

FOAMABLE OIL-IN-WATER EMULSIFIED OIL OR FAT COMPOSITION,
AND FOAMABLE OIL-IN-WATER TYPE EMULSIFIED PRODUCT

Technical Field

5 [0001]

The present invention relates to a fat composition including an interesterified fat, where the composition can be suitably used for a whippable (foamable) oil-in-water emulsion. The present invention also relates to a
10 whippable oil-in-water emulsion having excellent physical property, taste and texture.

Background Art

[0002]

15 Generally, milk fat and/or vegetable fat are used for a whippable oil-in-water emulsion. Examples of the vegetable fat include coconut oil, palm kernel oil, palm oil, soybean oil, rapeseed oil etc., and hydrogenated oil thereof, fractionated oil thereof and interesterified oil
20 thereof, and mixed oil thereof.

[0003]

A fresh cream and a whippable oil-in-water emulsion including only milk fat as a fat have superior taste which cannot be replaced, but in the pre-foamed (pre-whipped)
25 state (liquid cream), these have poor emulsion stability

and readily undergo considerable viscosity increases or solidification (commonly referred to as "bote") when the product temperature increases, or due to vibrations during transport. In addition, there are some disadvantages, for example, a range of endpoint for obtaining an optimum whipped cream is narrow (i.e., poor workability for whipping) and a shape retention of the whipped cream is insufficient. There is also economic problem that the product costs will be high since a fresh cream and a milk fat are relatively expensive.

[0004]

Among the vegetable fat, lauric fat such as coconut oil and palm kernel oil make the whippable oil-in-water emulsion having good meltability. However, there are some problems when such vegetable fats are added at high amount. For example, an emulsion stability of the oil-in-water emulsion becomes low, and a stiff appearance (referred to as "shimari") readily occurs over time after whipping, and thereby workability for a nappe and a squeezing from nozzle becomes low.

[0005]

Hydrogenated vegetable oil from soybean oil and rapeseed oil are often used in a whippable oil-in-water emulsion because these oils give enhanced emulsion stability and workability for whipping, less change on

standing of the whipped oil-in-water emulsion, good
workability for a nappe and a squeezing from nozzle, and
tolerance to temperature change. However, there is a
problem that such hydrogenated oil contains trans-acids
5 (trans-unsaturated fatty acids).
[0006]

In recent years, research results have been obtained
that the risk of heart diseases such as arteriosclerosis is
increased when too much trans-unsaturated fatty acid is
10 taken in. Recently, in selling of food, there are move to
introduce the obligation to display the trans-unsaturated
fatty acid content and the selling restrictions of food
product containing certain level of trans-unsaturated fatty
acid also in Asian countries as well as Western countries.

15 Since the amounts of trans-unsaturated fatty acids
ingested in the past have been lower than in Europe and the
US, the perspective in Japan is that there is no particular
health problem at the present time. However, also in Japan,
there are move to introduce the obligation to display the
20 trans-unsaturated fatty acid content. Therefore, fats
still lower in trans-unsaturated fatty acid would be
desirable.

Based on such circumstances, a whippable oil-in-water
emulsion that contains the least possible trans-unsaturated
25 fatty acid would be desirable.

[0007]

Patent document 1 describes a whippable oil-in-water emulsion including milk fat, interesterified fat of palm type fat and lauric fat and starch material, wherein the whippable oil-in-water emulsion has good physical property and taste, and contains less trans fatty acid.

Patent Document 1: JP 2010-22305 A

10 Disclosure of the Invention

Problems to be Solved by the Invention

[0008]

An object of the present invention is to provide a fat composition for a whippable oil-in-water emulsion where the fat composition provides good emulsion stability, superior workability for whipping and whippability (foamability) of the oil-in-water emulsion, and where the obtained whipped cream from the whippable oil-in-water emulsion has external appearance, good shape retention property and resistance to water separation, workability for a nappe and a squeezing from nozzle, and has melting speed in the mouth and milk taste while eating those are similar to fresh cream though derived from vegetable fats. In addition, another object of the present invention is to provide the fat composition containing the least possible trans-unsaturated fatty acids.

In addition, further object of the present invention is to provide a whippable oil-in-water emulsion, where the obtained whipped cream from the whippable oil-in-water emulsion has external appearance, good shape retention property and resistance to water separation, workability for a nappe and a squeezing from nozzle, and has melting speed in the mouth and milk taste while eating those are similar to fresh cream though derived from vegetable fats.

10 Means for Solving the Problems

[0009]

The present inventors have intensively studied and have found that an oil-in-water emulsion which is obtained by using a fat composition including an interesterified fat which is obtained by interesterifying raw materials including palm type fat and lauric fat as major ingredients with lipase while the reaction is controlled so that each components are within a certain range has, surprisingly, melting speed in the mouth and milk taste those are similar to fresh cream when eating as a whipped cream though the fat composition is derived from vegetable fats. In addition, they have found that the obtained oil-in-water emulsion has superior emulsion stability and shape retention property while fresh cream and a whippable oil-in-water emulsion including only milk fat as fat have

defect of such properties. The present invention has been completed based on the above findings.

[0010]

That is, a first aspect of the present invention is a
5 fat composition including an interesterified oil obtained
by interesterifying raw materials including palm type fat
and lauric fat as major ingredients with lipase, wherein
lauric acid content in a constituent fatty acid of the
interesterified oil is 8 to 24 wt%, P20 content of the
10 interesterified oil is 5 to 18 wt%, and PPO content in the
P20 is 30 to 60 wt%.

[0011]

A second aspect of the present invention is the fat
composition of the first aspect, including 50 wt% or more
15 of the interesterified oil.

A third aspect of the present invention is the fat
composition of the first or second aspect, including the
interesterified oil and lauric fat.

[0012]

20 A fourth aspect of the present invention is a
whippable oil-in-water emulsion including the fat
composition of any one of the first to third aspects.

A fifth aspect of the present invention is the
whippable oil-in-water emulsion of the fourth aspect,
25 including 10 to 50 wt% of fat and 40 to 80 wt% of water.

Effects of the Invention

[0013]

The present invention enables to provide a fat
5 composition for a whippable oil-in-water emulsion where the
fat composition provides good emulsion stability, superior
workability for whipping and whippability of the oil-in-
water emulsion, and where the obtained whipped cream from
the whippable oil-in-water emulsion has external appearance,
10 good shape retention property and resistance to water
separation, workability for a nappe and a squeezing from
nozzle, and has melting speed in the mouth and milk taste
while eating those are similar to fresh cream though
derived from vegetable fats.

15 In addition, the present invention enables to provide
the fat composition containing the least possible trans-
unsaturated fatty acids.

Best Mode for Carrying Out the Invention

20 [0014]

A raw material of the interesterified fat includes
palm type fat and lauric fat as major ingredients.

Examples of the palm type fat include palm oil, and a
fractionated oil such as palm stearin and palm olein
25 obtained from fractionation of palm oil, as well as a

hydrogenated oil thereof and the like, and one or two or more fats can be selected therefrom for use, and in particular from the perspective of imparting shape retention property to the whipped cream, the palm type fat is preferably palm oil, palm stearin, or mixed oil of palm oil and palm stearin.

[0015]

Examples of the lauric fat include, for example, coconut oil and palm kernel oil, and a fractionated oil such as palm kernel olein and palm kernel stearin obtained therefrom by fractionation, and a hydrogenated oil thereof and the like, and one or two or more fats can be selected therefrom for use, and in particular, coconuts oil, palm kernel oil and palm kernel olein are preferable from the point of emulsion stability of the whippable oil-in-water emulsion, and further, palm kernel olein is most preferable from the point that the obtained whipped cream can have melting speed in the mouth and milk taste similar to those of fresh cream. In addition, palm kernel olein is preferable also from the point of cost effective.

[0016]

Blending ratio for palm type fat and lauric fat in a raw material of the interesterified fat of the present invention is preferably 8 to 24 wt% of lauric acid content in the constituent fatty acid. Provided that this range is

satisfied, a fat other than these can also be used. For example, vegetable oil such as soybean oil, rapeseed oil, sunflower seed oil, cottonseed oil, peanut oil, rice bran oil, corn oil, safflower oil, olive oil, kapok oil, sesame oil and evening primrose oil, as well as animal fats such as beef tallow and lard, and a medium-chain fatty acid triglyceride can be exemplified, where the above-mentioned fat individually or as mixed oil, or hydrogenated oil, fractionated oil, hydrogenated fractionated oil or fractionated hydrogenated oil thereof, as well as processed fat thereof such as where interesterification or the like has been carried out can be used.

[0017]

A preferred aspect of the raw material of the interesterified fat is a fat including 45 to 85 wt% of palm type fat and 55 to 15 wt% of lauric fat, more preferably a fat including 50 to 80 wt% of palm type fat and 50 to 20 wt% of lauric fat, further preferably a fat including 55 to 70 wt% of palm type fat and 45 to 30 wt% of lauric fat. In addition, a preferred aspect of the raw material of the interesterified fat is total adding amount of palm type fat and lauric fat is 70 wt% or more, more preferably 80 wt% or more, further preferably 90 wt% or more.

[0018]

In the case of using palm oil, palm stearin or mixed

oil of palm oil and palm stearin as palm type fat and using coconut oil, palm kernel oil or palm kernel olein as lauric fat in the raw material of the interesterified oil, when adding amount of the palm type fat is more than 85 wt% and
5 adding amount of the lauric fat is less than 15 wt%, the whippable oil-in-water emulsion obtained by using the fat composition including the interesterified fat has low emulsion stability and is easy to solidified, and hardness of the obtained whipped cream is easy to change and the
10 whipped cream has low workability for a nappe and a squeezing from nozzle and has waxy mouth feel. In contrast, when adding amount of the palm type fat is less than 45 wt% and adding amount of the lauric fat is more than 55 wt%, the obtained whipped cream has low shape retention property.
15 [0019]

In the present invention, interesterification reaction is carried out with lipase as a catalyst. A fat from interesterification with lipase is preferable because it has superior taste as fat, in particular, whipped cream
20 obtained from a whippable oil-in-water emulsion including the fat has melting speed in the mouth and taste similar to fresh cream, compared to a fat from chemical interesterification with inorganic catalyst such as sodium methylate.

25 [0020]

Lipase is used as a lipase powder or an immobilized lipase in which lipase powder is immobilized on carrier such as diatom earth, silica and ion exchange resin.

[0021]

5 Generally, there are two types of lipase, the one catalyzes 1,3-selective interesterification and the other catalyzes random interesterification without positional specificity. In the present invention, the latter lipase is preferably used. Specific examples include lipase
10 derived from *Alcaligenes* sp. (e.g. Lipase QLM, Lipase PL manufactured by Meito Sangyo Co., Ltd.) and immobilized lipase derived from *Thermomyces lanuginosus* (e.g. Lipozyme TLIM manufactured by Novozymes AS). Among them, preferably Lipase QLM, more preferably Lipozyme TLIM is used because
15 the whipped cream of an oil-in-water emulsion prepared by using fat composition including a fat obtained by using such lipase has melting speed in the mouth and milk taste similar to those of fresh cream.

[0022]

20 Lauric acid content in the constituent fatty acid of the interesterified fat of the present invention is necessary to 8 to 24 wt%, preferably 8.5 to 21 wt%, more preferably 11 to 20 wt%. Lauric acid content in the constituent fatty acid of the interesterified fat can be
25 adjusted by adequately choosing a raw material of

interesterification reaction and blending ratio because a composition of the constituent fatty acid generally does not vary between before and after the interesterification reaction.

5 When the lauric acid content in the constituent fatty acid of the interesterified fat is less than 8 wt%, a whippable oil-in-water emulsion including the interesterified fat has low emulsion stability and is easy to solidified, and hardness of the obtained whipped cream
10 is easy to change and the whipped cream has low workability for a nappe and a squeezing from nozzle and has waxy mouth feel.

 When the lauric acid content in the constituent fatty acid of the interesterified oil is more than 24 wt%, a
15 whippable oil-in-water emulsion including the interesterified oil has insufficient shape retention property as a whipped cream and melting speed in the mouth is too fast and it is hard to obtain melting speed in the mouth similar to fresh cream.

20 [0023]

 P20 content in the interesterified fat of the present invention is necessary to 5 to 18 wt%, preferably 6 to 15 wt%, more preferably 7 to 11 wt%.

 PPO content in the P20 of the interesterified fat of
25 the present invention is necessary to 30 to 60 wt%,

preferably 35 to 56 wt%, more preferably 40 to 50 wt%.

When the P2O content in the interesterified fat is less than 5 wt%, a whippable oil-in-water emulsion including the interesterified fat has insufficient shape retention property as a whipped cream and melting speed in the mouth is too fast and it is hard to obtain melting speed in the mouth similar to fresh cream.

When the P2O content in the interesterified fat is more than 18 wt%, a whippable oil-in-water emulsion including the interesterified oil has low emulsion stability and is easy to solidified, and hardness of the obtained whipped cream is easy to change and the whipped cream has low workability for a nappe and a squeezing from nozzle and has waxy mouth feel.

When the PPO content in the P2O is less than 30 wt%, a whippable oil-in-water emulsion including the interesterified oil has low emulsion stability and is easy to plasticized, and hardness of the obtained whipped cream is easy to change and melting speed in the mouth is too fast and it is hard to obtain melting speed in the mouth similar to fresh cream.

When the PPO content in the P2O is more than 60 wt%, whipped cream from a whippable oil-in-water emulsion including the interesterified oil has less milk taste and waxy mouth feel.

[0024]

It is desirable to choose appropriate lipase catalyst and to adjust an amount of the lipase catalyst to be used in the reaction and reaction time because a whipped cream
5 having a taste more similar to fresh cream and excellent milk taste can be obtained by adjusting the lauric acid content, P2O content and PPO content in the interesterified fat of the present invention to the above-mentioned range. In addition, it is desirable to adjust a reaction condition
10 such as temperature and pH.

[0025]

To the obtained interesterified oil, other fat can be added to prepare a whippable oil-in-water emulsion. The other fat is not limited, but preferably lauric fat because
15 melting speed in the mouth as a whipped cream becomes good. The preferred adding amount of the lauric fat is 10 to 50 wt%, more preferably 20 to 40 wt% in the fat composition for the whippable oil-in-water emulsion.

[0026]

20 Examples of the lauric fat include, for example, coconut oil and palm kernel oil, and a fractionated oil such as palm kernel olein and palm kernel stearin obtained therefrom by fractionation, and a hydrogenated oil thereof and the like, and one or two or more fats can be selected
25 therefrom for use.

In addition, it is preferable to use a fat derived from palm kernel oil as the lauric fat because the obtained whipped cream has good workability for a nappe and a squeezing from nozzle, and has milk taste similar to fresh cream.

[0027]

In the present invention, a "whippable oil-in-water emulsion" is a creamy substance having whippability, which is prepared by using basic raw materials such as the above fat composition, protein and water together with an emulsifier to form oil-in-water emulsion. It is also called as "whipping cream". It becomes so-called "whipped cream" or "whip cream" when it is whipped by using beater or specific mixer.

[0028]

A whippable oil-in-water emulsion of the present invention includes 10 to 50 wt% of the fat composition of the present invention and 40 to 80 wt% of water.

[0029]

As for protein, a protein from non-fat milk solid is generally used. Non-fat milk solid is necessary to add emulsion stability as the whippable oil-in-water emulsion as well as milk taste to the oil-in-water emulsion. Examples of the non-fat milk solid include skim milk powder, whole milk powder, fresh cream, milk and condensed milk.

As the other protein, casein, lactalbumin, vegetable protein etc. can be used. In addition, skim milk powder or whole milk powder can be used after subjecting the Maillard reaction treatment. Such a non-fat milk solid is used at a content of 1 to 15 wt%, preferably 3 to 8 wt% with respect to a total of the oil-in-water emulsion.

[0030]

In addition, emulsifier, salts, stabilizer, flavor etc. generally used in a well-known artificial cream can also be used in the whippable oil-in-water emulsion. For example, emulsifier such as soy lecithin, sucrose fatty acid ester, polyglyceryl fatty acid ester and sorbitan fatty acid ester, salt such as alkali metal phosphate and alkali metal citrate and stabilizer such as xanthan gum and guar gum can be used in an appropriate amount.

[0031]

The whippable oil-in-water emulsion of the present invention can be prepared based on a production process of conventional filled cream or imitation cream. If necessary, the emulsion can be pasteurized or sterilized. A homogenization or agitation can be carried out before or after the pasteurization (sterilization). The homogenization can be either a prior homogenization or post homogenization and can also be two-stage homogenization in which both homogenizations are combined.

[0032]

The whippable oil-in-water emulsion obtained by the above described process can be used as a conventional nappe and flower-shaped cream for decoration of cake, and a
5 filling material for bread, confectionery etc.

Examples

[0033]

The present invention will be explained in more detail
10 by reference to Examples, but spirit of the present invention is not limited to the following Examples. All percentages and parts used in the Examples are based on weight.

[0034]

15 (Preparation of interesterified fat)

(Intesterified fat A)

As raw materials, 50 parts of palm oil (iodine value; 52) and 50 parts of palm kernel olein (iodine value; 25) were mixed and water content of the mixture was adjusted to
20 100 ppm by vacuum dehydration. Then, 1 wt% of immobilized lipase, "Lipozymes TL-IM" manufactured by Novozymes AS, was added to the mixture and interesterification reaction was carried out in the sealed container at 70°C of reaction temperature for 35 hours of reaction time while stirring.
25 Then, the immobilized lipase was removed from the reaction

mixture by filtration, and then the mixture was subjected to conventional purification to obtain the interesterified fat A.

[0035]

5 (Intesterified fat B)

As raw materials, 60 parts of palm oil (iodine value; 52) and 40 parts of palm kernel olein (iodine value; 25) were mixed and water content of the mixture was adjusted to 100 ppm by vacuum dehydration. Then, 1 wt% of immobilized lipase, "Lipozymes TL-IM" manufactured by Novozymes AS, was added to the mixture and interesterification reaction was carried out in the sealed container at 70°C of reaction temperature for 20 hours of reaction time while stirring. Then, the immobilized lipase was removed from the reaction mixture by filtration, and then the mixture was subjected to conventional purification to obtain the interesterified fat B.

[0036]

(Intesterified fat C)

20 The interesterified fat C was obtained in the same manner as the interesterified fat B except that reaction time was changed to 35 hours.

(Intesterified fat D)

The interesterified fat D was obtained in the same manner as the interesterified fat B except that reaction

time was changed to 70 hours.

(Interesterified fat E)

The interesterified fat E was obtained in the same manner as the interesterified fat B except that raw materials were changed to 80 parts of palm oil (iodine value; 52) and 20 parts of palm kernel olein (iodine value; 25) and that reaction time was changed to 33 hours.

[0037]

(Interesterified fat F)

As raw materials, 60 parts of palm oil (iodine value; 52) and 40 parts of palm kernel olein (iodine value; 25) were mixed and water content of the mixture was adjusted to 100 ppm by vacuum dehydration. To a column, 45 g of immobilized lipase, "Lipozymes TL-IM" manufactured by Novozymes AS was filled. The above described dehydrated oil was subjected to an interesterification reaction by supplying the mixture to the column at 120 g/hour of flow rate and 70°C of reaction temperature. The obtained interesterified oil was subjected to conventional purification to obtain the interesterified fat F.

[0038]

(Interesterified fat G)

The interesterified fat G was obtained in the same manner as the interesterified fat B except that the immobilized lipase was changed from "lipozymes TL-IM" to

"Lipase QLM" (manufactured by Meito Sangyo Co., Ltd.) and that reaction time was changed to 27 hours.

[0039]

(Interesterified fat H)

5 The interesterified fat H was obtained in the same manner as the interesterified fat B except that raw materials were changed to 60 parts of palm stearin (iodine value; 31) and 40 parts of palm kernel olein (iodine value; 25) and that reaction time was changed to 35 hours.

10 (Interesterified fat I)

 The interesterified fat I was obtained in the same manner as the interesterified fat B except that raw materials were changed to 60 parts of palm oil (iodine value; 52) and 40 parts of palm kernel oil (iodine value; 18) and that reaction time was changed to 35 hours.

15

(Interesterified fat J)

 The interesterified fat J was obtained in the same manner as the interesterified fat B except that raw materials were changed to 60 parts of palm stearin (iodine value; 31) and 40 parts of palm kernel oil (iodine value; 18) and that reaction time was changed to 35 hours.

20

(Interesterified fat K)

 The interesterified fat K was obtained in the same manner as the interesterified fat B except that raw materials were changed to 60 parts of palm oil (iodine

25

value; 52) and 40 parts of coconut oil (iodine value; 8.5) and that reaction time was changed to 35 hours.

[0040]

(Interesterified fat L)

5 The interesterified fat L was obtained in the same manner as the interesterified fat B except that raw materials were changed to 40 parts of palm oil (iodine value; 52) and 60 parts of palm kernel olein (iodine value; 25) and that reaction time was changed to 35 hours.

10 (Interesterified fat M)

 The interesterified fat M was obtained in the same manner as the interesterified fat B except that reaction time was changed to 12 hours.

(Interesterified fat N)

15 The interesterified fat N was obtained in the same manner as the interesterified fat B except that reaction time was changed to 110 hours.

(Interesterified fat O)

20 The interesterified fat O was obtained in the same manner as the interesterified fat B except that raw materials were changed to 90 parts of palm oil (iodine value; 52) and 10 parts of palm kernel olein (iodine value; 25) and that reaction time was changed to 30 hours.

[0041]

25 (Interesterified fat P)

As raw materials, 60 parts of palm oil (iodine value; 52) and 40 parts of palm kernel olein (iodine value; 25) were mixed and 0.3 wt% of sodium methyrate as a catalyst was added to the mixture. Then, random interesterification reaction was carried out at 80°C for 40 minutes under 20 Torr of vacuum condition. The reaction mixture was washed with water and dehydrated, and then subjected to conventional purification to obtain the interesterified fat P.

10 [0042]

The formulation of raw materials and composition analysis of interesterified fats A to P are shown in table 1. P2O content and PPO content were measured by using the following measurement method.

15

Table 1

	Raw materials for interesterification				Fat composition of interesterified fat		
	Palm type fat		Lauric fat				
		Amount (parts)		Amount (parts)	Lauric acid content (%)	P2O content (%)	PPO content (%)
Interesterified fat A	Palm oil	50	Palm kernel olein	50	21.0	5.9	44.6
Interesterified fat B	Palm oil	60	Palm kernel olein	40	16.2	10.1	35.0
Interesterified fat C	Palm oil	60	Palm kernel olein	40	16.5	8.2	44.8
Interesterified fat D	Palm oil	60	Palm kernel olein	40	16.5	8.1	56.0
Interesterified fat E	Palm oil	80	Palm kernel olein	20	8.5	15.0	45.3
Interesterified fat F	Palm oil	60	Palm kernel olein	40	16.9	8.2	47.0
Interesterified fat G	Palm oil	60	Palm kernel olein	40	16.4	8.3	45.0
Interesterified fat H	Palm stearin	60	Palm kernel olein	40	17.1	11.1	44.3
Interesterified fat I	Palm oil	60	Palm kernel oil	40	19.3	10.2	45.1
Interesterified fat J	Palm stearin	60	Palm kernel oil	40	19.0	7.3	44.0
Interesterified fat K	Palm oil	60	Coconut oil	40	18.8	6.9	45.7
Interesterified fat L	Palm oil	40	Palm kernel olein	60	25.6	4.1	48.7
Interesterified fat M	Palm oil	60	Palm kernel olein	40	16.5	11.4	26.3
Interesterified fat N	Palm oil	60	Palm kernel olein	40	16.8	8.1	63.3
Interesterified fat O	Palm oil	90	Palm kernel olein	10	4.4	22.1	42.3
Interesterified fat P	Palm oil	60	Palm kernel olein	40	16.2	8.1	67.2

(Measurement method of P2O content and PPO content in fat)

P2O content in fat can be measured as total content of PPO content and POP content by the following high-performance liquid chromatography analysis (1). Further, PPO content and POP content can be calculated by multiplying the result of the above (1) by a composition ratio of symmetric and asymmetric triglyceride determined by thin-layer chromatography analysis (2).

(1) The high performance liquid chromatography analysis was carried out with (column: ODS, eluent: acetone/acetonitrile = 80/20, elution rate: 0.9 ml/minute, column temperature: 25°C, detector: differential refractometer).

(2) The thin layer chromatography analysis was carried out with (plate: a silver nitrate thin layer plate, development solvent: benzene/hexane/diethyl ether = 75/25/2, detector: a densitometer).

[0043]

(Examples 1-12 and Comparative Examples 1-6)

The fats of Examples 1-11 and Comparative Examples 1-5 were obtained by mixing 25 parts by weight of palm kernel oil and 75 parts by weight of the interesterified fats A-P, respectively.

In addition, fat of Example 12 was prepared by mixing 75 parts by weight of the interesterified fat C and 25

parts by weight of hydrogenated coconut oil.

Further, fat of Comparative Example 6 was obtained by mixing 75 parts by weight of "MELANO FRESH 31" manufactured by Fuji Oil Co., Ltd (hydrogenated oil having 31°C of melting point made from rapeseed oil and palm oil) and 25 parts by weight of palm kernel oil.

A content of trans-unsaturated fatty acid in the constituent fatty acid is 1 wt% or less in the fats of Examples 1-12 and Comparative Examples 1-5, but 24 wt% in the fat of Comparative Example 6.

[0044]

(Examples 13-24 and Comparative Examples 7-12)

The whippable oil-in-water emulsions of Examples 13-24 and Comparative Examples 7-12 were prepared by using the fats of Examples 1-12 and Comparative Examples 1-6 according to the following procedure. A correspondence table between the fat used and the obtained whippable oil-in-water emulsion is shown in table 2.

Table 2: Correspondence table between the fat used and the obtained whippable oil-in-water emulsion

Fat	Content of the fat	Obtained whippable oil-in-water emulsion
Example 1	75 parts of the interesterified oil A and 25 parts of palm kernel oil	Example 13
Example 2	75 parts of the interesterified oil B and 25 parts of palm kernel oil	Example 14

Example 3	75 parts of the interesterified fat C and 25 parts of palm kernel oil	Example 15
Example 4	75 parts of the interesterified fat D and 25 parts of palm kernel oil	Example 16
Example 5	75 parts of the interesterified fat E and 25 parts of palm kernel oil	Example 17
Example 6	75 parts of the interesterified fat F and 25 parts of palm kernel oil	Example 18
Example 7	75 parts of the interesterified fat G and 25 parts of palm kernel oil	Example 19
Example 8	75 parts of the interesterified fat H and 25 parts of palm kernel oil	Example 20
Example 9	75 parts of the interesterified fat I and 25 parts of palm kernel oil	Example 21
Example 10	75 parts of the interesterified fat J and 25 parts of palm kernel oil	Example 22
Example 11	75 parts of the interesterified fat K and 25 parts of palm kernel oil	Example 23
Example 12	75 parts of the interesterified fat C and 25 parts of hydrogenated coconut oil	Example 24
Comparative Example 1	75 parts of the interesterified fat L and 25 parts of palm kernel oil	Comparative Example 7
Comparative Example 2	75 parts of the interesterified fat M and 25 parts of palm kernel oil	Comparative Example 8
Comparative Example 3	75 parts of the interesterified fat N and 25 parts of palm kernel oil	Comparative Example 9
Comparative Example 4	75 parts of the interesterified fat O and 25 parts of palm kernel oil	Comparative Example 10
Comparative Example 5	75 parts of the interesterified fat P and 25 parts of palm kernel oil	Comparative Example 11
Comparative Example 6	75 parts of "MELANO FRESH 31" manufactured by Fuji Oil Co., Ltd and 25 parts of palm kernel oil	Comparative Example 12

[0045]

(Preparation of whippable oil-in-water emulsion)

Oil phase was prepared from 40 parts of fat of Example or Comparative Example, 0.2 part of lecithin and 0.1 part of polyglyceryl fatty acid ester (HLB 8). Water phase was prepared by dissolving 5 parts of skim milk powder, 0.1 part of sucrose fatty acid ester (HLB 5), 0.05 part of hexametaphosphate and 0.1 part of milk flavor to 55 parts of water. The oil phase and the aqueous phase were pre-emulsified by stirring with a homomixer at 65°C for 30

minutes, sterilized at 145°C for 4 seconds in a direct heating mode with an ultrahigh temperature sterilization apparatus (manufactured by IWAI KIKAI KOGYO CO., LTD), homogenized at a homogenization pressure of 5 MPa, and then immediately cooled to 5°C. After cooling, the resulting emulsion was aged for about 24 hours to obtain a whippable oil-in-water emulsion.

[0046]

(Evaluation of whippable oil-in-water emulsion)

The whippable oil-in-water emulsions of Examples 13-24 and Comparative Examples 7-12 were evaluated by the following procedure.

The evaluation results are shown in table 3 and table 4.

Whipping time and overrun in all of Examples 13-24 and Comparative Examples 7-12 were within the range from 1 minute to 1 minute and 40 seconds and within the range from 100 to 110, respectively. In addition, all of Examples 13-24 and Comparative Examples 7-12 showed good results of workability for whipping and whippability.

[0047]

A. Evaluation method for emulsion stability of whippable oil-in-water emulsion

(1) Viscosity (cP): Viscosity of whippable oil-in-water emulsion was measured with B-type viscometer

(manufactured by TOKYO KEIKI INC.) under the condition of rotor No. 2, 60 rpm and 3 to 7°C of measurement temperature.

(2) Solidification test ("Bote" test): Fifty grams of whippable oil-in-water emulsion was put into a 100 ml-
5 volume beaker, and incubated at 20°C for 2 hours. Then, 4 alumina ceramic balls with 7g weight and 15 mm of diameter were put into the beaker, and then the beaker was shaken for 5 minutes using a horizontal shaker. After that, the presence or absence of solidification of the whippable oil-
10 in-water emulsion was checked.

[0048]

B. Method of assessment of a product obtained by whipping a whippable oil-in-water emulsion

(1) Whipping time: Time until a whippable oil-in-water
15 emulsion reaches the optimal whipped state when a mixture of 1 kg of whippable oil-in-water emulsion and 80g of granulated sugar is whipped with a HOBART mixer (MODEL N-5 manufactured by HOBART CORPORATION) at the third gear (300 rpm).

20 (2) Overrun:
$$\frac{[(\text{Weight of whippable oil-in-water emulsion per given volume}) - (\text{weight of whipped cream after whipping per given volume})]}{(\text{weight of whipped cream after whipping per given volume})} \times 100$$

(3) Shape retention property: Fineness of a flower-
25 shaped whipped cream after storage at 15°C for 24 hours is

assessed on three scales of "A", "B" and "C" in order of fineness in which "A" is best.

(4) Water separation: Fineness of a flower-shaped whipped cream after storage at 15°C for 24 hours is assessed. It was represented as "-" in the case where water separation was not observed, as "+" in the case where water separation was observed.

(5) Workability for nappe and squeezing from nozzle: An ease of operation of nappe and squeezing from nozzle was evaluated.

A: Good workability

B: Slightly bad workability, but acceptable

C: Bad workability

(6) Taste and melting speed in the mouth:

Fresh cream manufactured by Meiji Co., Ltd. was whipped according to the method described in the above (1) to prepare whip cream with 105 of overrun and the obtained whip cream was used as control. Milk taste, sweetness, degree of unpleasant aftertaste and melting speed in the mouth of the whipped whippable oil-in-water emulsion were evaluated as compared to the control. The evaluation criteria are as follows:

Milk taste, sweetness:

A: Milk taste and sweetness similar to whipped fresh cream are strongly sensed

B: Milk taste and sweetness similar to whipped fresh cream are sensed

C: Milk taste and sweetness similar to whipped fresh cream are little sensed

5 Unpleasant aftertaste:

A: No unpleasant aftertaste was sensed as well as whipped fresh cream

B: Weak unpleasant aftertaste was sensed

C: Unpleasant aftertaste was sensed

10 Melting speed in the mouth (meltability) was evaluated as compared to the whipped fresh cream.

Table 3

A Evaluation of emulsion stability

	Evaluation of whippable oil-in-water emulsion	
	Viscosity (cP)	Solidification test
Example 13	130	Absent
Example 14	142	Absent
Example 15	155	Absent
Example 16	123	Absent
Example 17	175	Absent
Example 18	139	Absent
Example 19	161	Absent
Example 20	177	Absent
Example 21	153	Absent
Example 22	171	Absent
Example 23	145	Absent

Example 24	115	Absent
Comparative Example 7	122	Absent
Comparative Example 8	162	Present
Comparative Example 9	157	Absent
Comparative Example 10	176	Present
Comparative Example 11	134	Absent
Comparative Example 12	119	Absent

Table 4

B Evaluation when whipping a whippable oil-in-water emulsion

	Evaluation of physical property			Evaluation of taste		
	Shape retention	Water Separation	Workability for nappe and squeezing	Milk taste, sweetness	Unpleasant aftertaste	Meltability (as compared to whipped fresh cream)
Example 13	B	-	A	A	A	Similar to fresh cream
Example 14	A	-	A	A	A	Too fast
Example 15	A	-	A	A	A	Similar to fresh cream
Example 16	A	-	A	A	A	Similar to fresh cream
Example 17	A	-	B	A	A	Similar to fresh cream
Example 18	A	-	A	A	A	Similar to fresh cream
Example 19	A	-	A	B	B	Similar to fresh cream
Example 20	A	-	A	A	A	Similar to fresh cream
Example 21	A	-	A	B	A	Too fast
Example 22	B	-	A	B	A	Too fast
Example 23	B	-	A	B	A	Too fast
Example 24	A	-	B	B	A	Similar to fresh cream
Comparative Example 7	C	-	A	B	A	Too fast
Comparative Example 8	A	-	C	A	A	Too fast
Comparative Example 9	A	-	A	C	A	Waxy
Comparative Example 10	A	-	C	B	A	Waxy
Comparative Example 11	A	-	A	C	C	Waxy
Comparative Example 12	A	-	A	C	C	Similar to fresh cream

Industrial Applicability

[0049]

A fat composition of the present invention for a whippable oil-in-water emulsion can be used as a fat composition for a whippable oil-in-water emulsion having good emulsion stability, superior workability for whipping and whippability, where the obtained whipped cream from the whippable oil-in-water emulsion has external appearance, good shape retention property and resistance to water separation, and has melting speed in the mouth and milk taste while eating those are similar to fresh cream though derived from vegetable fats.

In addition, a whippable oil-in-water emulsion having good emulsion stability, superior workability for whipping and whippability can be produced by using the fat composition of the present invention for a whippable oil-in-water emulsion, where the obtained whipped cream from the whippable oil-in-water emulsion has external appearance, good shape retention property and resistance to water separation, workability for a nappe and a squeezing from nozzle, and has melting speed in the mouth and milk taste while eating those are similar to fresh cream though derived from vegetable fats.

CLAIMS

1. A method for producing an interesterified fat, comprising providing raw materials comprising 45 to 85 wt% of palm type fat, which is palm oil, fractionated palm oil, or mixed oil thereof, and 15 to 55 wt% of lauric fat, which is coconut oil, palm kernel oil, palm kernel olein, or mixed oil thereof, as major ingredients, wherein total adding amount of palm type fat and lauric fat is 70 wt% or more, and

interesterifying the raw materials with lipase, which catalyzes random interesterification without positional specificity, until lauric acid content in a constituent fatty acid of the interesterified fat is 8 to 24 wt%, P2O content of the interesterified fat is 5 to 18 wt%, and PPO content in the P2O is 30 to 60 wt% (PPO: a triglyceride in which fatty acids at 1,2-positions or 2,3-positions are palmitic acid and fatty acid at 3-position or 1-position is oleic acid, POP: a triglyceride in which fatty acids at 1,3-positions are palmitic acid and fatty acid at 2-position is oleic acid, P: palmitic acid, O: oleic acid).

2. A method for producing a whippable oil-in-water emulsion, comprising providing raw materials comprising 45 to 85 wt% of palm type fat, which is palm oil, fractionated palm oil, or mixed oil thereof, and 15 to 55 wt% of lauric fat, which is coconut oil, palm kernel oil, palm kernel olein, or mixed oil thereof, as major ingredients, wherein total adding amount of palm type fat and lauric fat is 70 wt% or more,

interesterifying the raw materials with lipase, which catalyzes random interesterification without positional specificity, until lauric acid content in a constituent fatty acid of the interesterified fat is 8 to 24 wt%, P2O content of the interesterified fat is 5 to 18%, and PPO content in the P2O is 30 to 60 wt% (PPO: a triglyceride in which fatty acids at

1,2-positions or 2,3-positions are palmitic acid and fatty acid at 3-position or 1-position is oleic acid, POP: a triglyceride in which fatty acids at 1,3-positions are palmitic acid and fatty acid at 2-position is oleic acid, P: palmitic acid, O: oleic acid), and

mixing the obtained interesterified oil and other ingredients comprising emulsifier and water,

wherein the whippable oil-in-water emulsion comprises 10 to 50 wt% of fat and 40 to 80 wt% of water.