Claims

1. A method for processing a vegetable fat composition (VFC), the method comprising the steps of

- providing the vegetable fat composition (VFC),
- in a first neutralization step (FNS) separating free fatty acids from the vegetable fat composition (VFC) thereby obtaining a neutralized vegetable fat composition (NVF),
- in a separation step (FRA) separating the neutralized vegetable fat composition (NVF) into a first fraction (FF) rich in StOO and/or OOO and a second fraction (SF) rich in StOSt (where St = stearic acid and O = oleic acid),
- in a second neutralization step (SNS) adding to the first fraction (FF) a second base (SB) thereby obtaining a neutralized first fraction (NFF),
- feeding the neutralized first fraction (NFF) and a stearic acid source (SAS) into an enzymatic transesterification step (ETE) transesterifying the neutralized first fraction (NFF) by means of enzymes with 1,3-specific transesterification activity thereby obtaining a transesterified first fraction (TFF).

2. Method according to claim 1, wherein said first neutralization step (FNS) comprises the steps of

- in a base adding step (BAS) adding a first base (FB) to the vegetable fat composition (VFC) thereby obtaining a base added vegetable fat composition (BAF),
- in a soap separation step (SSS) separating free fatty acids in the form of saponified free fatty acids (SFA) from the base added vegetable fat composition (BAF) thereby obtaining a reduced vegetable fat composition (FAR) having a reduced content of free fatty acids, and
- in a soap residue removal step (SRR) adding a first acid (FAC) to the reduced vegetable fat composition (FAR) thereby obtaining the neutralized vegetable fat composition (NVF).

3. Method according to claim 1, wherein said first neutralization step (FNS) comprises a distillation step (DIS) of distilling free fatty acids (FFA) from the vegetable fat composition (VFC) thereby obtaining a neutralized vegetable fat composition (NVF).

4. Method according to claim 3, wherein said first neutralization step (FNS) furthermore comprises adding a first acid (FAC) to the vegetable fat composition (VFC) before the distilling step (DIS).

5. Method according to claim 3 or 4, wherein said first acid is phosphoric acid.

6. Method according to any of claims 3 to 5, wherein said first neutralization step (FNS) furthermore comprises bleaching said vegetable fat composition (VFC) before said distilling step (DIS).

7. Method according to any of the preceding claims, wherein the vegetable fat composition (VFC) comprises shea fat.

8. Method according to any of the preceding claims, wherein the vegetable fat composition (VFC) comprises refined shea fat.

9. Method according to any of the preceding claims, wherein the neutralized first fraction (NFF) is bleached.

10. Method according to any of the preceding claims, wherein the separation step (FRA) involves a fractionation step (FRA).

11. Method according to any of the preceding claims, wherein the first base (FB) comprises an aqueous solution of NaOH.

12. Method according to any of the preceding claims, wherein the first base (FB) comprises a 50% w/w aqueous solution of NaOH.

13. Method according to any of the preceding claims, wherein the amount of the first base (FB) added to the vegetable fat composition (VFC) in the base adding step (BAS) is based on the amount of free fatty acids in the vegetable fat composition (VFC).

14. Method according to any of the preceding claims, wherein the amount of the first base added to the vegetable fat composition (VFC) in the base adding step (BAS) is based on the acidity of the vegetable fat composition (VFC).

15. Method according to any of the preceding claims, wherein the molar amount of the first base (FB) added to the vegetable fat composition (VFC) in the base adding step (BAS) is between 0.5 and 3 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as between 0.8 and 2 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as between 1 and 2 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as between 1.2 and 1.4 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as 1.3 times the molar amount of the free fatty acids in the vegetable fat composition (VFC).

16. Method according to any of the preceding claims, wherein the amount of the first base (FB) that is added to the vegetable fat composition (VFC) in the base adding step (BAS) is between 1 g and 500 g, such as between 5 g and 50 g, such as between 11.0 g and 22.0 g for each kilogram of the vegetable fat composition (VFC), such as between 14.7 g and 18.4 g.

17. Method according to any of the preceding claims, wherein the second base (SB) comprises an aqueous solution of NaOH.

18. Method according to any of the preceding claims, wherein the second base (SB) comprises a 50% w/w aqueous solution of NaOH.

19. Method according to any of the preceding claims, wherein the molar amount of the second base (SB) added to the first fraction in the second neutralization step (SNS) is between 0.5 and 3 times the molar amount of the free fatty acids in the first fraction (FF), such as between 0.8 and 2 times the molar amount of the free fatty acids in the first fraction (FF), such as between 1 and 2 times the molar amount of the free fatty acids in the first fraction (FF), such as between 1.2 and 1.4 times the molar amount of the free fatty acids in the first fraction (FF), such as 1.3 times the molar amount of the free fatty acids in the first fraction (FF).

20. Method according to any of the preceding claims, wherein the amount of the second base (SB) that is added to the first fraction (FF) in the second neutralization step (SNS) is between 0.1 and 2 for each kilogram of vegetable fat composition (VFC) provided, such as between 0.45 g and 0.9 g, such as between 0.6 g and 0.75 g.

21. Method according to any of the preceding claims, wherein the soap separation step (SSS) comprises

- centrifuging the base added vegetable fat composition (BAF) with the saponified free fatty acids (SFA) so as to separate the saponified free fatty acids (SFA) from the base added vegetable fat composition (BAF).

22. Method according to any of the preceding claims, wherein the soap separation step (SSS) comprises

- washing the base added vegetable fat composition (BAF).

23. Method according to any of the preceding claims, wherein the soap separation step (SSS) comprises

- drying the base added vegetable fat composition (BAF).

24. Method according to any of the preceding claims, wherein the first acid (FAC) comprises citric acid.

25. Method according to any of the preceding claims, wherein the first acid comprises an aqueous solution of citric acid in a concentration of between 1 and 90 % w/w, such as between 5 and 80 % w/w, such as between 10 and 60 % w/w, such as between 15 and 40 % w/w, such as between 15 and 30 % w/w, such as between 18 and 25 % w/w, such as 20 % w/w.

26. Method according to any of the preceding claims, wherein the amount of the first acid (FAC) that is added to the first fraction is between 10 g and 200 g per 1000 kilogram of the first fraction, such as between 20 g and 100 g, such as between 67 g and 60 g, such as 65 g.

27. Method according to any of the preceding claims, wherein the first acid (FAC) transforms any residual saponified free fatty acids in the reduced vegetable fat composition (FAR) into free fatty acids.

28. Method according to any of the preceding claims, wherein residues of citric acid are removed by adding the second base (SB).

29. Method according to any of the preceding claims, wherein the concentration of citric acid in the neutralized first fraction (NFF) is lower than 10 ppm by weight, such as lower than 5 ppm by weight, such as lower than 2 ppm by weight, such as lower than 1 ppm by weight, such as lower than 0.75 ppm by weight, such as lower than 0.5 ppm by weight, such as lower than 0.3 ppm by weight, such as lower than 0.2 ppm by weight, such as lower than 0.1 ppm by weight, such as lower than 0.05 ppm by weight, such as lower than 0.3 ppm by weight, such as lower than 0.2 ppm by weight, such as lower than 0.01 ppm by weight, after adding the second base.

30. Method according to any of the preceding claims, wherein the concentration of acids in the neutralized first fraction (NFF) is lower than 10 mmol/100g of the first fraction, such as lower than 5 mmol/100g of the first fraction, such as lower than 2 mmol/100g of the first fraction, such as lower than 1 mmol/100g of the first fraction, such as lower than 0.75 mmol/100g of the first fraction, such as lower than 0.5 mmol/100g of the first fraction, such as lower than 0.3 mmol/100g of the first fraction, such as lower than 0.2 mmol/100g of the first fraction, such as lower than 0.1 mmol/100g of the first fraction, such as lower than 0.05 mmol/100g of the first fraction, such as lower than 0.3 mmol/100g of the first fraction, such as lower than 0.2 mmol/100g of the first fraction, such as lower than 0.01 mmol/100g of the first fraction, after second neutralization.

31. Method according to any of the preceding claims, wherein neutralized first fraction (NFF) is completely neutralized.

32. Method according to any of the preceding claims, wherein the enzymes with transesterification activity are 1,3 specific enzymes.

33. Method according to any of the preceding claims, wherein an additional step of drying the neutralized vegetable fat (NFV) is performed after the second neutralization step (SNS) and before the enzymatic transesterification step (ETE) .

34. Method according to any of the preceding claims, wherein the process comprises an additional step of removing karitene.

35. System for processing a vegetable fat composition (VFC) according to any of claims 1-34, the system comprising a common processing line (CPL), a first processing line (FPL), and a first output (FOP), the common processing line (CPL) comprising

- a free fatty acid removal apparatus (FFR), and

- a separator unit (FU) for performing the separation of said separation step (FRA),

the first output (FOP) being adapted for said first fraction (FF) to be fed into, and being connected to said separation unit (FU),

the first processing line (FPL) being adapted for said second fraction (SF) to be fed into, and being connected to said separation unit (FU), said first processing line (FPL) comprising

- a second base inlet (SBI) for adding said second base (SB) in said second neutralization step (SNS), and
- a reaction system (RS) for performing transesterification in said enzymatic transesterification step (ETE).

36. System for processing a vegetable fat composition (VFC) according to claim 35, wherein the free fatty acid removal apparatus (FFR) comprises

- a first base inlet (FBI) for adding said first base (FB) in said base adding step (BAS),
- a soap separator (SS) for separating saponified free fatty acids (SFA) in said soap separation step (SSS), and
- a first acid inlet (FAI) for adding said first acid (FAC) in said soap residue removal step (SRR).

37. System for processing a vegetable fat composition (VFC) according to claim 35, wherein the free fatty acid removal apparatus (FFR) comprises

- a distillation unit (DIU) for separating free fatty acids in said first neutralization step (FNS).

38. System for processing a vegetable fat composition (VFC) according to any of claims 35 to 37, wherein said first output (FOP) forms part of a second processing line (SPL), said second processing line (SPL) comprising

- a mixing unit for mixing said first fraction (FF) with a palm oil mid fraction to obtain a cocoa butter equivalent.

39. System for processing a vegetable fat composition (VFC) according to any of claims 35 to 38, wherein said first processing line (FPL) furthermore comprises a mixing unit for mixing said transesterified first fraction (TFF) with a palm oil mid fraction to obtain a cocoa butter equivalent.

40. Method of processing shea fat, wherein the process comprises the step of neutralizing the processed fat prior to a transesterification step.

41. Method of processing shea fat according to claim 40, wherein the neutralization of the shea fat is performed subsequent to a soap residue removal step.

42. Method of processing shea fat according to claim 40 or 41, wherein said neutralized first fraction (NFF) is neutralized prior to said enzymatic transesterification step (ETE) according to the method of any of claims 1 – 34.

CLAIMS

1. A method for processing a vegetable fat composition (VFC), the method comprising the steps of:

providing the vegetable fat composition (VFC);

in a first neutralization step (FNS) separating free fatty acids from the vegetable fat composition (VFC) thereby obtaining a neutralized vegetable fat composition (NVF),

in a separation step (FRA) separating the neutralized vegetable fat composition (NVF) into a first fraction (FF) rich in StOO and/or OOO and a second fraction (SF) rich in StOSt (where St = stearic acid and O = oleic acid);

in a second neutralization step (SNS) adding to the first fraction (FF) a second base (SB) thereby obtaining a neutralized first fraction (NFF) ;

feeding the neutralized first fraction (NFF) and a stearic acid source (SAS) into an enzymatic transesterification step (ETE) transesterifying the neutralized first fraction (NFF) by means of enzymes with 1,3-specific transesterification activity thereby obtaining a transesterified first fraction (TFF).

2. A method according to Claim 1, in which the first neutralization step (FNS) comprises the steps of:

in a base adding step (BAS) adding a first base (FB) to the vegetable fat composition (VFC) thereby obtaining a base added vegetable fat composition (BAF);

in a soap separation step (SSS) separating free fatty acids in the form of saponified free fatty acids (SFA) from the base added vegetable fat composition (BAF) thereby obtaining a reduced vegetable fat composition (FAR) having a reduced content of free fatty acids; and

in a soap residue removal step (SRR) adding a first acid (FAC) to the reduced vegetable fat composition (FAR) thereby obtaining the neutralized vegetable fat composition (NVF).

3. A method according to Claim 1, in which the first neutralization step (FNS) comprises a distillation step (DIS) of distilling free fatty acids (FFA) from the vegetable fat composition (VFC) thereby obtaining a neutralized vegetable fat composition (NVF).

4. A method according to Claim 3, in which the first neutralization step (FNS) furthermore comprises adding a first acid (FAC) to the vegetable fat composition (VFC) before the distilling step (DIS).

5. A method according to Claim 3 or 4, in which the first acid is phosphoric acid.

6. A method according to Claim 3, 4 or 5, in which the first neutralization step (FNS) furthermore comprises bleaching the vegetable fat composition (VFC) before the distilling step (DIS).

7. A method according to any preceding claim, in which the vegetable fat composition (VFC) comprises shea fat.

8. A method according to any preceding claim, in which the vegetable fat composition (VFC) comprises refined shea fat.

9. A method according to any preceding claim, in which the neutralized first fraction (NFF) is bleached.

10. A method according to any preceding claim, in which the separation step (FRA) involves a fractionation step (FRA).

11. A method according to any preceding claim, in which the first base (FB) comprises an aqueous solution of NaOH.

12. A method according to any preceding claim, in which the first base (FB) comprises a 50% w/w aqueous solution of NaOH.

13. A method according to any preceding claim, in which the amount of the first base (FB) added to the vegetable fat composition (VFC) in the base adding step (BAS) is based on the amount of free fatty acids in the vegetable fat composition (VFC).

14. A method according to any preceding claim, in which the amount of the first base added to the vegetable fat composition (VFC) in the base adding step (BAS) is based on the acidity of the vegetable fat composition (VFC).

15. A method according to any preceding claim, in which the molar amount of the first base (FB) added to the vegetable fat composition (VFC) in the base adding step (BAS) is between 0.5 and 3 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as between 0.8 and 2 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as between 1 and 2 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as between 1.2 and 1.4 times the molar amount of the free fatty acids in the vegetable fat composition (VFC), such as 1.3 times the molar amount of the free fatty acids in the vegetable fat composition (VFC).

16. A method according to any preceding claim, in which the amount of the first base (FB) that is added to the vegetable fat composition (VFC) in the base adding step (BAS) is between 1 g and 500 g, such as between 5 g and 50 g, such as between 11.0 g and 22.0 g for each kilogram of the vegetable fat composition (VFC), such as between 14.7 g and 18.4 g.

17. A method according to any preceding claim, in which the second base (SB) comprises an aqueous solution of NaOH.

18. A method according to any preceding claim, in which the second base (SB) comprises a 50% w/w aqueous solution of NaOH.

19. A method according to any preceding claim, in which the molar amount of the second base (SB) added to the first fraction in the second neutralization step (SNS) is between 0.5 and 3 times the molar amount of the free fatty acids in the first fraction (FF), such as between 0.8 and 2 times the molar amount of the free fatty acids in the first fraction (FF), such as between 1 and 2 times the molar amount of the free fatty acids in the first fraction (FF), such as between 1.2 and 1.4 times the molar amount of the free fatty acids in the first fraction (FF), such as 1.3 times the molar amount of the free fatty acids in the first fraction (FF).

20. A method according to any preceding claim, in which the amount of the second base (SB) that is added to the first fraction (FF) in the second neutralization step (SNS) is between 0.1 and 2 for each kilogram of vegetable fat composition (VFC) provided, such as between 0.45 g and 0.9 g, such as between 0.6 g and 0.75 g.

21. A method according to any preceding claim, in which the soap separation step (SSS) comprises centrifuging the base added vegetable fat composition (BAF) with the saponified

free fatty acids (SFA) so as to separate the saponified free fatty acids (SFA) from the base added vegetable fat composition (BAF).

22. A method according to any preceding claim, in which the soap separation step (SSS) comprises washing the base added vegetable fat composition (BAF).

23. A method according to any preceding claim, in which the soap separation step (SSS) comprises drying the base added vegetable fat composition (BAF).

24. A method according to any preceding claim, in which the first acid (FAC) comprises citric acid.

25. A method according to any preceding claim, in which the first acid comprises an aqueous solution of citric acid in a concentration of between 1 and 90 % w/w, such as between 5 and 80 % w/w, such as between 10 and 60 % w/w, such as between 15 and 40 % w/w, such as between 15 and 30 % w/w, such as between 18 and 25 % w/w, such as 20 % w/w.

26. A method according to any preceding claim, in which the amount of the first acid (FAC) that is added to the first fraction is between 10 g and 200 g per 1000 kilogram of the first fraction, such as between 20 g and 100 g, such as between 67 g and 60 g, such as 65 g.

27. A method according to any preceding claim, in which the first acid (FAC) transforms any residual saponified free fatty acids in the reduced vegetable fat composition (FAR) into free fatty acids.

28. A method according to any preceding claim, in which residues of citric acid are removed by adding the second base (SB).

29. A method according to any preceding claim, in which the concentration of citric acid in the neutralized first fraction (NFF) is lower than 10 ppm by weight, such as lower than 5 ppm by weight, such as lower than 2 ppm by weight, such as lower than 1 ppm by weight, such as lower than 0.75 ppm by weight, such as lower than 0.5 ppm by weight, such as lower than 0.3 ppm by weight, such as lower than 0.2 ppm by weight, such as lower than 0.1 ppm by weight, such as lower than 0.05 ppm by weight, such as lower than 0.3 ppm by weight, such as lower than 0.2 ppm by weight, such as lower than 0.01 ppm by weight, after adding the second base.

30. A method according to any preceding claim, in which the concentration of acids in the neutralized first fraction (NFF) is lower than 10 mmol/100g of the first fraction, such as lower than 5 mmol/100g of the first fraction, such as lower than 2 mmol/100g of the first fraction, such as lower than 1 mmol/100g of the first fraction, such as lower than 0.75 mmol/100g of the first fraction, such as lower than 0.5 mmol/100g of the first fraction, such as lower than 0.3 mmol/100g of the first fraction, such as lower than 0.2 mmol/100g of the first fraction, such as lower than 0.1 mmol/100g of the first fraction, such as lower than 0.05 mmol/100g of the first fraction, such as lower than 0.3 mmol/100g of the first fraction, such as lower than 0.2 mmol/100g of the first fraction, such as lower than 0.01 mmol/100g of the first fraction, after second neutralization.

31. A method according to any preceding claim, in which neutralized first fraction (NFF) is completely neutralized.

32. A method according to any preceding claim, in which the enzymes with transesterification activity are 1,3 specific enzymes.

33. A method according to any preceding claim, in which an additional step of drying the neutralized vegetable fat (NFV) is performed after the second neutralization step (SNS) and before the enzymatic transesterification step (ETE).

34. A method according to any preceding claim, in which the process comprises an additional step of removing karitene.

35. A system for processing a vegetable fat composition (VFC) according to any preceding claim, the system comprising a common processing line (CPL), a first processing line (FPL), and a first output (FOP), the common processing line (CPL) comprising:

a free fatty acid removal apparatus (FFR); and

a separator unit (FU) for performing the separation of the separation step (FRA);

the first output (FOP) being adapted for the first fraction (FF) to be fed into, and being connected to the separation unit (FU);

the first processing line (FPL) being adapted for the second fraction (SF) to be fed into, and being connected to the separation unit (FU), the first processing line (FPL) comprising:

a second base inlet (SBI) for adding the second base (SB) in the second neutralization step (SNS); and

a reaction system (RS) for performing transesterification in the enzymatic transesterification step (ETE).

36. A system for processing a vegetable fat composition (VFC) according to Claim 35, in which the free fatty acid removal apparatus (FFR) comprises

a first base inlet (FBI) for adding the first base (FB) in the base adding step (BAS);

a soap separator (SS) for separating saponified free fatty acids (SFA) in the soap separation step (SSS); and

a first acid inlet (FAI) for adding the first acid (FAC) in the soap residue removal step (SRR).

37. A system for processing a vegetable fat composition (VFC) according to Claim 35, in which the free fatty acid removal apparatus (FFR) comprises a distillation unit (DIU) for separating free fatty acids in the first neutralization step (FNS).

38. A system for processing a vegetable fat composition (VFC) according to Claim 35, 36 or 37, in which the first output (FOP) forms part of a second processing line (SPL), the second processing line (SPL) comprising a mixing unit for mixing the first fraction (FF) with a palm oil mid fraction to obtain a cocoa butter equivalent.

39. A system for processing a vegetable fat composition (VFC) according to any of Claims 35 to 38, in which the first processing line (FPL) furthermore comprises a mixing unit for mixing the transesterified first fraction (TFF) with a palm oil mid fraction to obtain a cocoa butter equivalent.

40. A method of processing shea fat, in which the process comprises the step of neutralizing the shea fat prior to a transesterification step, and in which the neutralization of the shea fat is performed subsequent to a soap residue removal step.