAERD RIGMOR [SE]; M) 14 November 2002 (2002-11-14) example 1	1-15
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Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

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- \*&\* document member of the same patent family

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## INTERNATIONAL SEARCH REPORT

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## C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2005/004642 A (KERRY GROUP SERVICES LTD [IE]; BOURKE NEIL JOSEPH [NL]) 20 January 2005 (2005-01-20) page 5, line 30 - page 10, line 21; claim 1; examples 1-3	1-11,13
X	WO 2006/037847 A (RAISIO BENECOL OY [FI]; EKBLOM JARI [FI]; LAHTINEN RITVA [FI]; KOPONEN) 13 April 2006 (2006-04-13) claims 1-43; examples 3-5	1-11,13

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2007/062061

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
WO 0064276	A	02-11-2000	AU 4402800 A	10-11-2000
			US 2002160060 A1	31-10-2002
WO 03049548	A	19-06-2003	AU 2002349035 A1	23-06-2003
WO 02089594	A	14-11-2002	EP 1389919 A1	25-02-2004
			SE 521883 C2	16-12-2003
			SE 0101588 A	09-11-2002
WO 2005004642	A	20-01-2005	NONE	
WO 2006037847	A	13-04-2006	CN 101048080 A	03-10-2007
			EP 1827137 A1	05-09-2007