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(54) Title: NATURAL TRIGLYCERIDE FATS

(57) Abstract

Glyceride fat which comprises a mixture of glycerides originating from seed oils which have not substantially been subjected to chemical modification, which glycerides are derived from fatty acids which comprise: (a) at least 10 wt.% of C_{18}-C_{24} saturated fatty acids; (b) which comprise stearic and/or arachidic and/or behenic acid and/or lignoceric acid; (c) oleic and/or linoleic acid, while (d) the ratio of saturated C_{18}-acid/saturated $(C_{20}+C_{22}+C_{24})$-acids ≥ 1, preferably ≥ 5, more preferably ≥ 10, which glycerides contain calculated on total fatty acid weight; (e) ≤ 5 wt.% of linolenic acid; (f) ≤ 5 wt.% of trans fatty acids; (g) ≤ 75 wt.%, preferably ≤ 60 wt.% of oleic acid on total fatty acids on position 2 of the glyceride molecule which glycerides contain calculated on total glycerides weight; (h) ≥ 8 wt.% HOH + HHO triglycerides; (i) ≤ 5 wt.% of trisaturated triglycerides; (j) which glycerides have a solids content comprising $N_{10} > 10$ and $N_{35} \leq 15$ and which is characterised in that the ratio of (HOH + HHO) and (HLH + HHL) triglycerides > 1, where H is a saturated C_{18}-C_{24} fatty acid residue, O is an oleic acid residue and L is a linoleic acid residue.

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Natural triglyceride fats

The present invention deals with triglyceride fats which have not substantially been subjected to chemical modification treatments and which are suitable for the manufacture of shortenings, margarine and other plastic compositions containing edible fats.

The modern consumer consciously selects his food and preferably chooses products which help him maintaining good health and physical condition. If there is a choice, some consumers prefer products which have been obtained by manufacturing methods which use no or little chemical treatments.

Triglyceride fats are a component of many food products. They may be a natural component of the product, as in butter, or they have been added deliberately. Triglyceride fats as they exist in nature often lack properties deemed important for the preparation of food products of high quality with respect to consistency, taste and health.
Margarine fats, for example, in the first place should contain enough solids to impart a spreadable consistency to the product obtained by emulsifying the fat

with a water phase. Although some animal fats may be suitable in this respect, they are avoided because a considerable consumption of these fats is believed to contribute to developing cardiovascular diseases.
On the other hand vegetable fats, which are cheap and are abundantly available, generally are liquid and should be hardened to make them suitable as a margarine fat. Vegetable fats and particularly marine oils often contain glycerides of highly unsaturated fatty acids which are prone to oxidation and then develop unacceptable off-flavours. Hardening may change the unsaturated fatty acids to saturated or more saturated fatty acids. However, the hardening process to some extent generates fatty acids with trans double bonds. Many consumers wish to control the amounts of these trans fatty acids as well as of fully saturated fatty acids in their diet.

There is therefore a need for triglyceride fats which on one side are natural, or "green",which means that they have not or hardly been subjected to chemical modification treatments and which contain low contents of trans fatty acids and of highly unsaturated fatty acids, particularly linolenic acid and which, on the other side, contain enough solids to allow the manufacture of margarine and shortenings. The need for solids should be balanced against a desired low level of intermediate chain (C_{12}-C_{16}) saturated fatty acids. An ideal oil after its isolation from a plant and after purification could be used immediately without any chemical modification in a margarine manufacturing process.
Such fats are described in EP 0 369 519 (UNILEVER). However, such fats show a steep N-line which, departing from a high value at 10°C quickly drops to unacceptable low levels at 20-25°C. It should be noted that the ratio of H20 and H2L triglycerides is 1 or less.

In this specification H stands for C_{18}-C_{24} saturated fatty acid residues, S for stearic acid residue, O for oleic acid residue and L for linoleic acid residue.

In GB 2 239 256 (KRAFT) dealing with the production of margarine oils the use of SOS triglycerides for margarine manufacture is dissuaded in favour of SLS triglycerides. However, an actual disclosure of a margarine manufacturing process is lacking.

WO 91/08677 (KRAFT) refers to glyceride fats obtained by interesterification which contain H2O and H2L triglycerides at a ratio which is < 0.5.

STATEMENT OF INVENTION

The invention provides a glyceride fat which comprises a mixture of glycerides originating from seed oils which have not substantially been subjected to chemical modification,
which glycerides are derived from fatty acids which comprise

(a) at least 10 wt.% of C_{18}-C_{24} saturated fatty acids
(b) which comprise stearic and/or arachidic and/or behenic acid and/or lignoceric acid and
(c) oleic and/or linoleic acid, while
(d) the ratio of saturated C_{18}-acid / saturated $(C_{20}+C_{22}+C_{24})$-acids ≥ 1, preferably ≥ 5, more preferably ≥ 10,

which glycerides contain

(e) $\leq$ 5 wt.% of linolenic acid calculated on total fatty acid weight
(f) $\leq$ 5 wt.% of trans fatty acids calculated on total fatty acid weight
(g) $\leq$ 75 wt.%, preferably $\leq$ 60 wt.% of oleic acid on total fatty acids on position 2 of the glyceride molecule:

which glycerides contain calculated on total glycerides weight

(h) $\geq$ 8 wt.% HOH + HHO triglycerides
(i) $\leq$ 5 wt.% of trisaturated triglycerides weight

which glycerides have

(j) a solids content comprising $N_{10} > 10$ and $N_{35} \leq 15$

and which is characterised in that the ratio of (HOH + HHO) and (HLH + HHL) triglycerides is > 1, preferably > 1.2.

The mixture comprises a hardstock component which preferably is selected from the stearin fractions of dry fractionated sheanut oil and dry fractionated high stearic soybean oil.

Fats characterised by the above features have a relatively high SOS content. They are very suitable to be used as the fat component of plastic edible fat containing compositions, particularly spreads, which are believed to be health supporting and which have good consistency, spreadability over the relevant temperature range and mouth melting properties.

DETAILED DESCRIPTION

The fats of the invention originate from plant seeds. According to a special embodiment the fat is obtained, in whole or in part, from soybean, corn, olive, rape, safflower or sunflower plants which have been genetically modified and, optionally, further selected using known breeding methods.
After harvesting the oil may be used without any treatment other than the usual oil refining treatments comprising degumming, bleaching and deodorisation.
More often, however, in order to obtain an oil which satisfies the definition in this specification, the oils need at least one modification treatment comprising fractionation or interesterification or blending. For obtaining an optimum mix of triglycerides the fat of course may be blended with other fats which also have not been chemically modified and therefore qualify as "green". Fats suitable for

blending comprise sunflower oil, rapeseed oil, corn oil, shea oil, regular soybean oil, high stearic soybean oil and fractions thereof. In the context of this patent spcification high stearic soybean oil is defined as soybean oil with an increased content of stearic acid exceding 10 wt.% stearic acid.
Also two or more of such treatments may be combined.
Because the fats are claimed to have not substantially been subjected to chemical modification, solvent fractionation is excluded as well as chemical interesterification processes. But dry fractionation and enzymatic interesterification processes are allowed, because these are natural and not considered as chemical modifications. Hydrogenation is allowed too, provided that not more than 10 wt.%, preferably not more than 5 wt.% of the fat blend has been subjected to hydrogenation. Such fat blends are considered as having not substantially been subjected to chemical modification.

In the context of this specification the terms oils and fats are used without discrimination, with the proviso that oils are fats which are liquid at ambient temperature.

As said before, many consumers wish to restrict the intake of fat with much intermediate chain (C_{12}-C_{16}) saturated fatty acids. Therefore the fat of the invention has a content of C_{12}-C_{16} fatty acids which preferably is $\leq$ 15 wt.%, more preferably $\leq$ 10 wt.% and still more preferably $\leq$ 5 wt.%, calculated on total fatty acid weight.

The amount of saturated fatty acids to a large extent determines the solids content of the fat. For structuring the fat a minimum amount of solids has to be present. Therefore the fat contains $\geq$ 10 wt.% , preferably $\geq$ 15 wt.%, more preferably $\geq$ 20 wt.% of saturated fatty acids calculated on total fatty acids weight.

The saturated fatty acids comprise stearic and/or arachidic and/or behenic acid and/or lignoceric acid, with the proviso that the ratio of saturated C_{18}-acid / saturated $(C_{20}+C_{22}+C_{24})$-acids is ≥ 1, preferably ≥ 5 and more preferably ≥ 10.

The unsaturated fatty acids supplementing the saturated ones comprise oleic and/or linoleic acid and ≤ 5 wt.% of linolenic acid, with the proviso that ≤ 5 wt.% of trans fatty acids is present.
By trans fatty acid is meant an unsaturated fatty acid having a carbon chain length of from 16 - 24 carbon atoms and having at least one unsaturated carbon-carbon bond which is in *trans*-configuration.
The weight percentage of trans fatty acids is determined in accordance with AOCS official test Cd 14-61 (1984).
The weight percentage of fatty acid moieties as mentioned in this specification is calculated on total weight of fatty acid moieties in the triglyceride or glyceride composition, unless indicated otherwise.
AOCS official method Ce 1-62 (81) may be used to determine the weight percent of respective fatty acid moieties of a margarine oil.
The weight percentage of triglycerides as mentioned in this specification is calculated on total weight of triglycerides in the glyceride composition, unless indicated otherwise.

Not more than 75 wt.%, preferably not more than 60 wt.% of the fatty acids on position Sn2 consists of oleic acid.

The amount of trisaturated triglycerides (HHH) should be restricted to ≤ 5 wt.%.

With regard to the unsaturated triglycerides the fats of the invention are characterised by an amount of ≥ 8 wt.%, preferably ≥ 12 wt.% of HOH +

HHO triglycerides, while the ratio of (HOH + HHO) triglycerides and (HLH + HHL) triglycerides should be > 1, preferably > 1.2. More preferably such ratio is
1 - 9 and still more preferably 1.2 - 4.
This feature is a deviation of prior art fats having a ratio H2O/H2L < 1, which feature unexpectedly enables the production of spreads which have a good spreadability over the relevant range of 5°-20°C as well as a good melting behaviour. The relatively high H2O/H2L ratio enables the reduction of the amount of hardstock, a generally less desired fat component with much saturated triglycerides, and the use of relatively more unsaturated oils, which are better available and preferred from a nutritional point of view. Notwithstanding the reduced amount of hardstock the N_{20}-value remains substantially unchanged and emulsified products made of the oils have good Stevens values.

The low level of HHH-glycerides and the melting line of the HOH-glycerides contribute to the excellent melting and spreading behaviour of the present fat blend.

A particularly preferred fat according to the invention has additional to the general features mentioned hereinbefore the following composition features

< 8 wt.% C_{12}-C_{16} fatty acids
> 25 wt.% stearic acid
< 5 wt.% saturated $C_{20}+C_{22}+C_{24}$ fatty acids

the balance essentially being oleic and linoleic acid.

The fats of the invention mainly consist of triglycerides but they may contain diglycerides and monoglycerides too.
Because the presence of disaturated diglycerides has a negative impact on the crystallisation behaviour of glyceride fats, their preferred content in the fat, is

rather low and comprises ≤ 5 wt.%, more preferably ≤ 3 wt.% of disaturated diglycerides calculated on total glycerides weight.

Blending triglyceride fats has already been mentioned as a suitable way to obtain the fats comprised by the invention. Suitable blends may be made from e.g. the stearin fraction of dry fractionated sheanut oil as hardstock which is blended with sunflower oil and, optionally, with high stearic soybean oil. A preferred hardstock is the stearin fraction of high stearic soybean oil.

Surprisingly it has been found that the stearin fraction of dry fractionated high stearic soybean oil contains a high level of HLH triglycerides. No natural source of HLH triglycerides was known before. By combining this HLH source with a natural HOH source, such as the stearin fraction of dry fractionated sheanut oil, in varying amounts and ratios the N-line of the resulting fat blend can be greatly manipulated as to level and steepness.

The amounts of the various oils constituting the blend should be chosen such that the final blend satisfies the specification of the oil as defined according to the invention.

Alternatively, the glyceride fats of the invention may be obtained wholly or partially from genetically modified seed bearing plants, such as soybean, corn, olive, rape, safflower or sunflower plants.

The glyceride fats of the invention may be used for manufacturing plastic edible fat containing compositions, particularly spreads. These are understood to include compositions comprising 1-100% fat phase and 0-99% aqueous phase, which include margarine, spreads containing <80% fat, shortenings and bakery fats.

Preferably the composition comprises 40-80% of fat phase and 20-60% of aqueous phase.

The spreads may be prepared with conventional processes, for example, those described in EP 0 089 082.

The fats of the invention have N-lines with $N_{10} > 10$ and $N_{35} \leq 15$. Preferably, they comply with solid fat contents desired for fats suitable for manufacturing spreads, particularly tub margarine, wrapper margarines and bakery margarines. For exhibiting good quick melting properties when starting with a firm consistency at refrigerator temperature preferably the difference of N_5 and N_{20} values is at least 10.

For tub margarines the preferred solids content (N_T) is

at 10°C 11 to 30
at 20°C 4 to 15
at 30°C 0.5 to 8
at 35°C 0 to 4

The obtained margarine shows quick melting behaviour in the mouth. In this respect they exceed the performance of commercially available margarines of which the fat blend comprises a mixture of hydrogenated and/or chemically interesterified components.

For wrapper margarine the preferred solids content (N_T) is

at 10°C 20 to 45
at 20°C 14 to 25
at 30°C 2 to 12
at 35°C 0 to 5

For bakery fat the preferred solids content (N_T) is

at 10°C	30 to 60
at 20°C	20 to 55
at 30°C	5 to 35
at 35°C	0 to 15

The N-lines also allow the application of the fats in the manufacture of ice-cream and candy, e.g of non-CBE candy coatings (CBE = cacao butter equivalent).

The use of intermediate chain saturated fatty acids is to a great extent avoided. The fats of the present invention enable the manufacture of margarine spreads which combine a good spread consistency with the presence of fatty acids of which predominantly are considered more healthy. The fats show an pleasant quick melting behaviour in the 15 to 25 °C range, while low thinness values are attained.

The various embodiments of the invention comprise fats of which the fatty acid distribution over the positions of the glyceride molecule have not been changed by a randomisation treatment.
But, in an alternative embodiment at least a part of the fat of the invention has been subjected to an enzymatic treatment randomizing the fatty acid distribution over the terminal Sn1- and Sn3-positions of the glyceride molecule.
In another embodiment at least a part of the fat incorporated into the fat of the invention has been subjected to an enzymatic treatment randomizing the fatty acid distribution over the Sn1, Sn2 and Sn3 positions of the glyceride molecule. A process for such treatment can be found e.g. in EP patent application 93308864.3.

A further aspect of the invention is the use of the fats according to the above specification for manufacturing a plastic edible fat containing composition.

EXAMPLE 1

The stearin fraction of dry fractionated sheanut oil and fully refined sunflower oil were blended in a ratio of 15:85.

The main fatty acids and triglyceride groups of the used stearin fraction of dry fractionated sheanut oil are listed in Table 1.1 and Table 1.2.

TABLE 1.1

Fatty acids	Overall	2-position
C_{16} (Palmitic)	5.0%	1.0%
C_{18} (Stearic)	57.8%	4.7%
C_{18}:1 (Oleic)	32.4%	86.5%
C_{18}:2 (Linoleic)	3.0%	7.7%
C_{20} (Arachidic)	1.6%	0.1%
C_{22} (Behenic)	0.2%	0.0%

TABLE 1.2

Triglyceride group	
HOH	66.0%
HHO	2.0%
HLH	7.4%
HHL	0.0%
Rest	24.6%

The resulting fat blend had a content of HOH + HHO which is 10.2 wt.% and of HLH + HHL of 1.5 wt.% on total glyceride weight and a content of palmitic acid of about 6 wt.% on total weight of fatty acids.

The solid contents at 5°, 10°, 20°, 30° and 35°C, the N-values, are 14.9, 11.4, 4.4, 0.6 and 0.3 respectively. The N-values can conveniently be measured by means of NMR as described in Fette, Seifen, Anstrichmittel 80, (1978), 180-186 (one hour stabilisation).

Further characteristic features of the fat blend have been summarized in Table 8.

From this fat blend a spread was manufactured. The spread had the following composition (wt.% on total composition):

FAT PHASE: 80%

79.5%	fat
0.3%	Cetinol
0.2%	Admul 6203
trace	beta carotene

WATER PHASE: 20%

19.3%	water
0.3%	skimmed milk powder
0.1%	potassium sorbate
0.3%	salt

The spread was processed at laboratory scale through a conventional A-A-C sequence with a throughput of 4.5 kg/hr, an exit temperature on the second A-unit (800 rpm) of 6.2°C, an exit temperature on the C-unit (250 rpm) of 11.0°C and a line pressure of 3 bar. A product resulted with unexpectedly good spreadability properties, which is shown by the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	68
S10	58
S15	49
S20	23

The product has good spreadability properties over the complete temperature range from refrigerator temperature to ambient temperature. The product has a good mouthfeel, being very "quick" in the mouth and exhibits excellent melting behaviour due to the very low level of HHH triglycerides and the favourable melting range, with regard to mouth temperature, of the HOH triglycerides. In this respect the product clearly has a better performance than commercially available margarines of which the fat blend comprises a mixture of hydrogenated and/or chemically interesterified components.

The product was very quick in the mouth and exhibited excellent melting behaviour, good spreadability and plasticity. The product showed a thinness value (viscosity at 34°C) of 74 which is very low compared to average margarines.

COMPARISON EXAMPLE A

(based on interesterified fat)

Fully refined sunflower oil and an interesterified mixture of 50 wt.% of fully hardened palm oil and 50 wt.% of fully hardened palm kernel oil were blended in a ratio of 87 : 13.

A spread was manufactured using the ingredients (except the oil) and the process according to example 1.

The solid contents at 10°, 20°, 30° and 35°C, the N-values, were 12.0, 7.2, 3.2 and 0.6. respectively (one hour stabilisation).

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	86
S10	66
S15	49
S20	26

On account of the relatively high content of HHH triglycerides the thinness value is: > 150.

From this comparison example it is apparent that the thinness value of the fat of the invention is considerably lower, although the N-lines of examples 1 and A are about the same.

EXAMPLE 2

The stearin fraction of the dry fractionated sheanut oil used in example 1, fully refined high stearic soybean oil and fully refined sunflower oil were blended in a ratio of 17:37:46.

The soybean source is identical to that described by Hammond and Fehr as the A6 germplasm line (Crop Science 23 192-193).
The compositions of the triglyceride and of the fatty acids of this soybean oil is according to Table 2.1.

The resulting fat blend had a content of HOH + HHO which is 16.1 wt.% and of HLH + HHL of 6.7 wt.% on total glyceride weight and a content of palmitic acid of about 7 wt.% on total weight of fatty acids.
The solid contents at 10°, 20°, 30° and 35°C, the N-values, are 30.3, 19.4, 3.3 and 0.9 respectively (one hour stabilisation).
Further characteristic features of the fat have been summarized in TABLE 8.

TABLE 2.1

Triglyceride group	High stearic soybean oil
HOH	12.1%
HHO	0.3%
HLH	13.7%
HHL	0.3%
Rest	73.6%

From this fat a spread was manufactured. The spread had the following composition (wt.% on total composition):

FAT PHASE: 80%

79.5%	fat
0.3%	Cetinol
0.2%	Admul 6203
trace	beta carotene

WATER PHASE: 20%

19.3%	water
0.3%	skimmed milk powder
0.1%	P sorbate
0.3%	salt

The spread was processed at laboratory scale through a conventional A-C-A-A-B sequence with a throughput of 4 kg/hr, an exit temperature on the C-unit (150 rpm) of 17.5°C, an exit temperature on the last A-unit (1000 rpm) of 6.1°C, an exit temperature on the B-unit of 11.5°C and a line pressure of 10 bar. An unexpectedly good wrapper margarine resulted, which though has a good mouthfeel.

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	544
S10	459
S15	256
S20	113

Compared with an average margarine the product had a good appearance as expressed by a low gloss and a low yellowness index.

TABLE 8

Claimed		Example 1: 15dfSHs/85SF	Example 2: 17dfSHs/37HSBO/46SF
1)	chemically modified?	no	no
a)	$\geq$ 10% H-fatty acids (H $\geq C_{18}$)	13.9	26.5
b)	S (C_{18})	12.8	24.2
	A (C_{20})	0.5	1.4
	B (C_{22})	0.6	0.9
c)	O (C_{18}:1)	22.3	23.9
	L (C_{18}:2)	56.7	40.8
d)	$C_{18}/(C_{20}+C_{22}+C_{24})$ ≥ 1, ≥ 5, ≥ 10	11.6	10.5
e)	$\leq$ 5% Le (C_{18}:3)	0.3	1.8
f)	$\leq$ 5% trans fatty acids	< 0.1	< 0.1
g)	O at 2-pos. $\leq$ 75%, $\leq$ 60%	29.6	39.4

Claimed		Example 1: 15dfSHs/85SF	Example 2: 17dfSHs/37HSBO/46SF
h)	≥ 8% HOH+HHO (H ≥ C_{18})	10.2	16.1
i)	≤ 5% trisaturated TAGs	0.7	1.0
j)	N10 > 10	11.4	30.3
	N35 ≤ 15	0.3	0.9
	(HOH+HHO)/ (HLH+HHL) > 1 (H ≥ C_{18})	6.6	2.4
2)	N5-N20 ≥ 10	10.5	> 15
3)	N10: 11 to 30	11.4	
	N20: 4 to 15	4.4	
	N30: 0.5 to 8	0.6	
	N35: 0 to 4	0.3	
4)	N10: 20 to 45		30.3
	N20: 14 to 25		19.4
	N30: 2 to 12		3.3
	N35: 0 to 5		0.9
5)	N10: 30 to 60		
	N20: 20 to 55		
	N30: 5 to 35		
	N35: 0 to 15		
6)	C_{12}-C_{16} ≤ 15%, ≤ 10%, ≤ 5%	6.4	6.8
7)	disaturated DAGs ≤ 5%, ≤ 3%	< 1	< 1

EXAMPLE 3

The stearin fraction of the dry fractionated sheanut oil used in example 1 and fully refined sunflower oil were blended in a ratio of 50:50.

The resulting fat blend had a content of HOH + HHO which is 34.0 wt.% and of HLH + HHL of 4.0 wt.% on total glyceride weight and a content of palmitic acid of about 6 wt.% on total weight of fatty acids.

The solid contents at 10°, 20°, 30° and 35°C, the N-values, are 47.9, 40.8, 24.1 and 3.7 respectively.

Further characteristic features of the fat have been summarized in TABLE 9.

From this fat a bakery margarine was manufactured. The bakery margarine had the following composition (wt.% on total composition):

FAT PHASE: 83%

82.7%	fat
0.15%	admul 6203
0.15%	beta carotene

WATER PHASE: 17%

16%	water
1%	salt

The bakery margarine was processed at laboratory scale through a conventional A-A-C-B sequence with a throughput of 2.1 kg/hr, an exit temperature on the second A-unit (1000 rpm) of 23.1°C, an exit temperature on the C-unit (200 rpm) of 23.6°C, an exit temperature on the B-unit of 25.8°C and a line pressure of 10 bar. The margarine was stored at 20°C.

The product exhibited the following "Stevens" values (1 week) at the indicated temperatures:

S15	1207
S20	950
S25	674

The resulted bakery margarine (I) was used in manufacturing croissants according to the following method:

DOUGH COMPOSITION:

Wheat flour Banket Extra	2000 g
Castor sugar	60
Pressed yeas	100
Salt	40
Dough improver	60
Water (depending on wheat flour)	1160
Margarine	284

A dough laminate of 16 layers was formed by two times book folding. The croissant dough pieces have a thickness of 2.5 mm before bending to the typical croissant shape. The dough temperature after lamination was ambient. The dough was proofed at 32°C for 60 minutes. Then, fresh croissants were baked at 220°C for 18 minutes.

During lamination the bakery margarine exhibited very good laminating properties.

For comparison a bakery margarine was produced of which the glyceride mixture was obtained by blending the stearin fraction of the dry fractionated sheanut oil, fully hardened palm oil and fully refined sunflower oil in a ratio of 40:10:50. The resulting bakery margarine (II) was used in the manufacturing of croissants according to the method described.

A comparison between the specific volume (S.V.-) values of the baked croissants manufactured with bakery margarine I and those manufactured with bakery margarine II showed that for the croissants baked with margarine I the S.V.-values were from 2 up to 10% higher. Typical examples are given in table 3.1:

TABLE 3.1

S.V. croissants baked with margarine I (in cm^3/g)	S.V. croissants baked with margarine II (in cm^3/g)
10.2	9.4
10.1	9.3

EXAMPLE 4

The stearin fraction of the dry fractionated sheanut oil used in example 1 and fully refined sunflower oil were blended in a ratio of 60:40.

The resulting fat blend had a content of HOH + HHO which is 40.8 wt.% and of HLH + HHL of 4.6 wt.% on total glyceride weight and a content of palmitic acid of about 6 wt.% on total weight of fatty acids.
The solid contents at 10°, 20°, 30° and 35°C, the N-values, are 57.6, 51.2, 33.3 and 10.9 respectively.
Further characteristic features of the fat have been summarized in Table 9.

A bakery margarine was manufactured from this fat. The bakery margarine had the following composition (wt.% on total composition):

FAT PHASE: 83%

82.7%	fat
0.15%	Admul 6203
0.15%	beta carotene

WATER PHASE: 17%

16%	water
1%	salt

The bakery margarine was processed at laboratory scale through a conventional A-A-C-B sequence with a throughput of 2.2 kg/hr, an exit temperature on the second A-unit (1000 rpm) of 23.8°C, an exit temperature on the C-unit (200 rpm) of 25.5°C, an exit temperature on the B-unit of 28.5°C and a line pressure of 15 bar. The margarine was stored at 30°C.

The product exhibited the following "Stevens" values (1 week) at the indicated temperatures:

S15	3711
S20	2672
S25	1592

The relatively high hardness level of the product indicated by the Stevens values makes the product pre-eminently suitable to be used in a tropical application.

The resulted bakery margarine (I) was used in manufacturing croissants according to the method described in example 3 with the exception that the dough temperature after lamination was 28.6°C.

During lamination the bakery margarine exhibited good laminating properties.

For comparison a bakery margarine was produced of which the glyceride mixture was obtained by blending the stearin fraction of the dry fractionated sheanut oil, fully hardened palm oil and fully refined sunflower oil in a ratio of 50:10:40. The resulting bakery margarine (II) was also used in the manufacturing of croissants according to the method described.

A comparison between the S.V. values of the baked croissants manufactured with bakery margarine I and those manufactured with bakery margarine II showed that the S.V. values of the croissants baked with margarine I were from 4 up to 12% higher. Typical examples are given in table 4.1:

TABLE 4.1

S.V. croissants baked with margarine I (in cm^3/g)	S.V. croissants baked with margarine II (in cm^3/g)
8.6	7.9
8.7	7.8

TABLE 9

Claimed		Example 3: 50dfSHs/50SF	Example 4: 60dfSHs/40SF
1)	chemically modified?	no	no
a)	≥ 10% H-fatty acids (H ≥ C_{18})	32.9	38.1
b)	S (C_{18})	31.4	36.6
	A (C_{20})	1.0	1.1
	B (C_{22})	0.5	0.4
c)	O (C_{18}:1)	26.5	27.6
	L (C_{18}:2)	34.6	28.3
d)	$C_{18}/(C_{20}+C_{22}+C_{24})$ ≥ 1, ≥ 5, ≥ 10	20.9	24.4
e)	≤ 5% Le (C_{18}:3)	0.2	0.2
f)	≤ 5% trans fatty acids	< 0.1	< 0.1
g)	O at 2-pos. ≤ 75%, ≤ 60%	53.0	59.7
h)	≥ 8% HOH+HHO (H ≥ C_{18})	34.0	40.8
i)	≤ 5% trisaturated TAGs	2.3	2.7

		Example 3: 50dfSHs/50SF	Example 4: 60dfSHs/40SF
j)	N10 > 10 N35 ≤ 15	47.9 3.7	57.6 10.9
	(HOH+HHO)/ (HLH+HHL) > 1 (H ≥ C_{18})	8.6	8.8
2)	N5-N20 ≥ 10	≈11	≈10
3)	N10: 11 to 30 N20: 4 to 15 N30: 0.5 to 8 N35: 0 to 4		
4)	N10: 20 to 45 N20: 14 to 25 N30: 2 to 12 N35: 0 to 5		
5)	N10: 30 to 60 N20: 20 to 55 N30: 5 to 35 N35: 0 to 15	47.9 40.8 24.1 3.7	57.6 51.2 33.3 10.9
6)	C_{12}-C_{16} ≤ 15%, ≤ 10%, ≤ 5%	5.9	5.7
7)	disaturated DAGs ≤ 5%, ≤ 3%	< 1.2	< 1.5

EXAMPLE 5

A stearin fraction (BO stearin 1) of a high stearic soybean oil was obtained by dry fractionation. The solid phase content of the slurry was 8% (determined by NMR).

The overall fatty acid compositions of the soybean oil and the obtained stearin fraction are listed in Table 5.1. This high stearic soybean oil was obtained from PIONEER (Johnston, Iowa, USA).

The triglyceride groups of the used stearin fraction are listed in Table 5.2.

TABLE 5.1

Fatty acids	High stearic soybean oil	Stearin fraction of high stearic soybean oil (BO stearin 1)
C_{16} (Palmitic)	8.8%	6.6%
C_{18} (Stearic)	18.4%	38.4%
C_{18}:1 (Oleic)	16.9%	12.5%
C_{18}:2 (Linoleic)	44.7%	33.9%
C_{18}:3 (Linolenic)	9.1%	6.6%
C_{20} (Arachidic)	1.1%	1.5%
C_{22} (Behenic)	0.4%	0.4%

TABLE 5.2

Triglyceride group	Stearin fraction of high stearic soybean oil (BO stearin 1)
HHH	< 1.0%
HOH	8.8%
HHO	0.4%
HLH	29.1%
HHL	0.5%
Rest	60.2%

The stearin fraction of dry fractionated soybean oil, the stearin fraction of the dry fractionated sheanut oil described in example 1 and fully refined sunflower oil were blended in a ratio of 37.5 : 14 : 48.5.

The resulting fat blend had a content of HOH + HHO which is 13 wt.% and of HLH + HHL of 12.3 wt.% on total glyceride weight and a content of palmitic acid of about 6 wt.% on total weight of fatty acids.
The solid contents at 5°, 10°, 20°, 30° and 35°C, the N-values, were 31.4, 28.5, 19.3, 2.1 and <0.5 respectively (one hour stabilisation).
Further characteristic features of the fat have been summarized in TABLE 10.

From this fat a wrapper margarine was manufactured with a composition as described in example 1.
The spread was processed at laboratory scale through an A-C-A-B sequence with a throughput of 3.6 kg/hr, an exit temperature on the C-unit (150 rpm) of 9.9°C, an exit temperature on the second A-unit (600 rpm) of 8.0°C and a line pressure of 13 bar. A good product resulted.

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	507
S10	453
S15	269
S20	86

TABLE 10

Claimed		Example 5: 14dfSHs/48.5SF/ 37.5BO stearin 1	Example 6: 12dfSHs/ 24BO/36SF/ 28BO stearin1	Example 7: 11dfSHs/66SF/ 23BO stearin 2
1)	chemically modified?	no	no	no
a)	≥ 10% H-fatty acids (H ≥ C_{18})	26.2	21.6	19.0
b)	S (C_{18})	25.0	20.5	17.7
	A (C_{20})	0.9	0.8	0.7
	B (C_{22})	0.3	0.3	0.5
c)	O (C_{18}:1)	21.0	21.5	22.7
	L (C_{18}:2)	43.2	45.0	49.5
d)	C_{18}/(C_{20}+C_{22}+C_{24}) ≥ 1, ≥ 5, ≥ 10	20.8	18.6	14.8
e)	≤ 5% Le (C_{18}:3)	2.7	3.7	2.0
f)	≤ 5% trans fatty acids	< 0.1	< 0.1	< 0.1
g)	O at 2-pos. ≤ 75%, ≤ 60%	23.4	24.3	29.4
h)	≥ 8% HOH+HHO (H ≥ C_{18})	13.0	10.7	9.2
i)	≤ 5% trisaturated TAG's	1.0	0.8	0.7
j)	N10 > 10	28.5	21.3	16.4
	N35 ≤ 15	<0.5	<0.5	<0.5
	(HOH+HHO)/ (HLH+HHL) > 1 (H ≥ C_{18})	1.1	1.1	1.4
2)	N5-N20 ≥ 10	12.1	11.4	10.2
3)	N10: 11 to 30		21.3	16.4
	N20: 4 to 15		13.4	9.0
	N30: 0.5 to 8		0.8	0.6
	N35: 0 to 4		<0.5	<0.5

Claimed		Example 5: 14dfSHs/48.5SF/ 37.5BO stearin 1	Example 6: 12dfSHs/ 24BO/36SF/ 28BO stearin1	Example 7: 11dfSHs/66SF/ 23BO stearin 2
4)	N10: 20 to 45	28.5		
	N20: 14 to 25	19.3		
	N30: 2 to 12	2.1		
	N35: 0 to 5	<0.5		
5)	N10: 30 to 60			
	N20: 20 to 55			
	N30: 5 to 35			
	N35: 0 to 15			
6)	C_{12}-C_{16} ≤ 15%, ≤ 10%, ≤ 5%	6.2	7.4	6.5
7)	disaturated DAGs ≤ 5%, ≤ 3%	< 1.0	< 1.0	< 1.0

EXAMPLE 6

The stearin fraction (BO stearin 1) of dry fractionated high stearic soybean oil described in example 5, the stearin fraction of the dry fractionated sheanut oil described in example 1, fully refined soybean oil and fully refined sunflower oil were blended in a ratio of 28 : 12 : 24 : 36.

The resulting fat blend had a content of HOH + HHO which is 10.7 wt.% and of HLH + HHL of 9.4 wt.% on total glyceride weight and a content of palmitic acid of about 7 wt.% on total weight of fatty acids.
The solid contents at 5°, 10°, 20°, 30° and 35°C, the N-values, were 24.8, 21.3, 13.4, 0.8 and <0.5 respectively (one hour stabilisation).
Further characteristic features of the fat have been summarized in TABLE 10.

From this fat a tub margarine was manufactured with a composition as described in example 1.

The spread was processed at laboratory scale through an A-C-A-C sequence with a throughput of 4.5 kg/hr, an exit temperature on the second A-unit (600 rpm) of 8.1°C, an exit temperature on the second C-unit (250 rpm) of 11.5°C and a line pressure of 15 bar. A good product resulted.

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	433
S10	390
S15	233
S20	62

The product was very quick in the mouth and exhibited excellent melting behaviour, good spreadability and plasticity. The product showed a thinness value (viscosity at 34°C) of 64 which is very low compared to average margarines.

COMPARISON EXAMPLE B

(based on tropical oils)

Dry fractionated palm oil stearin, palm kernel oil, palm oil and soybean oil were blended in a ratio of 13 : 15 : 25 : 47.

A spread was manufactured using the ingredients (except the oil) and the process according to example 6.

The solid contents at 5°, 10°, 20°, 30° and 35°C, the N-values, were 31.6, 23.8, 12.5, 6.6 and 3.6 respectively (one hour stabilisation).

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	547
S10	344
S15	151
S20	41

Thinness value of 360. While the N-line is comparable with the N-line of example 6, the melting behaviour (thinness value) of the example 6 margarine is much better.

EXAMPLE 7

A stearin fraction (BO stearin 2) was obtained by dry fractionation from the same high stearic soybean oil mentioned in examples 5 and 6. The solid phase content of the slurry was 8% (determined by NMR).

The overall fatty acid composition of the obtained stearin fraction is listed in Table 7.1.

TABLE 7.1

Fatty acids	Stearin fraction of high stearic soybean oil (BO stearin 2)
C_{16} (Palmitic)	7.2%
C_{18} (Stearic)	33.6%
C_{18}:1 (Oleic)	13.7%
C_{18}:2 (Linoleic)	36.5%
C_{18}:3 (Linolenic)	7.1%
C_{20} (Arachidic)	1.4%
C_{22} (Behenic)	0.4%

The triglyceride groups of the used stearin fraction are listed in Table 7.2.

TABLE 7.2

Triglyceride group	Stearin fraction of high stearic soybean oil (BO stearin 2)
HHH	< 1.0%
HOH	7.2%
HHO	0.2%
HLH	23.5%
HHL	0.4%
Rest	67.7%

The BO stearin 2, the stearin fraction of the dry fractionated sheanut oil described in example 1 and fully refined sunflower oil were blended in a ratio of 23 : 11 : 66.

The resulting fat blend had a content of HOH + HHO which is 9.2 wt.% and of HLH + HHL of 6.6 wt.% on total glyceride weight and a content of palmitic acid of about 6.5 wt.% on total weight of fatty acids.
The solid contents at 5°, 10°, 20°, 30° and 35°C, the N-values, were 19.2, 16.4, 9.0, 0.6 and <0.5 respectively (one hour stabilisation).
Further characteristic features of the fat have been summarized in TABLE 10.

From this fat a spread was manufactured with a composition as described in example 1.

The spread was processed at laboratory scale through a convential A-A-C sequence with a throughput of 4.5 kg/hr, an exit temperature on the second A-unit (600 rpm) of 8.4°C, an exit temperature on the C-unit (100 rpm) of 12.1°C and a line pressure of 1 bar. A good product resulted.

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	247
S10	217
S15	136
S20	49

The product was very quick in the mouth and exhibited excellent melting behaviour, good spreadability and plasticity. The product showed a thinness value (viscosity at 34°C) of 62 which is very low compared to average margarines.

COMPARISON EXAMPLE C

(based on tropical oils)

Dry fractionated palm oil stearin, dry fractionated palm kernel stearin and sunflower oil were blended in a ratio of 15 : 7 : 78.

A spread was manufactured using the ingredients (except the oil) and the process according to example 7.

The solid contents at 5°, 10°, 20°, 30° and 35°C, the N-values, were 16.3, 13.5, 9.6, 5.2 and 5.0 respectively (one hour stabilisation).

The product exhibited the following "Stevens" values (1 week) at the indicated measuring temperatures:

S5	72
S10	49
S15	35
S20	27

Thinness value of 282.

While the N-line is comparable with the N-line of example 7, the melting behaviour (thinness value) of the example 7 margarine is much better.

CLAIMS

1. Glyceride fat which comprises a mixture of glycerides originating from seed oils which have not substantially been subjected to chemical modification, which glycerides are derived from fatty acids which comprise

(a) at least 10 wt.%, preferably $\geq$ 15 wt.%, more preferably $\geq$ 20 wt.% of C_{18}-C_{24} saturated fatty acids

(b) which comprise stearic and/or arachidic and/or behenic acid and/or lignoceric acid

(c) oleic and/or linoleic acid, while

(d) the ratio of saturated C_{18}-acid / saturated $(C_{20}+C_{22}+C_{24})$-acids is $\geq$ 1, preferably $\geq$ 5, more preferably $\geq$ 10,

which glycerides contain calculated on total fatty acid weight

(e) $\leq$ 5 wt.% of linolenic acid

(f) $\leq$ 5 wt.% of trans fatty acids

(g) $\leq$ 75 wt.%, preferably $\leq$ 60 wt.% of oleic acid on total fatty acids on position 2 of the glyceride molecule

which glycerides contain calculated on total glycerides weight

(h) $\geq$ 8 wt.%, preferably $\geq$ 12 wt.% of HOH + HHO triglycerides

(i) $\leq$ 5 wt.% of trisaturated triglycerides

(j) which glycerides have a solids content comprising $N_{10} > 10$ and $N_{35} \leq 15$

and which is characterised in that the ratio of (HOH + HHO) and (HLH + HHL) triglycerides > 1, preferably $\geq$ 1.2, where H is a saturated C_{18}-C_{24} fatty acid residue, O is an oleic acid residue and L is a linoleic acid residue.

2. Glyceride fat according to claim 1, where the ratio of (HOH + HHO) and (HLH + HHL) triglycerides is 1 - 9, preferably 1.2 - 4.

3. Glyceride fat according to claims 1 or 2, where $N_5 - N_{20} \geq 10$.

4. Glyceride fat according to any one of claims 1-3, suitable for the production of tub margarine, which has a solids content (N_T)

at 10°C of 11 to 30
at 20°C of 4 to 15
at 30°C of0.5 to 8
at 35°C of 0 to 4

5. Glyceride fat according to any one of claims 1-3, suitable for the production of wrapper margarine, which has a solids content (N_T)

at 10°C of 20 to 45
at 20°C of 14 to 25
at 30°C of 2 to 12
at 35°C of 0 to 5

6. Glyceride fat according to any one of claims 1-3, suitable for use as a bakery fat, which has a solids content (N_T)

at 10°C of 30 to 60
at 20°C of 20 to 55
at 30°C of 5 to 35
at 35°C of 0 to 15

7. Glyceride fat according to any one of claims 1-6, which has a content of C_{12}-C_{16} fatty acids $\leq$ 15 wt.%, preferably $\leq$ 10 wt.%, more preferably $\leq$ 5 wt.%, calculated on total fatty acid weight.

8. Glyceride fat according to any one of claims 1-7, which has a content of ≤ 5 wt.%, preferably ≤ 3 wt.% of disaturated diglycerides calculated on total glycerides weight.

9. Glyceride fat according to any one of claims 1-8, obtained wholly or partially from genetically modified soybean, corn, olive, rape, safflower or sunflower plants.

10. Glyceride fat according to claim 1 which has the following fatty acid composition

$< 8\%$ C_{12}-C_{16} fatty acids
$> 25\%$ stearic acid
$< 5\%$ saturated $C_{20}+C_{22}+C_{24}$ fatty acids

the balance essentially being oleic and linoleic acid.

11. Glyceride fat according to any one of claims 1-10, characterized in that the mixture of glycerides includes a dry fractionated fat blend.

12. Glyceride fat according to claim 11, characterized in that the dry fractionated fat blend is the stearin fraction of a dry fractionated high stearic soybean oil.

13. Glyceride fat according to any one of claims 1-12, possessing a fatty acid distribution which is non-random.

14. Glyceride fat according to any one of claims 1-12, characterized in that the mixture of glycerides includes a fat blend which has been subjected to an enzymatic interesterification treatment randomizing the fatty acid distribution over the terminal Sn1- and Sn3-positions of the glyceride molecule.

15. Glyceride fat according to any one of claims 1-12, characterized in that the mixture of glycerides includes a fat blend which has been subjected to an enzymatic interesterification treatment randomizing the fatty acid distribution over the Sn1-, Sn2- and Sn3-positions of the glyceride molecule.

16. Plastic edible fat containing composition comprising 1-100% fat phase and 0-99% aqueous phase, preferably 40-80% of fat phase and 20-60% of aqueous phase, wherein the fat phase is constituted by the fat according to any one of the preceding claims.

17. Use of a fat according to any one of the previous claims for manufacturing a plastic edible fat containing composition.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 94/03002

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A23D9/00 A23D7/00 A23D7/02 C11C3/10 C11B7/00

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)
IPC 6 A23D C11C C11B

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)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR,A,2 660 160 (CEMA) 4 October 1991 see page 1, line 30 - line 38 see claims 1,3,6 ---	1,7,8,10,11,16,17
X	CH,A,433 939 (NV VERENIGDE TEXTIEL&-OLIEFABRIEKEN AFD. CROK&LAAN) 14 October 1967 see the whole document ---	1,8,16,17
X	EP,A,0 227 364 (FUJI OIL COMPANY LTD) 1 July 1987 see page 5; claims 1-4,8-10; tables 1,3 --- -/--	1,2

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search 3 November 1994	Date of mailing of the international search report 17. 11. 94
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 Kanbier, D

International application No.
PCT/EP 94/03002

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB,A,2 244 717 (CHARLEVILLE RESEARCH LIMITED) 11 December 1991 see page 23, line 17 - page 24, line 15; claims 1-7,13,14,20-24,28-30; examples 1,3,5 ---	1,3-5, 7-10,16, 17
A	EP,A,0 470 658 (UNILEVER NV) 12 February 1992 see page 4; claims 1-4,6-9; examples 1-7 -----	1,7-10, 15-17

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/EP 94/03002

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