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- (54) Benævnelse: **NON-HYDROGENATED FAT COMPOSITION, USE AND PROCESS**
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EP-A1- 2 636 313
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DESCRIPTION

[0001] The present invention relates to a non-hydrogenerated fat composition, uses thereof and a process to prepare such a fat composition.

BACKGROUND

[0002] Shea butter is obtained from the nuts of the shea tree (*Butyrospermum parkii*). Shea butter is used commercially as a source of StOSt (1,3-Distearoyl 2-oleoyl glyceride).). Shea butter is relatively rich in stearic and oleic acids. Shea butter may be fractionated to produce shea stearin, a higher melting fraction with potential use as a CBE, and a lower melting shea olein fraction. Shea stearin is rich in StOSt but contains other triglycerides such as StOO and StLSt (where L represents linoleic acid). The shea olein generally has a lower commercial value.

[0003] WO 2013/131862 (Loders Croklaan) describes a glyceride composition comprising triglycerides and diglycerides, obtainable from shea oil.

[0004] WO 2012/052471 (Fuji Oil) describes various lauric oil blends of oil, including compositions which may contain shea butter or shea stearin combined with oils and fats.

[0005] US 6277433 (Loders Croklaan) describes fat mixtures including interesterified shea olein, used in puff pastry applications.

[0006] WO 2017/055102 (Loders Croklaan) describes a temperature tolerant fat using shea olein for confectionery applications.

DETAILED DESCRIPTION

[0007] It is an object of the invention to enable fat compositions, preferably including the shea olein fraction, that are suitable for food applications such as bakery and/or confectionery.

[0008] It is another object of the invention to provide fat compositions that have a good processability, in particular under cooled conditions.

[0009] The present invention relates to a non-hydrogenerated fat composition, comprising greater than 28% by weight stearic acid (C18:0) fatty acid residues; greater than 44% by weight oleic acid (C18:1) fatty acid residues, and less than 10% by weight of palmitic acid (C16) fatty acid residues, based on the total C8-C24 fatty acid residues, and greater than 30% by weight of the combined amounts of StOSt, StStO, StOO and OStO triglycerides based on

the total glycerides present in the composition, wherein the weight ratio of $(\text{StOSt}+\text{StStO})/(\text{StOO} + \text{OStO})$ is from 0.7 to 1.2. Such compositions have a good processability and are suitable for food applications such as bakery and/or confectionery. The fat compositions are for instance obtainable from shea butter or fractions thereof, preferably blends of shea butter and shea olein.

[0010] The term "non-hydrogenated" has its usual meaning in the art that the fat composition, or any of its component fats, has not been subjected to a step of hydrogenation. Typically, non-hydrogenated means that the fat composition comprises less than 1%, more preferably less than 0.5%, by weight of trans fatty acids based on the total C8-C24 fatty acid residues.

[0011] The term fatty acid, as used herein, refers to straight chain saturated or unsaturated (including mono-, di- and poly- unsaturated) carboxylic acids having from 8 to 24 carbon atoms. Fatty acid residues may be determined by GC-FAME (fatty acid methyl ester) according to ISO 12966-2 and ISO 12966-4. Triglyceride compositions may be determined by GC (ISO 23275). The analysis includes triglycerides such as StOO, StOSt and StStSt, wherein St is a stearic acid residue and O is an oleic acid residue. N10 is the SFC at 10 °C as measured using NMR on the stabilized fat according to ISO 8292-1. Such fats show a good processability, in particular when the fat composition is taken out of a cooled storage which would typically be at a temperature of 8 °C or below. The fat composition has an N10 of 25-40, an N20 of less than 35, an N30 of less than 15, an N35 of less than 10 and an N40 of less than 8.

[0012] In a preferred embodiment, the composition comprises a blend of shea butter and shea olein or an interesterified blend of shea butter and shea olein. Preferably, the blend consists of shea butter and shea olein in a weight ratio of from 10:90 to 90:10, more preferably from 20:80 to 80:20. Other fat fractions may be blended with such a blend, and also additives such as emulsifiers may be added, depending on the application.

[0013] In yet another preferred embodiment, the composition is free or essentially free of fatty acid residues from palm oil or palm oil fractions. By essentially free it is meant that the composition contains less than 1% by weight of fatty acid residues from palm oil or palm oil fractions.

[0014] The weight ratio $(\text{StOSt}+\text{StStO})/(\text{StOO} + \text{OStO})$ is from 0.7-1.2.

[0015] In a preferred embodiment, the composition comprises less than 10%, preferably less than 5%, by weight of C12 fatty acid residues, based on the total C8-C24 fatty acid residues. Lauric fatty acid residues are undesirable in certain applications, in particular there may be incompatibility with cocoa butter.

[0016] Preferably, the stearic acid to palmitic acid weight ratio is greater than 2.5, more preferably greater than 4.

[0017] The invention also relates to the use of a composition according to the invention for a

bakery application.

[0018] In a preferred embodiment, the bakery application is as a shortening. A shortening is a product consisting of 100% fat, which is plasticized, usually by votation means, for use in different bakery applications such as puff pastries, cakes and/cookies as a dough or lamination fat.

[0019] Bakery compositions comprising a fat composition of the invention typically also comprise flour and optionally water.

[0020] In another preferred embodiment, the bakery application is puff pastry. Such fat compositions have specific properties appreciated in puff pastry applications, in particular a processability that allows for applying the fat in thin layers with dough. Making puff pastry products typically involves repeatedly rolling and folding a shortening into a dough, resulting in alternate layers of fat and dough. When such a puff pastry layered material is baked, this results in a baked product with significant gaseous pockets, called 'puff'.

[0021] The invention further relates to the use of a triglyceride composition according to any of the preceding claims for a confectionery application, in particular a confectionery filling fat. Confectionery compositions containing a composition of the invention typically also comprise sugar and may further comprise cocoa powder.

[0022] The invention also relates to a process for the preparation of a triglyceride composition, comprising the blending of shea butter and shea olein in a weight ratio of from 10:90 to 90:10, preferably from 20:80 to 80:20. The non-interesterified blends are particularly suitable for application in confectionery, in particular as filling fats.

[0023] In a preferred embodiment, the shea olein is interesterified shea olein.

[0024] In another preferred embodiment, in the process after blending, the shea butter and the shea olein are chemically or enzymatically interesterified. The interesterified blends are particularly suitable for applications in puff pastry applications.

[0025] The invention will now be further elucidated by the following examples.

Example 1: Shea olein/Shea butter blends

[0026] Typical compositions of shea butter and interesterified shea olein as used herein are shown below.

	Refined shea butter	Refined interesterified shea olein
IVFAME	48	60.5
FFA%	0.08	0.05

	Refined shea butter	Refined interesterified shea olein
C8:0	0	0.1
C10:0	0	0
C12:0	0.4	1
C14:0	0.2	0.5
C16:0	3.9	7.8
C18:0	44.2	27.3
C18:1	43.2	52.9
C18:2	5.8	8
C18:3	0.2	0.3
Total Trans	0.2	0.4
C20:0	1.5	1.1
SAFA	50.5	38.1
PPSt+PStP	0.1	0.4
PStSt+StPSt	0.2	1.4
POSt+PStO+OPSt	5.1	5.7
StStSt	1.3	2.4
StOSt +StStO	41.7	15.6
StOO+OStO	25.7	26.1
StLSt+StStL	4.5	0
OOO	4.6	16.9
AStSt+StASt	0.1	0.3
AOST+AStO+OAST	2	1

[0027] In the above table:

Cx:y refers to a fatty acid having x carbon atoms and y double bonds; levels determined by GC-FAME (ISO 12966-2 and ISO 12966-4)

IVFAME refers to calculated iodine value;

FFA refers to the amount of free fatty acids;

Trans refers to *trans* fatty acids;

SAFA refers to saturated fatty acids;

O, P, St, L and A refer to oleic, palmitic, stearic, linoleic and arachidic acids, respectively;

Triglyceride compositions: POSt, and other triglycerides were determined by GC (ISO 23275),

wherein each GC peak includes triglycerides having the same fatty acids in different positions e.g., PSt is in the same signal peak as PStO and StPO.

[0028] Chemically interesterified Shea olein was blended with Shea butter by using two different ratios: 80/20 (w/w) and 60/40 (w/w). The fat compositions were obtained from the blends after bleaching and deodorization. As a reference fat for the confectionery application trials, the commercially available fat Biscuitine 300 was used, as obtained from IOI Loders Crocklaan BV, The Netherlands. As a reference fat for the bakery application trials, a fat blend of palm oil and palm stearin (IV~35) with a ratio 50/50 (w/w) was used. The analytical results of the reference fats and the inventive fat compositions are shown in Table 1.

Table 1: Fat compositions 80/20 interesterified shea olein/shear butter, Biscuitine 300, 60/40 interesterified shea olein/shear butter and 50/50 palm oil/palm stearin.

	Example 1.1 interesterified shea olein/shear butter 80/20	Reference 1.1 Biscuitine 300	Example 1.2 interesterified shea olein/shear butter 60/40	Reference 1.2 palm oil/palm stearin 50/50
IVFAME	58.2	47.1	55.4	43.5
SAFA	40.3	53.8	43.1	57.7
C8:0	0	0	0	0
C10:0	0.1	0	0	0
C12:0	0.7	0.3	0.6	0.3
C14:0	0.4	1.2	0.3	1.1
C16:0	7.1	46.5	6.8	50.8
C18:0	30.5	5.1	33.7	4.8
C18:1	51.5	37.4	48.8	33.9
C18:2	7.5	8.2	7.2	7.8
C18:3	0.2	0.2	0.2	0.2
Total Trans	0.5	0.1	0.3	0.2
C20:0	1.2	0.4	1.3	0.4
POP+PPO	2.5	34.5	2.4	28.3
PPSt+PStP	0.6	2.3	0.6	3.3
PStSt+StPSt	1.1	0.4	1.1	0.4
POSt+PStO+OPSt	5.4	5.9	5.7	4.6
StStSt	2.2	0	2.1	0.1
StOSt+StStO	20.1	0.7	25.4	0.7
StOO+OStO	25.7	2	25.5	1.9
StLSt+LStSt	1.2	0.1	2.6	0

	Example 1.1 interesterified shea olein/shear butter 80/20	Reference 1.1 Biscuitine 300	Example 1.2 interesterified shea olein/shear butter 60/40	Reference 1.2 palm oil/palm stearin 50/50
OOO	14	2.9	10.6	2.8
AStSt+StAst	0.3	0	0.3	0
AOST+ASTO+OAST	1.3	0	1.5	0.1
(StStO+StOST)/(StOO+OSTO)	0.78	0.35	1	0.37
S20-N10	30	56	36	59
S20-N20	25	38	31	48
S20-N30	10	16	12	30
S20-N35	5	8	6	23
S20-N40	3	3	3	18

[0029] In the above table:

Cx:y refers to a fatty acid having x carbon atoms and y double bonds; levels determined by GC-FAME (ISO 12966-2 and ISO 12966-4)

IVFAME refers to calculated iodine value;

SAFA refers to saturated fatty acids;

Trans refers to *trans* fatty acids;

O, P, St, L and A refer to oleic, palmitic, stearic, linoleic and arachidic acids, respectively;

Triglyceride compositions: POST, and other triglycerides were determined by GC (ISO 23275), wherein each GC peak includes triglycerides having the same fatty acids in different positions e.g., POST is in the same signal peak as PStO and StPO.

S20-Nx refers to solid fat content determined by NMR on 20°C stabilized fat at x°C (ISO 8292-1);

Example 2 Interesterified Shea Olein/Shea butter blend

[0030] 200kg of a blend of 60% by weight Shea olein and 40% by weight of Shea butter was chemically interesterified using sodium methoxide followed by bleaching and deodorization. This fat is referred to as Example 1.3. The fat composition has the following composition (Table

2):

Table 2: Fat Composition interesterified 60/40 shea olein/shear butter

IVFAME	57.6
SAFA	42.3
C8:0	0
C10:0	0
C12:0	0.4
C14:0	0.3
C16:0	8.5
C18:0	31.6
C18:1	48.6
C18:2	7.9
C18:3	0.6
Total Trans	0.3
C20:0	1.2
POP+PPO	1.6
PPSt+PStP	1.1
PStSt+StPSt	3.6
POSt+PStO+OPSt	8.6
StStSt	3.7
StOSt+STStO	16.8
StOO+OStO	21.9
StLSt+StStL	1.6
OOO	11.8
AStSt+StASt	0.5
AOSt+AStO+OAST	1.3
(StOSt+StStO)/(StOO+OStO)	0.77
S20-N10	30
S20-N20	25
S20-N30	13
S20-N35	8
S20-N40	5

[0031] In the above table:

Cx:y refers to a fatty acid having x carbon atoms and y double bonds; levels determined by

GC-FAME (ISO 12966-2 and ISO 12966-4)

IVFAME refers to calculated iodine value;

SAFA refers to saturated fatty acids;

Trans refers to *trans* fatty acids;

O, P, St, L and A refer to oleic, palmitic, stearic, linoleic and arachidic acids, respectively;

Triglyceride compositions: POSt, and other triglycerides were determined by GC (ISO 23275), wherein each GC peak includes triglycerides having the same fatty acids in different positions e.g., POSt is in the same signal peak as PStO and StPO.

S20-Nx refers to solid fat content determined by NMR on 20°C stabilized fat measured at x°C (ISO 8292-1).

Example 3: Confectionery fillings

[0032] A cocoa-containing confectionery filling was prepared by mixing the following ingredients in Table 3 using a ball mill at 240 rpm for 40 minutes. Fat blend 1.1 was used. For a reference filling fat, the fat blend was replaced by a standard filling fat, Biscuitine 300 obtained from Loders Croklaan BV, Wormerveer, The Netherlands.

Table 3: Cocoa filling recipe

Ingredients	%
Fat blend	40
Sugar	45
Cocoa powder 10/12 alkalized	10
Skimmed milk powder	5
Lecithin	0.4
Vanillin	0.02
Total fat phase	40

[0033] A confectionery filling with hazelnut was prepared by mixing the following ingredients using a ball mill at 240 rpm for 40 minutes. Fat blend 1.1 is used. For a reference filling fat, the fat blend was replaced by a standard filling fat, Biscuitine 300 obtained from Loders Croklaan BV, Wormerveer, The Netherlands.

Table 4: Hazelnut filling recipe

Ingredients	%
Fat blend	30
Sugar	39
Hazelnut paste	16
Full cream milk powder	10
Cocoa powder 10/12 alkalized	5
Lecithin	0.2
Vanilla flavor	0.02
Total fat phase	42

[0034] The confectionery fillings are summarized in table 5.

Table 5: Confectionery fillings according to recipes as described above:

Cocoa Filling	Fat Blend
1	Example 1.1
2	Reference 1.1
Hazelnut Filling	Fat Blend
3	Example 1.1
4	Reference 1.1

Example 4: Storage Trials

[0035] The confectionery fillings prepared according to Example 3 were deposited (at 23-26°C for Example 1.1 and at 30-33°C for the Reference 1.1) into dark chocolate shells and cooled in a static cooling cabinet (12°C) for at least 15 minutes. After the initial cooling, the chocolate shells were bottomed with dark chocolate and cooled in a static cooling cabinet (12°C) for at least 15 minutes. The chocolate shells containing the fillings were then stored at different temperatures for further evaluation. The chocolate shells were stored at 20°C, 25°C as well as under temperature cycling conditions between 15°C for 12 hours and 25°C for 12 hours.

[0036] The appearance was assessed after 1 day, 2 weeks, 1 month and 3 months as shown in the following tables. Appearance was evaluated for gloss and blooming.

Gloss and Bloom

[0037] Gloss is indicated by a gloss factor ranging from 1-5, wherein 1 is matte (no gloss) and

5 is very glossy. Bloom is indicated by a bloom factor ranging from A-C, wherein A is no bloom and C is heavily bloomed. Results are shown in Tables 6a, 6b, 6c and 6d.

Table 6a: Gloss and boom after one day

Sample	Fat Blend	20°C	25°C	15/25°C
1	Example 1.1	5A	5A	5A
2	Reference 1.1	5A	5A	5A
3	Example 1.1	5A	5A	5A
4	Reference 1.1	5A	5A	5A

Table 6b: Gloss and bloom after two weeks

Sample	Fat Blend	20°C	25°C	15/25°C
1	Example 1.1	5A	5B	4A
2	Reference 1.1	5A	1C	4A
3	Example 1.1	5A	5B	4A
4	Reference 1.1	5A	3C	4A

Table 6c: Gloss and bloom after 1 month

Sample	Fat Blend	20°C	25°C	15/25°C
1	Example 1.1	5A	4B	3A
2	Reference 1.1	4B	1C	3B
3	Example 1.1	5A	5B	4A
4	Reference 1.1	5B	1C	4B

Table 6d: Gloss and bloom after three months

Sample	Fat Blend	20°C	25°C	15/25°C
1	Example 1.1	5A	4B	2B
2	Reference 1.1	1C	1C	1C
3	Example 1.1	5B	4B	3B
4	Reference 1.1	2C	1C	2C

Example 5: Application of fat blends in puff-pastry

5.1 Shortening preparation

[0038] Shortenings were produced using Example 1.2 and Reference 1.2. The shortenings did not contain emulsifiers, dyes, flavor or any other additives.

[0039] The Example 1.2 shortening was produced at pilot scale with a votation equipment

having an A-C-A-B configuration with a 30% throughput. In this set-up the A-unit represents a scraped surface heat exchanger, the B-unit represents the resting tube and C-unit stands for a pin-rotor machine as known in the art. The fat was melted and equilibrated at a temperature equal to the melting point + 10°C. The first A-unit was set at 1,000 rpm, the second A-unit at 150 rpm, while the C-unit was set at 20 rpm. The product temperature measured 41.8°C after the first A-unit, 34.5°C after the C-unit. The shortening was packed under ambient conditions. Further on the shortening was tempered for 24h at 18°C and stored at 22°C afterwards.

[0040] Plastic shortenings were obtained, suitable to be used as lamination fats over a wide range of temperatures. The shortening produced with Example 1.2 showed no post-hardening over the investigated two months, with a constant hardness (cone penetration method, 45°, texture analyzer) of $117 \pm 8\text{g}$.

5.2 Preparation of puff-pastry products

[0041] The obtained shortenings were used in the preparation of puff-pastries as follows:

Table 7: Puff-pastry recipe

Dough ingredients	Quantity [g]
Flour	500
Water	275
Reference 1.2 / Example 1.2	60
Salt	5
Lamination fat	Quantity [g]
Reference 1.2 / Example 1.2	240

[0042] The dough was prepared and slowly kneaded with a spiral dough kneader for 8min. Afterwards the dough was left to rest for 10min at ambient temperature (20°C). The lamination was conducted in two steps, ½French (3-folding) and ½Dutch (4-folding) in the first step. The dough was left to rest for 30min at 4°C, after which the first lamination step was repeated and the dough subjected to another resting of 30min. The thickness of the final laminated dough measured 10mm. From this dough squared puff pastries were cut with a 93x93mm stainless steel dough cutter. The puff pastries were baked in a conventional baking oven at 190°C for 20min. The shortening produced with Example 1.2 showed superior plasticity and handling during lamination.

[0043] Compared to the reference shortening, the puff pastry baked with Example 1.2 shortening possesses enhanced properties:

- Superior height (Reference: 47.5mm; Blend 1: 59.2mm)

- Improved texture (better layer distinction)
- Consumer acceptance test: Excellent appearance and overall impression

Example 6: Multi-purpose shortening

[0044] From the Example 1.3 a shortening was developed. The shortening did not contain emulsifiers, dyes, flavors or any other additives.

[0045] The Example 1.3 shortening was produced at pilot scale through a votation set consisting of one A-unit, one B-unit and one C-unit. The throughput of the system was set at 40%, while the cooling was set at - 20°C. The fat was melted and equilibrated at 50°C. The A-unit was set at 1000 rpm, while the C-unit was set at 140 rpm. The product temperature at the exit from the resting tube measured ~ 15°C. The shortening was packed under ambient conditions. Further on the shortening was tempered for 24h at 18°C and stored at 22°C afterwards.

[0046] A plastic shortening was obtained, suitable to be used as a lamination fat over a wide range of temperatures and applications. The shortening was observed to be plastic enough to withstand multiple lamination steps (i.e. sheeting), without rupturing or being absorbed in the dough.

REFERENCES CITED IN THE DESCRIPTION

Cited references

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- [WO2012052471A \[0004\]](#)
- [US6277433B \[0005\]](#)

- WO2017055102A [0006]

IKKE-HYDROGENERET FEDTSAMMENSÆTNING, ANVENDELSE OG FREMGANGSMÅDE

Patentkrav

- 5
1. Ikke-hydrogeneret fedtsammensætning, som omfatter mere end 28 vægt-% stearinsyre (C18:0)-fedtsyrerester; mere end 44 vægt-% oliesyre (C18:1)-fedtsyrerester og mindre end 10 vægt-% palmitinsyre (C16)-fedtsyrerester baseret på det samlede indhold af (C8-C24)-fedtsyrerester og mere end 30 vægt-% af de kombinerede mængder af StOSt-,
10 StStO-, StOO- og OStO-triglycerider baseret på det samlede indhold af glycerider, der forefindes i sammensætningen, hvor vægtforholdet (StOSt+StStO)/(StOO+OStO) er 0,7-1,2, hvor St er en stearinsyrerest, og O er en oliesyrerest, og hvor fedtsammensætningen har et indhold af fast fedt (SFC - solid fat content) med et N10 på 25-40, et N20 på mindre end 35, et N30 på mindre end 15, et N35 på mindre end 10 og et N40 på mindre end 8,
15 som målt på det stabiliserede fedt i henhold til ISO 8292-1.
 2. Fedtsammensætning ifølge krav 1, hvor sammensætningen omfatter mindre end 1 vægt-% transfedtsyrer baseret på det samlede indhold af (C8-C24)-fedtsyrerester, såsom mindre end 0,5 vægt-%.
 - 20 3. Fedtsammensætning ifølge et hvilket som helst af de foregående krav, hvor sammensætningen omfatter en blanding af sheasmør og sheaolein eller en interesterificeret blanding af sheasmør og sheaolein, såsom hvor sammensætningen omfatter en blanding, som består af sheasmør og sheaolein i et vægtforhold fra 10:90 til 90:10, for eksempel fra
25 20:80 til 80:20, eventuelt hvor sammensætningen omfatter en eller flere af andre fedtfraktioner, og/eller hvor sammensætningen endvidere omfatter et eller flere tilsætningsstoffer, såsom emulgatorer.
 - 30 4. Fedtsammensætning ifølge et hvilket som helst af de foregående krav, hvor sammensætningen er fri eller i det væsentlige fri for fedtsyrerester fra palmeolie eller palmeoliefraktioner.

5. Fedtsammensætning ifølge et hvilket som helst af de foregående krav, hvor sammensætningen omfatter mindre end 10 vægt-%, fortrinsvis mindre end 5 vægt-%, af C12-fedtsyrerester baseret på det samlede indhold af (C8-C24)-fedtsyrerester.
- 5 6. Fedtsammensætning ifølge et hvilket som helst af de foregående krav, hvor vægtforholdet mellem stearinsyre og palmitinsyre er større end 2,5, fortrinsvis større end 4.
7. Anvendelse af en sammensætning ifølge et hvilket som helst af de foregående krav til en bagerianvendelse.
- 10 8. Anvendelse ifølge krav 7, hvor bagerianvendelsen er som bagefedt (shortening).
9. Anvendelse ifølge krav 7, hvor bagerianvendelsen er butterdej.
- 15 10. Anvendelse af en triglyceridsammensætning ifølge et hvilket som helst af kravene 1 til 6 til en konfekturanvendelse, særligt fedt til konfekturfyld.
11. Fremgangsmåde til fremstilling af en triglyceridsammensætning, hvilken fremgangsmåde omfatter blanding af sheasmør og sheaolein i et vægtforhold fra 10:90 til 90:10, fortrinsvis fra 20:80 til 80:20.
- 20 12. Fremgangsmåde ifølge krav 11, hvor sheaoleinet er interesterificeret sheaolein.
13. Fremgangsmåde ifølge krav 11 eller 12, hvor sheasmørret og sheaoleinet efter blanding
- 25 interesterificeres kemisk eller enzymatisk.