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- (54) Benævnelse: **FREMGANGSMÅDE TIL FREMSTILLING AF EN LIPIDSAMMENSÆTNING UDEN PALMEOLIE, ANVENDELSE DERAFF I ET FØDEVAREPRODUKT**
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PROCESS FOR THE PRODUCTION OF A LIPID COMPOSITION WITHOUT PALM OIL, USE
THEREOF IN A FOOD PRODUCT

FIELD OF THE INVENTION

- 5 The present invention relates to a lipid composition usable in food products which does not contain hydrogenated fat or partially hydrogenated fat, or palm oil.

TECHNOLOGICAL BACKGROUND

10 Palm oil is a vegetable oil which is currently included in the composition of numerous food products. It is obtained by hot pressing pulp of the oil palm fruit. It is a popular product in the agri-food industry due to its physical, rheological and organoleptic properties. It is therefore used in all types of food products manufactured by the agri-food industries: margarine, ready-meals, pizza, crisps, snacks, cereals, spreads, pastries, cakes, biscuits, crackers, etc.

15 The current overconsumption of palm oil is now criticized. Firstly, mass production of palm oil is accused of destroying the environment of the main producing regions (Malaysia, Indonesia, Borneo and Sumatra), and jeopardising numerous endemic and/or protected animal species of these regions, such as the orang-utan. Secondly, it is known that palm oil contains very high levels of saturated fatty acids. However, it is suspected
20 that the excessive consumption of saturated fatty acids could be cause of the increase in bad cholesterol (LDL-cholesterol) in the blood, and therefore could cause cardiovascular diseases.

The substitution of palm oil by other lipid materials is therefore desired. However, this substitution must advantageously be carried out by modifying as little as possible the
25 manufacturing process of food products and by modifying as little as possible the organoleptic properties of the finished food product.

An alternative has been proposed in patent application FR 2 986 693. This document proposes replacing palm oil in pastry, bread or biscuit products with an oily preparation in liquid or paste form comprising a vegetable oil other than palm oil (colza oil) and a
30 polysaccharide (cellulose dietary fibre) or an emulsifier (mixture of mono and triglycerides), and, optionally water.

OBJECTIVES OF THE INVENTION

In light of the abovementioned prior art, it would be preferable to have a composition to substitute palm oil, which has a texture and physical and rheological properties close to those of the fat containing palm oil, preferably, without using food additives.

This lipid composition for substituting palm oil would also have the advantage of being a food ingredient, notably for pastry products, capable of giving good organoleptic (e.g. soft) and nutritional properties, to foods in the compositions of which it is likely to be included.

This lipid composition for substituting palm oil, would also benefit from not affecting the shelf life of industrial food products likely to contain it, such as for example food products (e.g. cakes/pastries) with medium or long shelf life (MSL or LSL).

It is also desirable for this lipid composition for substituting palm oil, to be simple to use in an industrial food process.

Further, this lipid composition for substituting palm oil must be economically viable.

One of the objectives of the present invention is to propose a lipid composition satisfying at least one of the abovementioned specifications. This composition is intended to replace partially or fully palm oil in food preparations in order to improve their organoleptic and nutritional qualities.

Another objective of the invention is to provide a simple and economical manufacturing process of such an ingredient.

Another objective of the invention is to propose a food product, preferably a pastry product comprising a fat other than palm oil, that is tasty, soft, with long shelf life and easy to manufacture, without an unreasonable increase in the cost price. In particular, it would be advantageous that the manufacturing process of such a food product, offers the same flexibility and same aesthetic creation possibilities as the analogous product manufacturing process with palm oil.

BRIEF DESCRIPTION OF THE INVENTION

The present invention satisfies at least one of the abovementioned objectives.

A first object is a process for the preparation of a lipid composition, characterized in that it substantially consists of:

- a) dispersing at least a portion of a thickener in water at a temperature less than the gelatinization temperature of the thickener,
- b) heating this preparation to a temperature greater than or equal to the gelatinization temperature of the thickener, preferably while stirring, for a sufficient period of time to gelatinize the thickener;
- 5 c) cooling the gelatinized dispersion, preferably no later than 15 minutes after gelatinization, to a temperature less than or equal to the gelatinization temperature of the thickener, preferably less than or equal to 50°C, preferably less than or equal to 30°C to obtain a thickened milk, preferably a starch milk,
- 10 d) homogenizing the milk thus obtained with an emulsifier, preferably with an emulsifier based on egg yolk(s),
- e) forming an emulsion from the milk/emulsifier mixture homogenized in step d) and oil, preferably by progressively incorporating the oil into the milk/emulsifier mixture of step d). lipid composition, preferably an oil in water emulsion,
- 15 characterized in that:

This lipid composition with a palm oil content of less than or equal to, as a % by weight relative to the total weight of the composition and in an increasing order of preference: 99; 90; 80; 60; 40; 20; 10; 5; 3; 2; 1; 0.1; 0.01; 0.001.

Its saturated fatty acid content is less than or equal to, as a % by weight relative to the total weight of the composition and in an increasing order of preference: 30; 25; 20; 15; 12; 10;

20

Its Brookfield viscosity at 20°C is greater than or equal to 50,000 mPa.s and, preferably less than or equal to 120,000 mPa.s.

It comprises at least one oil other than palm oil, water, at least one emulsifier based on lecithin, preferably based on egg yolk, at least one thickener preferably based on starch, and more preferably still based on native starch.

25

Preferably, the lipid composition does not include palm oil.

This palm oil substitute is preferably an oil in water emulsion, containing for example, egg yolk and native starch.

30 In accordance with a remarkable embodiment of the invention, this lipid composition, is free from an emulsifying additive, the term "additive" being taken in its legal meaning, that is to say as defined by food industry legislation, and notably the EU regulation No.11279-2011 & EC regulation No.1333-2008.

Further, within the meaning of the invention, the term "free from" includes the total absence of emulsifying additive as well as the presence of at least one emulsifying additive in a concentration less than or equal to - as a % by weight relative to the total mass of the composition and in an increasing order to preference - 2; 1.5; 1; 0.5; 0.1; 10^{-2} ; 10^{-3} ; 10^{-4} ; 10^{-5} ; 10^{-6} .

This composition also stands out by its reduced or even nil palm oil content and by its reduced hydrogenated or partially hydrogenated fat content, which gives it certain nutritional and organoleptic benefits.

Other objectives of this invention are:

- 10 - the use of the lipid composition according to the invention, as fat in pastry products,
- a pastry product, preferably moist cake, comprising the lipid composition according to the invention or obtained by the process according to the invention.

15 **DETAILED DESCRIPTION OF THE INVENTION**

Definitions

These definitions are given at the very least by way of example, in order to contribute to the interpretation of the present explanation.

The "*Brookfield viscosity at 20°C*" is measured on a Brookfield viscometer - model DVIII, 20 equipped with a mobile spindle 07. The measurement is carried out a constant speed (50 rpm for 30 seconds at 20°C.

Within the meaning of the invention, an "*additive*" is a food additive in the legislative sense of the term, notably according to the EU regulation No.11279-2011 & EC regulation No.1333-2008.

25 Within the meaning of the invention, "*gelatinization*" of the thickener is the increase in its viscosity under the effect of an increase in temperature in the presence of water. In the case of starch, heating, in excess water, leads to swelling of the starch grains and the loss of their semi-crystalline structure and the associated birefringence. This translates into a change from a whitish appearance to a glassy appearance.

30 In a preferred embodiment, the lipid composition according to the invention is an O/W emulsion, of pasty consistency and of a viscosity determined greater than or equal to 50,000 mPa.s. These rheological characteristics make this palm oil substitute technologically equivalent to palm oil.

The composition may, in one of its particularly advantageous variants, satisfy the “*clean label*” marketing criteria, that is to say that its food “*additive*” content other than an emulsifying additive is less than or equal to, as % weight relative to the total weight of the composition and in an increasing order of preference: 99; 90; 80; 60; 40; 20; 10; 5; 3; 2; 1; 0.1; 0.01; 0.001; or better still, said composition does not contain any additive other than an emulsifying additive.

This health advantage for the consumer may be coupled with a technological interest since the thickener is not itself an “*additive*”, for example when it is native starch. In this preferred variant, the Brookfield viscosity at 20°C of the lipid composition is less than 80,000 mPa.s. It is therefore possible to control certain technological parameters, such as for example in the case of a pastry product, the diffusion of different coloured batters during cooking, in order to control the patterns thus formed.

According to a remarkable embodiment of the invention, the lipid composition for substituting palm oil, comprises an oil in water emulsion and one of the ingredients for the preparation of the emulsion is a colloidal dispersion in water, some thickener at least partially gelatinized. This characteristic facilitates the replication of the behaviour of a palm-oil based fat, in a food product, such as a pastry product.

Advantageously, a more detailed formulation of the lipid composition according to the invention, may be as % by weight relative to the total weight of the composition and in increasing orders of preference:

- Oil: from 55% to 98%; from 65% to 95%; from 70% to 90%; from 80% to 90%;
- Egg yolk: from 0.5% to 20%; from 1% to 15%; from 2% to 12%; from 5% to 10%; from 7% to 8%;
- Starch: from 0.05% to 10%; from 0.1% to 8%; from 0.2% to 5%; from 0.3% to 1%; from 0.3% to 0.8%; and
- Water: from 1% to 20%; from 3% to 15%; from 5% to 12%; from 6% to 11%; from 7% to 10%.

According to a very preferred embodiment, the lipid composition according to the invention consists of:

- Around 83% by weight, oil,
- Around 7.5% by weight, egg yolk,

- Around 0.5% by weight, starch, and
- Around 9% water,

relative to the total weight of the composition.

5 It is interesting to note that the lipid composition according to the invention may comprise as % weight relative to the total weight of fatty acids of the composition from 10 to 30%, preferably from 15 to 25% linoleic acid; and from 1 to 20%, preferably from 5 to 15% linolenic acid.

10 The oil used in the composition according to the invention is preferably one oil or a mixture of several oils, usable in food, liquid at room temperature. Preferably, the oil is chosen from oils having beneficial nutritional profiles, notably those having high levels of unsaturated fatty acids. The oil may be chosen from the group constituted by colza, sunflower, peanut, avocado, safflower, olive, grapeseed, sesame, soya, maize germ, walnut, squash seed, poppyseed, linseed oils and mixtures thereof. It may particularly be colza oil.

15 Egg yolk used in the lipid composition according to the invention may be in the forms known in the agri-food industry. It may be egg yolk in natural form, in stabilized form, in powder form, etc. It may particularly be egg yolk stabilized by phospholipase-type enzymes which enable the emulsifying power of the lecithin naturally contained in this raw material to be strengthened.

20 The thickener used in the lipid composition according to the invention is preferably selected from the group consisting of:

- Polysaccharides and mixtures thereof, and in particular starches. It may be native starch or modified starch, or a mixture of several native and/or modified starches. Modified starches have the advantage of developing a greater gelling power. However, it is preferred in the present invention to use native starch. Starch may be selected from varied vegetable origin starches, known to be usable in the agri-food industry. It may be selected from the group constituted of corn starch, wheat starch, potato starch (etc.) and mixtures thereof. It may particularly be native corn starch.

- Functional flours of different vegetable origins and mixtures thereof.

30 The lipid composition according to the invention may further comprise a hydrocolloid. The presence of a hydrocolloid may advantageously give body to the composition. This hydrocolloid may notably be a xanthan gum. However, in a preferred embodiment of the present invention, the composition does not contain hydrocolloid.

The lipid composition according to the invention may be obtained by a process comprising the abovementioned steps a) to d).

Further, this lipid composition has the advantage of being able to be kept at room temperature, without undergoing denaturation.

5 The invention relates to the use of the above-defined lipid composition as fat in pastry products, preferably moist cakes, notably with medium or long shelf life (MSL or LSL).

Pastry products, as such, which comprise as fat, the emulsified fat according to the invention or obtained by the above-defined process, are other objects of the invention.

These are preferably moist cakes, notably with medium or long shelf life (MSL or LSL).

10 These pastry products may also be characterized in that

- their saturated fatty acid content is less than or equal to 10%, preferably 5% by weight, relative to the total mass of the pastry product in question;

- and/or their unsaturated fatty acid content is greater than or equal to 14%, preferably 18% by weight, relative to the total mass of the pastry product in question.

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EXAMPLES

Example 1: Preparation of the lipid composition according to the invention (palm oil substitute): Colza oil texturization tests

20 Colza oil texturization tests have been carried out in order to give it a texture close to that of the fat conventionally used in the traditional baking sector, thick to firm and homogeneous appearance.

Thus, several types of texturized fats have been made according to the manufacturing scheme no.1 on the **single appended figure**.

25 The device used is the HOBART N50 20L planetary mixer on maximum speed: 1425 RPM

These tests are oil in water emulsion formulations, stable and rich in fat and are summarized in Table 1 below.

These products use salted, stabilized egg yolk at 11%.

30 This ingredient is obtained by the enzymatic action of a phospholipase A2 on the egg yolk fatty acids. The egg yolk thus obtained is not an “*additive*” within the meaning of the invention.

This ingredient associated with a modified corn starch (COLFLO 67 from National Starch) enables stable emulsions of high viscosity, with high fat content (80 to 84% colza oil) to be produced.

Example 2: Tests on the implementation in a cake type matrix

Yellow sponge type cake mock-ups incorporating the different formulations of fats produced as defined in Example 1 were prepared, as shown in Table 2:

5 **Table 2: comparison tests of yellow sponge cake products incorporating different types of fats**

Ingredients	Samples					
	ST	SHC	SH4	SH7	SH711C	SH711D
Flour T45	27.96	27.96	27.96	27.96	28.02	28.02
Granulated sugar	22.58	22.58	22.58	22.58	22.58	22.58
Beaten egg	23.12	23.12	23.12	23.12	23.12	23.12
Margarine ST	20.43					
Colza oil		20.43				
Hard fat H4			20.51			
Hard fat H7				20.51		
Hard fat H711C					20.51	
Hard fat H711D						20.51
Glucose syrup	2.69	2.69	2.69	2.69	2.69	2.69
Native wheat starch	1.83	1.83	1.83	1.83	1.83	1.83
Vanilla sugar	0.58	0.58	0.58	0.58	0.58	0.58
Sodium pyrophosphate	0.38	0.38	0.38	0.38	0.38	0.38
Sodium bicarbonate	0.19	0.19	0.19	0.19	0.19	0.19
Potassium sorbate	0.18	0.18	0.18	0.18	0.18	0.18
Pure dried fine salt	0.08	0.08	0.08	0.08	0.08	0.08
Cooking yield (as %)	91.14	91.35	88.95	88.7	88.72	88.7
Density of the raw batter (in kg/L)	1.089	1.060	1.026	1.045	1.028	1.040
Aw	0.743	0.689	0.757	0.757	0.76	0.755
Humidity (%)	14.32	11.47	14.58	14.46	14.47	14.50
pH	5.80	6.92	6.78	6.91	6.90	6.88

The two control cakes were made from standard Brossard margarine (ST) and colza oil (SHC).

The results obtained are as follows:

- ST yellow sponge cake: correct product in terms of texture and taste. The product is firm but remains soft in the mouth. The margarine leaves a light greasy veil on the tongue.

5 - Yellow sponge cake SH4 (emulsified fat according to the invention with 80% colza oil): the crumb of the product is less dense and a little less regular than that of the control. The taste of the cake is compliant without fake taste. The product is slightly more risen than the control product.

10 - Yellow sponge cake SH7 (fat at 84% colza oil): the product is more risen than the control and visually close to product SH4. The crumb is more honeycombed than that of the control and the product softer. The texture seems slightly rougher in the mouth and the product seems slightly more elastic upon chewing.

15 - Yellow sponge cake SHC (colza oil control): the product is the least risen of all the cakes tested. Its texture is also the driest. Products SH4 and SH7 are greatly superior, in terms of rise and moistness to the SHC cake carried out without addition of additives.

20 - Yellow sponge cake SH711 with formulation based on native corn starch: the product essentially has a more flexible consistency and therefore gives the best results.

Yellow sponge cake SH711C and D with formulation based on native wheat starch essentially have a more flexible and less elastic consistency than cake SH7. Nevertheless, the moulding of the raw batter SH711C gives the best results as it is slightly less thick than SH711D and consequently spreads better.

Patentkrav

1. Fremgangsmåde til fremstilling af en lipidsammensætning, **kendetegnet ved, at** den i alt væsentligt består af:

- 5 a) dispergering af mindst en del af et fortykningsmiddel i vand ved en temperature, der er lavere end fortykningsmidlets gelatinerings-temperatur,
- b) opvarmning af dette præparat til en temperature der er højere end eller lig med fortykningsmidlets gelatineringstemperatur, fortrinsvis under omrøring, i et tilstrækkeligt tidsrum til at gelatinere fortykningsmidlet;
- 10 c) afkøling af den gelatinerede dispersion, fortrinsvis ikke senere end 15 minutter efter gelatineringen, til en temperature der er lavere end eller lig med fortykningsmidlets gelatineringstemperatur, fortrinsvis lavere end eller lig med 50°C, mere fortrinsvis lavere end eller lig med 30°C, for at opnå en fortykket mælk, fortrinsvis en stivelsesmælk,
- 15 d) homogenisering af den således opnåede mælk med en emulgator, fortrinsvis med en emulgator baseret på æggeblomme(r),
- e) dannelse af en emulsion fra blandingen af mælk/emulgator homogeniseret i trin d) og olie, fortrinsvis ved gradvist at inkorporere olien i blandingen af mælk/emulgator fra trin d).

20

2. Fremgangsmåde ifølge krav 1, **kendetegnet ved, at** den opnåede lipidsammensætning er en olie-i-vand-emulsion:

- 25 • hvis indhold af palmeolie er mindre end eller lig med, i vægtprocent i forhold til sammensætningens samlede vægt og i stigende foretrukken rækkefølge: 99; 90; 80; 60; 40; 20; 10; 5; 3; 2; 1; 0,1; 0,01; 0,001;
- hvis indhold af mættet fedtsyre er mindre end eller lig med, i vægtprocent i forhold til sammensætningens samlede vægt og i stigende foretrukken rækkefølge: 30; 25; 20; 15; 12; 10;
- 30 • hvis Brookfield-viskositet ved 20°C er større end eller lig med 50.000 mPa.s og fortrinsvis mindre end eller lig med 120.000 mPa.s;
- og omfattende: mindst en olie forskellig fra palmeolie, vand, mindst en emulgator baseret på lecitin, fortrinsvis baseret på æggeblomme, mindst et fortykningsmiddel fortrinsvis baseret på stivelse, og mere fortrinsvis baseret på ubehandlet stivelse.

3. Fremgangsmåde ifølge krav 1 eller 2, **kendetegnet ved, at** den opnåede lipidsammensætning ikke omfatter palmeolie.

5 4. Fremgangsmåde ifølge krav 2 eller 3, **kendetegnet ved, at** den opnåede lipidsammensætning har et indhold af tilsætningsstof forskellig fra en emulgator, der er mindre end eller lig med, i vægtprocent i forhold til sammensætningens samlede vægt og i stigende foretrukken rækkefølge: 99; 90; 80; 60; 40; 20; 10; 5; 3; 2; 1; 0,1; 0,01; 0,001; eller endnu bedre, sammensætningen omfatter ikke
10 noget andet tilsætningsstof end en emulgator.

5. Fremgangsmåde ifølge et hvilket som helst af de foregående krav, **kendetegnet ved, at** den opnåede lipidsammensætning har en Brookfield-viskositet ved 20°C, på mindre end 80.000 mPa.s.

15

6. Fremgangsmåde ifølge et hvilket som helst af de foregående krav, **kendetegnet ved, at** den opnåede lipidsammensætning omfatter en olie-i-vand-emulsion, og hvor en af ingredienserne til fremstillingen af emulsionen er en kolloid dispersion i vand af det mindst delvist gelatinerede fortykningsmiddel.

20

7. Fremgangsmåde ifølge et hvilket som helst af de foregående krav, **kendetegnet ved, at** den opnåede lipidsammensætning omfatter - i vægtprocent i forhold til sammensætningens samlede vægt og i stigende foretrukken rækkefølge:

25 - Olie: fra 55% til 98%; fra 65% til 95%; fra 70% til 90%; fra 80% til 90%;

- Æggeblomme: fra 0,5% til 20%; fra 1% til 15%; fra 2% til 12%; fra 5% til 10%; fra 7% til 8%;

30 - Stivelse: fra 0,05% til 10%; fra 0,1% til 8%; fra 0,2% til 5%; fra 0,3% til 1%; fra 0,3% til 0,8%; og

- Vand: fra 1% til 20%; fra 3% til 15%; fra 5% til 12%; fra 6% til 11%; fra 7% til 10%.

8. Fremgangsmåde ifølge et hvilket som helst af de foregående krav,
35 **kendetegnet ved, at** den opnåede lipidsammensætning omfatter - i

vægtprocent i forhold til den samlede vægt af fedtsyrer i sammensætningen - fra 10 til 30%, fortrinsvis fra 15 til 25% linolsyre; og fra 1 til 20%, fortrinsvis fra 5 til 15% linolensyre.

- 5 **9.** Anvendelse af lipidsammensætningen som defineret i krav 7, som fedt i konditorprodukter.

Scheme 1: Manufacturing process of the hard fat

Study SBRF

