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# DESCRIPTION

## Background

**[0001]** Spreads, such as hazelnut or chocolate spreads, are prepared by mixing fat such as palm fat with hazelnut paste or chocolate to form a sweet spread that can easily be applied to for instance a sandwich by using common cutlery such as a spoon or a knife.

**[0002]** A problem with spreads is that the mixture of components may be unstable, leading to phase separation of the oil from the mixture (de-oiling/oil exudation). This leads to an unappealing appearance of the spread, and may also affect the taste and texture experienced when consuming the spread. Deoiling behavior may occur over time, and may be affected by the storage temperature of the spread.

**[0003]** Another problem that may occur with spreads is that the temperature tolerance for spreadability may be limited. Consumers may find it difficult to apply the spread at temperatures outside the appropriate temperature window. At temperatures below the suitable temperature range for spreadability, the spread is solid and excessive force is needed to apply the spread. Above the suitable temperature range, the spread becomes liquid and will insufficiently adhere to the cutlery (such as a knife) used to apply the spread to for instance a sandwich.

**[0004]** Another problem in spreads is that spreads, when stored in a refrigerator the spread can not be consumed immediately as the structure has become too hard to take out of the container by for instance a spoon or knife. This is referred to as the spoonability of the spread. Refrigerators are usually designed to cool products to a temperature under 10 °C.

**[0005]** It is particularly difficult to prepare a chocolate spread that has a sufficient chocolate flavor. When low amounts of chocolate are added, the chocolate taste is not strong enough. However, at higher levels of chocolate, the mixture may become unstable and shows recrystallization behavior after extended storage. The formation of crystals at the surface gives the spread an unappealing appearance and may affect the taste and texture.

**[0006]** Although satisfactory chocolate spreads are commercially available, these spreads only show the desired properties over a limited temperature range.

**[0007]** WO2014/016245 and WO2015/132206 disclose confectionery spread and/or filling compositions comprising interesterified shea olein fractions.

**[0008]** US6277433 discloses icing compositions, margarine or frying fats comprising randomised, interesterified shea olein.

**[0009]** It is an object of the invention to enable chocolate spreads that display desirable properties over a wider temperature range.

**[0010]** The present invention relates to a chocolate spread composition comprising cocoa butter, cocoa mass and/or cocoa powder, one or more of the ingredients selected from hazelnut paste, milk fat, milk powder, vanilla, and lecithin; 2% to 40 % by weight of a fat composition; 30% to 50% by weight of sugar; wherein the fat composition comprises at least 40 % by weight of interesterified shea olein and optionally up to 60% by weight of a liquid vegetable oil; wherein the interesterified shea olein has an oleic acid content of at least 50 % by weight and a stearic acid content of at least 25% by weight, based on the total C12 to C20 fatty acids present in the interesterified shea olein, and wherein the interesterified shea olein has a solid fat content of at least 10 % at 10°C, at least 6 % at 20°C, and at least 3 % at 30°C. The chocolate spread can also be used as a chocolate filling.

**[0011]** Preferably, the fat composition comprises at least 80%, preferably at least 90%, by weight of interesterified shea olein. More preferably, the fat composition comprises at least 99% by weight of interesterified shea olein and up to 1% by weight of a liquid oil. It is even more preferred if the composition comprises 100% by weight interesterified shea olein.

**[0012]** In a preferred embodiment, the liquid oil comprises soybean, sunflower and/or rapeseed oil, preferably rapeseed oil. Preferably, the liquid oil consists of rapeseed oil.

**[0013]** The spread comprises cocoa butter, cocoa mass and/or cocoa powder, wherein preferably the amount of cocoa butter, cocoa mass and/or cocoa powder is at least 10% by weight of the spread, preferably at least 15% by weight.

**[0014]** It is advantageous if the chocolate spread composition is essentially free of nuts components other than cocoa butter, cocoa mass and/or cocoa powder.

**[0015]** Preferably, the chocolate spread composition comprises a combination of milk powder and lecithin. In a preferred embodiment, the interesterified shea olein has a solid fat content in the range of from 10-20 % at 10°C, from 6-16 % at 20°C, and from 3-13 % at 30°C. Solid fat contents mentioned herein are determined using NMR spectroscopy according to the IUPAC 2.150a method.

**[0016]** It is advantageous if the composition has a good spoonability using a dry metal spoon at temperatures in the range of 1-15 °C, preferably in the range of 4-12 °C.

**[0017]** Preferably, the spread does not show recrystallization after storage at 15 °C for at least one month, preferably after 3 months.

**[0018]** Preferably, the spread does not show oil exudation after storage at 15 °C for at least one month, preferably after 3 months.



**[0019]** The invention also relates to a method of preparation of a chocolate spread composition, comprising the step of mixing a fat composition with other chocolate spread ingredients; wherein the fat composition comprises at least 60 % by weight of interesterified shea olein and optionally up to 40% by weight of a liquid vegetable oil; wherein the interesterified shea olein has an oleic acid content of at least 50 % by weight and a stearic acid content of at least 25% by weight, based on the total C12 to C20 fatty acids present in the interesterified shea olein, and wherein the interesterified shea olein has a solid fat content of at least 10 % at 10°C, at least 6 % at 20°C, and at least 3 % at 30°C.

**[0020]** Preferably, the fat composition is mixed with one or more of the ingredients selected from hazelnut paste, cocoa butter, cocoa mass, cocoa powder, milk fat, milk powder, vanilla, and lecithin; sugar; and optional other ingredients.

**[0021]** The invention will now be further elucidated by the following non-limiting examples.

## **Examples**

### **Example 1: Preparation of fat blends**

#### **A: interesterified shea olein**

**[0022]** About 5000 gram of shea olein was chemically interesterified. The oil was heated to 110°C and dried for 30 min at a pressure of about 50 mbar. To this dried oil was added sodium methoxide (0.10% w/w) and the mixture was stirred for 30 min at about 100 mbar. After this, the reaction was stopped by adding citric acid and washed with water afterwards until essentially free of soaps. The interesterified shea olein was further refined according to a standard refining procedure (bleaching and deodorization) for further use. The analytical results are shown in table 1 under fat blend A. Interesterified shea olein A (inShf) was blended with rapeseed oil (RP) to yield blends B and C. Analytical results are also shown in table 1. As a reference fat, the commercially available fully refined fat Durkex 102 was used, as obtained from Loders Croklaan BV, the Netherlands. This reference fat is based on a palm olein fraction, and is used in commercially available chocolate spreads. The analytical results are also shown in table 1.

#### **Example 2: fat blends analytical data**

**[0023]** Solid Fat content (SFC) is determined using NMR spectroscopy according to the IUPAC 2.150a method. Solid fat contents at x °C are denoted as Nx. For example, a solid fat content at 20 °C is referred to as N20.

**[0024]** Fatty acid residue composition was determined using fatty acid methyl ester analysis (FAME) gas chromatography according to ISO 15304. Cx:y refers to a fatty acid having x carbon atoms and y double bonds; The extension 'c' refers to cis fatty acids and 't' refers to trans fatty acids. Fatty acids are straight chain carboxylic acids having from 8 to 24 carbon atoms and optionally one or more double bonds.

**[0025]** The fatty acid compositions are characterized in the content of saturated fatty acids (SAFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). SAFA are fatty acids without unsaturated bonds, such as palmitic acid (C16:0) and oleic acid (C18:0). As defined herein, SAFA is the total of C12:0, C14:0, C16:0, C17:0, C18:0, C20:0, C22:0 C24:0. Mono unsaturated fatty acids (MUFA) are fatty acids having a single carbon-carbon double bond, which may be in either the cis or trans configuration. Total trans is the total amount of trans fatty acids.

**[0026]** The group of MUFA includes but is not restricted to palmitoleic acid (C16:1 cis) and oleic acid (C18:1 cis). As defined herein, MUFA is the total of C16:1 c/t, C18:1 c/t, C20:1 c/t, C22:1 c/t and C24:1 c/t; wherein c/t indicates the combined amounts of cis and trans fatty acids for that particular number of carbon atoms. Polyunsaturated fatty acids (PUFA) have more than one carbon-carbon double bond, such as two or three double bonds. SAFA, MUFA and PUFA values are calculated by adding up amounts of the respective compounds as determined through the FAME analysis.

**[0027]** Iodine value (IV) was calculated according to AOCS Cd 1c-85, based on the fatty acid composition, as determined using fatty acid methyl ester analysis (FAME) gas chromatography according to ISO 15304. IVFAME refers to the calculated iodine value.

**[0028]** Triglyceride composition was determined using gas chromatography according to ISO 23275. In the table the triglycerides are identified as 3-letter coded names according to the fatty acid residues, wherein A=Arachidoyl-, L= linoleoyl-, M = myristoyl-, P = palmitoyl, O = oleoyl-, St = Stearoyl-. For instance StOSt means 2-oleoyl-1,3-distearoylglyceride. SUMSOS refers to total SOS (S is stearic or palmitic acid and O is oleic acid).

Table 1. Analysis results for fats used for recrystallization test

Example	A inSHf	B 50/50 inSHf/RP	C 80/20 inSHf/RP	Ref Durkex 102
<b>Solid Fat Content</b>				
US-N10 NMR	14.1	7.8	8.9	11.3
US-N15 NMR	10.8	6.6	9	6.9
US-N20 NMR	9.3	4.1	7.7	4.5
US-N25 NMR	7.4	2.6	5.1	2.7
US-N30 NMR	5.3	2.1	3.7	1.2



Example	A inSHf	B 50/50 inSHf/RP	C 80/20 inSHf/RP	Ref Durkex 102
<b>Solid Fat Content</b>				
US-N35 NMR	3.7	1.3	2.4	0
<b>FAME</b>				
C8:0	0	0	0	0
C10:0	0	0	0	0
C12:0	0	0	0.1	0.3
C14:0	0	0.1	0.1	1
C15:0	0	0	0	0
C16:0	4.2	4.3	4.3	35.6
C16:1T	0	0	0	0
C16:1C	0.1	0.2	0.1	0.3
C17:0	0.1	0.1	0.1	0.1
C18:0	29.7	15.1	23.7	4
C18:1	54.9	59.2	56.5	44
C18:1T	0.1	0	0.1	0.1
C18:1C	54.9	59.2	56.5	44
C18:2	8.5	13.9	10.7	13.5
C18:2T	0.1	0.1	0.1	0.2
C18:2C	8.3	13.8	10.5	13.3
C18:3	0.3	4.8	2.2	0.4
C18:3T	0.1	0.6	0.3	0.1
C18:3C	0.1	4.2	1.9	0.3
C20:0	1.3	0.9	1.1	0.4
C20:1C	0.5	0.7	0.5	0.2
C20:2C	0	0	0	0
C22:0	0.1	0.2	0.2	0.1
C22:1	0	0	0	0
C22:1T	0	0	0	0
C22:1C	0	0	0	0
C24:0	0.1	0.1	0.1	0.1
C24:1C	0	0.1	0	0
Others	0.2	0.3	0.3	0.1

<b>FAME</b>				
SAFA	35.5	20.8	29.6	41.6
MUFA	55.5	60.2	57.3	44.4
PUFA	8.7	18.7	12.9	13.9
<b>IVFAME</b>	63.1	88.4	73.4	62.6
Total Trans	0.3	0.8	0.5	0.4
SAFA g/100g fat	33.8	19.8	28.1	39.5
MUFA g/100g fat	52.7	57.2	54.4	42.2
PUFA g/100g fat	8.3	17.8	12.2	13.2
<b>Triglycerides</b>				
MPP	0	0	0	0.2
MOM	0	0	0.2	0.1
PPP	0	0.1	0.2	2.4
MOP	0	0.7	2	1.6
MLP	0	0	0.6	0.6
PPSt	0.2	0.1	0.3	0.5
POP	0.5	0.1	0.3	16.3
PLP	0.5	0.3	0.5	11.5
C50 Others	1.1	0.2	0.9	1.1
PStSt	2.1	0.6	1	0.1
POSt	4.5	2.1	4	2.6
POO	4.4	5.4	4.7	31.1
PLSt	0.7	0.6	0.7	2.4
PLO	1.4	3	1.9	13.6
PLL	0.3	1.4	0.2	2.8
StStSt	3	1.7	2.3	0
StOSt	16.8	9.2	13.5	1.2
StOO	27.4	15.6	21.4	3.2
StLSt	1.8	0.8	1.5	0.2
OOO	16.4	24.7	18.2	4.1
StLO	7.5	5.9	6.9	1.6
OLO	6.7	14.8	9.4	1.9
StLL	0.6	0.3	0.5	0.3
OLL	1.2	6.1	2.5	0.4
AStSt	0	1.9	1.1	0



Triglycerides				
AOST	1.1	2.5	1.1	0
AOO	1.3	0.8	0.8	0.2
ALSt	0.1	0	0.4	0
Others	0.4	1.3	3	0.1
SUMSOS	21.8	11.4	17.8	20.1

### Example 3: chocolate spreads

[0029] A chocolate spread was prepared by mixing the following ingredients using a ball mill at 240 rpm for 45 minutes. Fat blend B was used. For a reference spread, the fat blend was replaced by a standard chocolate spread fat, Durkex 102 obtained from Loders Croklaan BV, Wormerveer, the Netherlands.

Ingredient	Percentage
Sugar	40
Fat blend	35
Milk chocolate (Milka)	15
Skimmed milk powder	5
Cocoa powder 74	5
Lecithin	0.4

### Example 4: chocolate spreads with hazelnut paste

[0030] A chocolate spread with hazelnut paste was prepared by mixing the following ingredients using a ball mill at 240 rpm for 45 min.

Ingredient	Percentage
Sugar	48
Fat blend	22
Hazelnut paste 100%	13
Skimmed milk powder	9
Cocoa powder alkalised	8
Lecithin	0.4

[0031] The chocolate spreads were prepared using the fat blends according to table 1. As a reference, fat blend Durkex 102 was used. Chocolate spreads are summarized in table 2.

Table 2: Chocolate spreads according to recipes as described in examples 3 and 4.

Chocolate spread (ex 3)	Fat blend
1	B
2	Ref
Chocolate spread + Hazelnut paste (ex 4)	Fat blend
3	A
4	B
5	C
6	Ref

#### Example 5: Storage trials: Recrystallization

[0032] The spreads prepared according to example 3 were deposited at 50°C in containers and cooled in a static cooling cabinet (12°C) for at least 20 minutes. After the initial cooling, the spreads were stored at different temperatures for further evaluation. The spreads were stored at temperatures of 15°C, 20°C, 25°C, 30°C, as well as under temperature cycling conditions cycling between 15°C 12 hours and 25°C for 12 hours and evaluated immediately after 1 night at ambient temperature (20°C) and after 1, 2 or 3 weeks, and after 1, 2 or 3 months. Recrystallization results are summarized in table 3.

[0033] The samples were evaluated for the following properties: Appearance (re-crystallization, oil exudation and gloss) and sensory evaluation.

Table 3: recrystallization results.

Chocolate spread (ex 3)	Fat blend	Recrystallization
1	B	no
2	Ref	yes
Chocolate spread + hazelnut (ex 4)		
4	B	no
6	Ref	no

[0034] For the chocolate spread based on fat blend B, no re-crystallization occurred, whereas recrystallization was clearly visible for the other chocolate spreads including the chocolate/hazelnut spreads. Samples where recrystallization had occurred showed crystals on the surface, including the chocolate/hazelnut spread using the same fat blend as the chocolate spread according to example 2.



[0035] These data show that fat blend B offers a solution for circumventing recrystallization in all-chocolate spreads without added hazelnut paste according to example 3.

### Temperature tolerance

[0036] The spreads 4-6 according to example 4 were stored at 50°C in containers and cooled in a static cooling cabinet (12°C) for at least 20 minutes. Subsequently, the containers were stored at different temperatures for further evaluation at fridge temperature (approx. 7°C), 20°C, 25°C, 40°C with cycling: 12 hours 20°C/ 12 hours 40°C. The samples were evaluated initially after 1 night, after 1 week and after 1 month.

### Spoonability

[0037] The samples were further tested for spoonability after storage for one week or one month at 7 °C. The samples were investigated qualitatively by attempting to scoop a spoon full of chocolate spread from a container directly after taking the container from the refrigerator, using a dry metal spoon at ambient temperature (20 °C). A new spoon at ambient temperature was used for each sample to rule out the influence of heating by hand warmth. As a reference, a chocolate spread based on Durkex 102 was used. Results are shown in tables 4a and 4b.

Table 4a: Spoonability after 1 week at 7°C

Chocolate spread	Fat composition	Spoonability
3	A	Hard, not spoonable
4	B	Softer than 3, spoonable
5	C	Harder than 4, spoonable
6	Ref	Hard, not spoonable

Table 4b: Spoonability after 1 month at 7°C

Chocolate spread	Fat composition	Spoonability
3	A	Hard, not spoonable
4	B	Spoonable
5	C	Hard, not spoonable
6	Ref	Hard, not spoonable

[0038] The appearance was assessed after one day, one week and one month, as shown in the following tables. Appearance was evaluated for oil exudation, re-crystallization, gloss and contraction. Gloss is indicated by a gloss factor ranging from 1-5, wherein 1 is matte (no gloss) and 5 is very glossy. Deoiling/oil exudation is indicated with the code OE. A grainy texture is indicated with the code GR. Results are shown in tables 5a, 5b and 5c.



Table 5a: Gloss after one day

Sample	Fat	7°C	20°C	25°C	40°C	20/40°C
3	A	1/2	2	2	5	5
4	B	2/3	3	3	5	5
5	C	2	2/3	2/3	5	5
6	Ref	3/4	4	4	5	5

Table 5b: Gloss after one week

Sample	Fat	7°C	20°C	25°C	40°C	20/40°C
3	A	1	1/2	2	5	5
4	B	1	3	3	5 OE	5
5	C	1	2	2/3	5 OE	5
6	Ref	1	4	4	OE	5

Table 5c: Gloss after one month

Sample	Fat	7°C	20°C	25°C	40°C	20/40°C
3	A	1	1/2	2	5	5 OE
4	B	1	3/4	3	OE	5
5	C	1	2	2/3	OE	5
6	Ref	1	4	4	OE	5 OE

[0039] After 1 month of storage, samples 3-6 were further subjected to relative sensory evaluation by a trained test panel, with the results shown in the diagram in Figure 1. The samples were evaluated for relative Hardness (first bite), Meltdown, Spreadability, Coolness, Waxiness, Flavour release time, Flavour impact and Flavour after effect.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- [WO2014016245A \[0007\]](#)
- [WO2015132206A \[0007\]](#)

- US6277433B [0008]

# TEMPERATURTOLERANT CHOKOLADE-SMØREPÅLÆG ELLER -FYLD OG TILBEREDELSESMETODE

## PATENTKRAV

- 5
1. Chokoladesmørepålæg og/eller -fyldsammensætning omfattende kakaosmør, kakaomasse og/eller kakaopulver;  
én eller flere ingredienser udvalgt blandt hasselnøddepasta, mælkefedt, mælkepulver, vanille og lecithin,
- 10 2% til 40 vægt% af en fedtsammensætning; 30% til 50 vægt% sukker;  
hvor fedtsammensætningen omfatter mindst 40 vægt% interesterificeret shea-olein og valgfrit op til 60 vægt% af en væskeformig vegetabilsk olie; hvor den interesterificerede shea-olein har
- et oleinsyreindhold på mindst 50 vægt% og
  - et stearinsyreindhold på mindst 25 vægt% på grundlag af det samlede indhold af
- 15 C12 til C20 fedtsyrer til stede i den interesterificerede shea-olein og
- hvor den interesterificerede shea-olein har et indhold af fast fedt på mindst 10 % ved 10°C, mindst 6 % ved 20°C og mindst 3 % ved 30°C.
2. Chokoladesmørepålæg i overensstemmelse med krav 1, hvor fedtsammensætningen
- 20 omfatter mindst 80%, helst mindst 90 vægt% interesterificeret shea-olein.
3. Chokoladesmørepålæg i overensstemmelse med krav 1 eller 2, hvor fedtsammensætningen omfatter mindst 99 vægt% interesterificeret shea-olein og op til 1 vægt% af en væskeformig olie.
- 25
4. Chokoladesmørepålæg i overensstemmelse med et hvilket som helst af de foregående krav, hvor sammensætningen omfatter 100 vægt% interesterificeret shea-olein.
5. Chokoladesmørepålæg i overensstemmelse med et hvilket som helst af de foregående
- 30 krav, hvor den væskeformige olie omfatter sojabønne-, solsikke- og/eller rapsolie, helst rapsolie.
6. Chokoladesmørepålæg i overensstemmelse med krav 5, hvor den væskeformige olie består af rapsolie.



7. Chokoladesmørepålæg-sammensætning i overensstemmelse med et hvilket som helst af de foregående krav, hvor smørepålægget omfatter kakaosmør, kakaomasse og/eller kakaopulver, hvor mængden af kakaosmør, kakaomasse og/eller kakaopulver er mindst 10 vægt% af smørepålægget, helst mindst 15 vægt%.
8. Chokoladesmørepålæg-sammensætning i overensstemmelse med krav 7, hvor chokoladesmørepålæg-sammensætningen i det væsentlige er fri for nøddekomponenter ud over kakaosmør, kakaomasse og/eller kakaopulver.
9. Chokoladesmørepålæg-sammensætning i overensstemmelse med et hvilket som helst af de foregående krav, hvor chokoladesmørepålæg-sammensætningen omfatter en kombination af mælkepulver og lecithin.
10. Chokoladesmørepålæg-sammensætning i overensstemmelse med et hvilket som helst af de foregående krav, hvor den interesterificerede shea-olein har et indhold af fast fedt i intervallet 10-20 % ved 10°C, 6-16 % ved 20°C og 3-13 % ved 30°C.
11. Chokoladesmørepålæg-sammensætning i overensstemmelse med et hvilket som helst af de foregående krav, hvor sammensætningen kan øses op med ske under anvendelse af en tør ske ved temperaturer i intervallet 1-15 °C, helst i intervallet 4-12 °C.
12. Chokoladesmørepålæg-sammensætning i overensstemmelse med et hvilket som helst af de foregående krav, hvor smørepålægget ikke fremviser rekrySTALLISERING efter lagring ved 15 °C i mindst én måned, helst efter 3 måneder.
13. Chokoladesmørepålæg-sammensætning i overensstemmelse med et hvilket som helst af de foregående krav, hvor smørepålægget ikke fremviser udsvedning af olie efter lagring ved 40 °C i mindst én måned, helst efter 3 måneder.
14. Tilberedningsmetode af en chokoladesmørepålæg-sammensætning og/eller konfektfyld, omfattende trinnet med blanding af en fedt-sammensætning med andre chokoladesmørepålæg- ingredienser; hvor fedtsammensætningen omfatter mindst 40 vægt% interesterificeret shea-olein og valgfrit

op til 60 vægt% af en væskeformig vegetabilsk olie; hvor den interesterificerede shea-olein har

- et oleinsyreindhold på mindst 50 vægt% og
- et stearinsyreindhold på mindst 25 vægt% på grundlag af det samlede indhold af C12 til C20 fedtsyrer til stede i den interesterificerede shea-olein og

5       - hvor den interesterificerede shea-olein har et indhold af fast fedt på mindst 10 % ved 10°C, mindst 6 % ved 20°C og mindst 3 % ved 30°C.

15.     Metode i overensstemmelse med krav 14, hvor fedtsammensætningen er blandet med

- 10       - én eller flere ingredienser udvalgt blandt hasselnøddepasta, kakaosmør, kakaomasse, kakaopulver, mælkefedt, mælkepulver, vanille og lecithin,
- sukker;
  - valgfrit andre ingredienser.

DRAWINGS

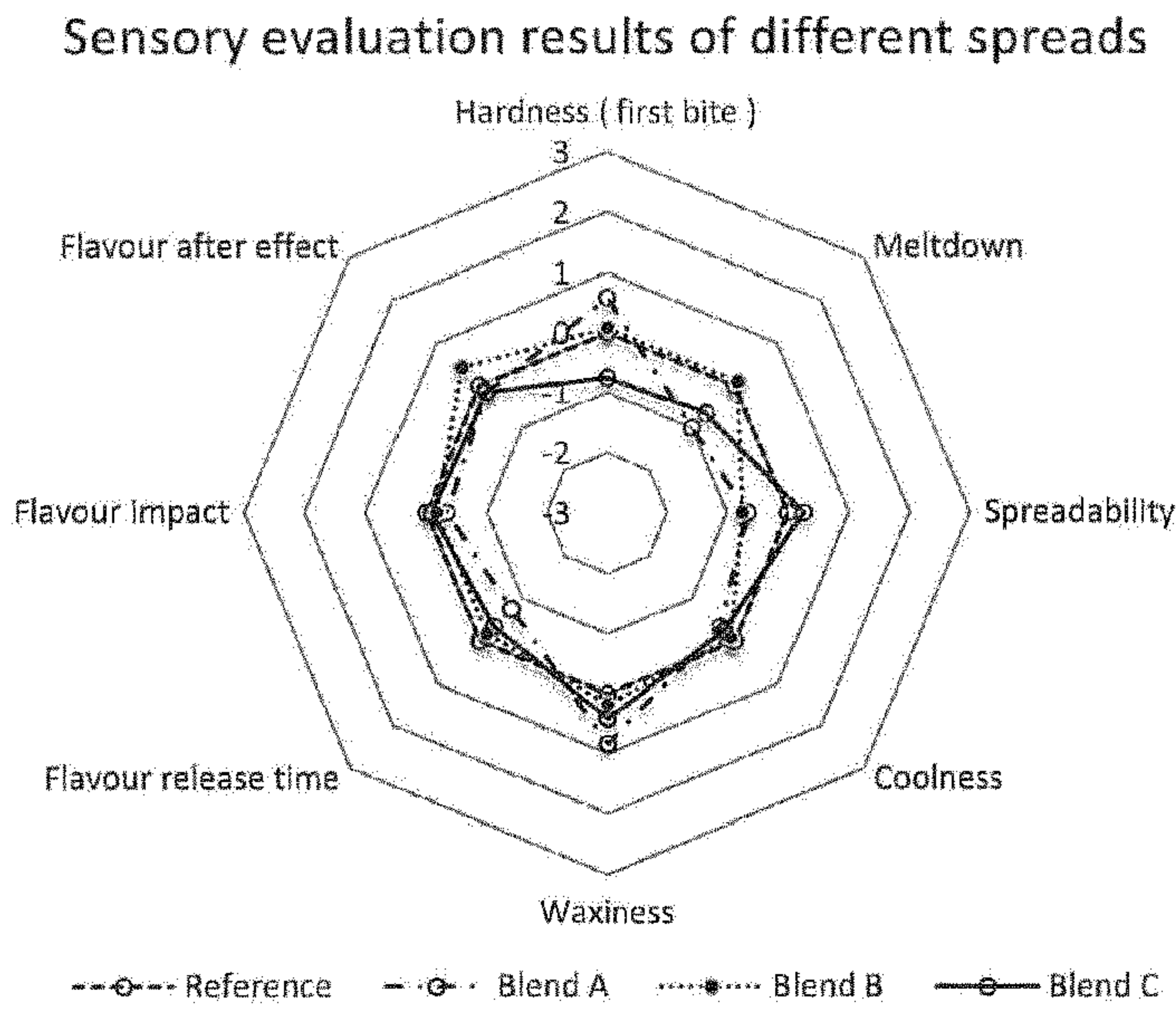


Fig 1