

FOAMABLE WATER-IN-OIL EMULSION

BACKGROUND OF THE INVENTION

5 1. Field of the Invention

[001] The present invention generally relates to a foamable water-in-oil emulsion.

2. Description of Related Art

[002] As desired, sugars and the like are formulated in various fats such as butter, margarine, and shortening, and stirred and foamed to form a buttercream, which is used
10 in a variety of pastries and cakes. However, because the fat of the buttercream is a continuous phase or water-in-oil emulsion, though the buttercream has excellent preservability, the in-mouth meltability is worse in any case, resulting in a heavier mouth feel, compared with oil-in-water emulsions represented by fresh cream.

[003] Therefore, attempts have been always made to improve the mouth feel by
15 improving the foamability of the oil so as to lower the specific weight of the buttercream.

[004] For example, Japanese Patent Publication No. 2006-273925, Japanese Patent Publication No. 2005-176738, Japanese Patent Publication No. 2004-290185, and Japanese Patent Publication No. 6-153793 all attempt to improve the foamablity using
20 specific emulsifying agent.

[005] On the other hand, the fat used in margarine and the like is generally those hardened by hydrogenation, and the hardened oils contain trans-fatty acids except completely hydrogenated fats, namely extremely hardened fats. With the rising health

awareness of consumers, the trans-fatty acids are being avoided. Therefore, oils that also have plasticity without being hardened, such as palm oil, are widely concerned.

[006] However, compared with the margarines using, for example, hardened oil containing trans-fatty acids, the margarines containing large amounts of palm oil and processed fats from palm oil have lower foamability, and thus the usage of palm oil and processed fats from palm oil is limited in the fat for buttercream that requires foaming.

[007] Japanese Patent Publication No. 8-47373 attempts to solve the problem using specific emulsifying agent, but the effect is not so satisfactory.

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SUMMARY OF THE INVENTION

[008] Accordingly, the present invention is directed to a well foamable water-in-oil emulsion suitable for buttercream, which can be obtained by using a polysorbate, even in case of using large amounts of palm oil and a processed fat from palm oil. The problem of trans-fatty acids can also be solved. The present invention is achieved based on palm oil and processed fats from palm oil that have good plasticity and are readily available.

[009] That is, the objects of the present invention are: 1) a foamable water-in-oil emulsion comprising a fat and a polysorbate, where the fat is formulated with 90 wt% or more of palm oil and/or a processed fat from palm oil, and 0.001 wt%-5 wt% of the polysorbate is contained in the water-in-oil emulsion; 2) the foamable water-in-oil emulsion according to Item [1], including substantially no trans-fatty acids; and 3) a buttercream, obtainable by foaming the foamable water-in-oil emulsion according to Item [1].

[0010] [Effects of the Present Invention]

[0011] The present invention can provide a buttercream containing substantially no trans-fatty acids and having excellent foamability, by using a foamable water-in-oil emulsion comprising a fat and a polysorbate, which is characterized in that the fat is
5 formulated with 90 wt% or more of palm oil and/or a processed fat from palm oil, and 0.001 wt%-5 wt% of the polysorbate is contained in the water-in-oil emulsion.

DESCRIPTION OF THE EMBODIMENTS

[0012] Examples of palm oil and processed fats from palm oil include palm oil,
10 palm oil midfraction, palm olein, super palm olein, palm stearin, and a single or mixed oil of these fat, or a fat obtained by, for example, extremely hardening or fractioning these fat, which contain substantially no trans-fatty acids. Palm oil and the processed fats from palm oil are comprised in the fat in an amount of 90 wt% or more.

[0013] If additional fat is used, then those containing substantially no trans-fatty
15 acids are preferred. Specific examples include vegetable fats such as rapeseed oil, soybean oil, sunflower seed oil, cotton seed oil, peanut oil, rice bran oil, corn oil, safflower oil, olive oil, kapok oil, sesame oil, evening primrose oil, palm oil, shea butter, sal butter, cacao butter, coconut oil, and palm kernel oil, and animal fats such as milk fat, tallow, lard oil, fish oil, and whale oil, as well as a single or mixed oil of these oils,
20 or a processed fat containing substantially no trans-fatty acids, obtained by, for example, extremely hardening or fractioning these oils. However, the natural fats containing a trace amount of trans-fatty acids, such as milk fat, are not excluded.

[0014] Moreover, as known to persons of skill in the art and not detailed herein, as a

buttercream, solid fat content (SFC) at 10°C must be 10 or more, and in view of in-mouth meltability, a SFC of 5 or less at 35°C is preferred.

[0015] In the present invention, the so called "containing substantially no trans-fatty acids" means that the amount of trans-fatty acids contained in a fat is equivalent to or less than that in the natural fat. Therefore, this means that when a natural fat containing a trace amount of trans-fatty acids, such as milk fat, is used, the amount of the trans-fatty acids is not needed to be considered.

[0016] The polysorbate used in the present invention can be a nonionic surfactant obtained by adding about 20 moles of ethylene oxide onto sorbitan fatty acid ester, such as polysorbate 20 (polyoxyethylene(20) sorbitan monolaurate), polysorbate 60 (polyoxyethylene(20) sorbitan monostearate), polysorbate 65 (polyoxyethylene(20) sorbitan tristearate), and polysorbate 80 (polyoxyethylene(20) sorbitan monooleate).

[0017] The content of the polysorbate is 0.001 wt%-5 wt%, preferably 0.01 wt%-2 wt%, and more preferably 0.02 wt%-1 wt%, based on the foamable water-in-oil emulsion. If it is less than 0.001 wt%, then the polysorbate cannot function thoroughly. If it is more than 5 wt%, then the flavor of the foamable water-in-oil emulsion will be severely compromised.

[0018] Specifically, the preparation of the foamable water-in-oil emulsion according to the present invention includes, for example, emulsifying the oil and aqueous phase warmed to 50°C-70°C by stirring with a propeller or homomixer, and then cooling and plasticizing in a kneader generally known in prior art such as scraped surface heat exchanger (e.g. Votator) or scraped plate heat exchanger (e.g. Kombinator).

[0019] In preparation of the foamable water-in-oil emulsion according to the present

invention, in order to prevent the crystal of palm oil from becoming large and stabilize the water-in-oil emulsion, the following commonly used synthetic emulsifying agents are preferably also used: sucrose fatty acid ester, glycerol fatty acid ester, polyglycerol fatty acid ester, sorbitan fatty acid ester, propylene glycol fatty acid ester, and monoglycerides of various organic acids, such as monoglyceride acetate, monoglyceride tartrate, mixed monoglyceride acetate tartrate, monoglyceride citrate, monoglyceride diacetyltartrate, monoglyceride lactate, monoglyceride succinate, and monoglyceride malate, and the like. By using these synthetic emulsifying agents, a water-in-oil emulsion can be easily obtained.

10 [0020] In addition to the components above, common salt, milk powder, sugar, flavor or pigment can be optionally used in the fat composition of the present invention.

[0021] [Embodiments]

[0022] Embodiments of the present invention will be described below, in which "%" and "part" are both based on weight.

15 [0023] Table 1

[0024] Composition of plastic water-in-oil emulsion

	Embodiment 1	Embodiment 2	Embodiment 3	Embodiment 4	Embodiment 5
Palm oil	40 (parts)	40	40	40	40
Super palm olein	42.8	42.8	42.8	42.8	42.8
Extremely hardened palm oil	1.0	1.0	1.0	0	1.0
Extremely hardened high-erucic acid rapeseed oil	0	0	0	1.0	0
Common salt	0.2	0.2	0.2	0.2	0.2
Polysorbate 60	0.5	0	0	0	0
Polysorbate 80	0	0.5	0.001	0.5	0.5

Saturated glycerol monostearate	0.5	0.5	0.5	0.5	0
Propylene glycol fatty acid ester	0.5	0.5	0.5	0.5	0
Water	16	16	16	16	16

[0025] Table 2

[0026] Composition of plastic water-in-oil emulsion

	Comparative Embodiment 1	Comparative Embodiment 2	Comparative Embodiment 3	Comparative Embodiment 4	Comparative Embodiment 5
Hardened fish oil (melting point, 36°C)	40 (parts)	0	0	0	0
Palm oil	0	40	40	40	40
Super palm olein	42.8	42.8	42.8	42.8	42.8
Extremely hardened palm oil	1.0	1.0	1.0	1.0	1.0
Common salt	0.2	0.2	0.2	0.2	0.2
Polysorbate 60	0	0	0	0	0
Polysorbate 80	0	0	0	0	0
Unsaturated glycerol monostearate	0	0	0.5	0	0
Saturated glycerol monostearate	0.5	0.5	0.5	0.5	0.5
Propylene glycol fatty acid ester	0.5	0.5	0.5	0.5	0.5
Saturated polyglycerol fatty acid ester	0	0	0	0	0.5
Water	16	16	16	16	16

5 **[0027]** Table 3

[0028] Results of whipping test

Mixing time	5 min	10 min	12 min	15 min
Embodiment 1	0.48	0.41	0.38	0.35
Embodiment 2	0.41	0.38	0.35	0.33
Embodiment 3	0.55	0.43	0.42	0.39
Embodiment 4	0.40	0.36	0.32	0.31
Embodiment 5	0.53	0.41	0.39	0.37

Comparative Embodiment 1	0.52	0.49	0.46	0.44
Comparative Embodiment 2	0.56	0.49	0.48	0.46
Comparative Embodiment 3	0.55	0.52	0.48	0.44
Comparative Embodiment 4	0.55	0.52	0.48	0.44
Comparative Embodiment 5	0.56	0.49	0.48	0.46

[0029] (Embodiment 1)

[0030] Following the composition shown in Embodiments 1-4 in table 1, a water-in-oil emulsion was obtained by quenching and kneading with a scraped plate heat exchanger after all the raw materials were added and mixed. Moreover, the SFC value of the fat is 22% at 10°C, and 1% at 35°C. The resulting water-in-oil emulsion was whipped to form a buttercream, and the specific weight of the buttercream was measured at the whipping times of 5 min, 10 min, 12 min, and 15 min.

[0031] Moreover, the whipping was performed on 1 kg of water-in-oil emulsion (125 rpm) using Kenwood Mixer at room temperature of 20°C. The whipping results are shown in table 3.

[0032] The specific weight of the buttercream is 0.5 or less at a whipping time of 5 min, and 0.35 or less at a whipping time of 15 min.

[0033] (Embodiment 2)

[0034] Polysorbate 60 in Embodiment 1 was replaced by polysorbate 80, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test.

[0035] Similar to Embodiment 1, the specific weight of the buttercream is 0.5 or less at a whipping time of 5 min, and 0.35 or less at a whipping time of 15 min.

[0036] (Embodiment 3)

[0037] The added amount of polysorbate 80 in Embodiment 2 was changed from 0.5% to 0.001%, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test.

[0038] In contrast to Embodiment 1, the specific weight of the buttercream is a slightly higher value of 0.55 at a whipping time of 5 min, and reaches to 0.39 at a whipping time of 15 min.

[0039] (Embodiment 4)

[0040] Extremely hardened palm oil in Embodiment 2 was replaced by extremely hardened high-erucic acid rapeseed oil, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test.

[0041] Similar to Embodiment 1, the specific weight of the buttercream is 0.5 or less at a whipping time of 5 min, and 0.35 or less at a whipping time of 15 min.

[0042] (Embodiment 5)

[0043] The emulsifying agents in Embodiment 2 were changed as polysorbate 80 alone, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test. In contrast to Embodiment 2, the emulsion stability and crystallization of palm oil with time in Embodiment 5 are worse (the crystal becomes large), but the whipping performance is similar to that in Embodiment 1, in which the specific weight of the buttercream is 0.53 at a whipping time of 5 min, and reaches to 0.37 at a whipping time of 15 min.

[0044] (Comparative Embodiment 1)

[0045] In the fat composition of Embodiment 1, hardened fish oil (melting point, 36°C) was used, and no polysorbate was used, and a water-in-oil emulsion was obtained

under the same conditions as those in Embodiment 1, which was then used for whipping test. The specific weight of the buttercream does not reach to 0.5 or less at a whipping time of 5 min, and is still 0.4 or more at a whipping time of 15 min. Furthermore, the content of the trans-fatty acids in the water-in-oil emulsion is 20 wt%.

5 [0046] (Comparative Embodiment 2)

[0047] In the fat composition of Embodiment 1, no polysorbate was used, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test.

[0048] The specific weight of the buttercream does not reach to 0.5 or less at a
10 whipping time of 5 min, and is still 0.4 or more at a whipping time of 15 min.

[0049] (Comparative Embodiment 3)

[0050] In the fat composition of Embodiment 1, no polysorbate was used, and an unsaturated glycerol monostearate was added instead, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for
15 whipping test.

[0051] The specific weight of the buttercream does not reach to 0.5 or less at a whipping time of 5 min, and is still 0.4 or more at a whipping time of 15 min.

[0052] (Comparative Embodiment 4)

[0053] In the fat composition of Embodiment 1, no polysorbate was used, and a
20 saturated glycerol monostearate was added alone instead, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test.

[0054] The specific weight of the buttercream does not reach to 0.5 or less at a

whipping time of 5 min, and is still 0.4 or more at a whipping time of 15 min.

[0055] (Comparative Embodiment 5)

[0056] In the fat composition of Embodiment 1, no polysorbate was used, and a polyglycerol fatty acid ester comprising saturated fatty acid as the constituted fatty acid
5 was used instead, and a water-in-oil emulsion was obtained under the same conditions as those in Embodiment 1, which was then used for whipping test.

[0057] The specific weight of the buttercream does not reach to 0.5 or less at a whipping time of 5 min, and is still 0.4 or more at a whipping time of 15 min.

[0058] It will be apparent to those skilled in the art that various modifications and
10 variations can be made to the structure of the present invention without departing from the scope or spirit of the invention. In view of the foregoing, it is intended that the present invention cover modifications and variations of this invention provided they fall within the scope of the following claims and their equivalents.

WHAT IS CLAIMED IS:

1. A foamable water-in-oil emulsion comprising a fat and a polysorbate,
wherein the fat is formulated with 90 wt% or more of palm oil and/or a processed fat
from palm oil, and 0.001 wt%-5 wt% of the polysorbate is contained in the water-in-oil
5 emulsion.
2. The foamable water-in-oil emulsion according to claim 1, comprising
substantially no trans-fatty acids.
3. A buttercream, obtainable by foaming the foamable water-in-oil emulsion
according to claim 1.