FROZEN CONFECTIONERY, AND OIL AND FAT FOR PRODUCING CONFECTIONERY

Technical Field

[0001]

The present invention relates to a fat for producing frozen confectionery and confectionery. More specifically, the present invention relates to a fat for producing frozen confectionery and confectionery, which provide an improved oxidation stability desired for a frozen confectionery and a confectionery.

Background Art

[0002]

Raw materials for ice cream product, such as ice cream, ice milk (ice cream meeting 10% or more of milk solids and 8.0% or more of milk fat), and lacto ice (ice cream meeting 3% or more of milk solids), include milk, dairy product, vegetable fat, sweetener, stabilizer, and flavor. As a dairy product, fresh cream, butter, or milk fat is mainly used as a milk fat source. Fresh cream must be used immediately, preferably fresh one is used at each time, because fresh cream has poor storage stability. Thus, butter or milk fat is used if it is difficult to obtain fresh cream every time. As a raw material of the ice cream

product, vegetable fat is also used as a source of fat instead of fresh cream, butter, or milk fat. In addition, skim milk powder and whole milk powder are often used as a source of non-fat milk solids because of their long shelf life.

[0003]

In the production of frozen confectionery, such as ice cream, mixture liquid of raw materials, which is called as "mix", is prepared by mixing and dissolving raw materials, then subjecting the mixture to treatments such as homogenizing and pasteurizing, and then cooling. The mixture liquid is generally used after the storage step, which is called as "aging". A frozen confectionery as a final product is obtained by freezing the mixture liquid, filling and packing the frozen mixture, then freezing the mixture in the hardening step. (Hereinafter, the mixture liquid is referred to as "frozen confectionery mix".)

[0004]

Some attempts using vegetable fat to a frozen confectionery are made because it enables to use various functions and characteristics different from those of milk fat. For example, there are methods for improving a texture of frozen confectionery utilizing melting property of the vegetable fat. Patent Document 1 discloses a method including using cocoa butter. Patent Document 2 discloses

a method including using the mixed fat of 60 to 80% of coconut oil and 40 to 20% of palm oil. Patent document 3 discloses a method including adding 95 to 40% of fat including 40% or more of symmetric triglyceride (SUS), and 5 to 60% of lauric fat. In addition, Patent Document 4 discloses that good meltability and rich taste can be added to a frozen confectionery having low milk fat content by using SSS triglyceride and SUS triglycerides derived from non-lauric fat, and lauric fat.

[0005]

Patent Document 5 discloses a method of preventing oxidization of food including frozen confectionery and food material, including using a combination of antioxidant derived from natural product, and lactoperoxidase. However, it does not disclose a method of improving an oxidation stability of milk fat.

[0006]

An antioxidant is generally added for improving the oxidation stability of vegetable fat. An oil-soluble antioxidant which is readily dispersed into fat is used, but it has a relatively low antioxidant activity in comparison with a water-soluble antioxidant. Thus, some methods for improving the oxidation stability of fat or food containing a large amount of fat, including dispersing the water-soluble antioxidant into the fat are disclosed.

[0007]

Patent Document 6 discloses a lipophilic antioxidant, which is water in oil emulsion, prepared by emulsifying 100 parts by weight of aqueous solution including one or two or more water-soluble antioxidative active substances, if necessary in combination with synergist, and 1 to 500 parts by weight of one or two or more lipophilic emulsifiers.

[0008]

Patent Document 7 discloses an oil-solubilized water-soluble compound formulation obtained by dissolving water-soluble compound except for catechin and emulsifier having 6 to 14 of HLB into water or alcohol, adding polyglycerol condensed ricinoleic acid ester to the obtained solution to prepare water in polyglycerol condensed ricinoleic acid ester emulsion liquid, adding 0.5 to 30 parts by weight of enzymatically degraded lecithin to the emulsion liquid, and then sufficiently mixing the liquid.

[0009]

Patent Document 8 discloses an antioxidative composition having a good oil-solubility obtained by dissolving antioxidative substances having low oil solubility, such as ascorbic acid, erythorbic acid, kojic acid, gallic acid, and malic acid, into lower alkyl alcohol, such as ethanol, then into organic acid monoglyceride, and then dissolving the mixed solution into polyglycerol

condensed ricinoleic acid ester.

[0010]

Chocolate, which is a typical example of food using fat for confectionery, is made from major raw materials including cacao component such as cacao mass, cocoa powder, and cocoa butter; milk powder such as whole milk powder, skim milk powder, and whey powder; sugar such as fine sugar, lactose, maltose, and fructose. It is classified into dark chocolate, milk chocolate, and white chocolate. Especially, when white chocolate is exposed to light, its commercial values are remarkably decreased by change in components that causes unpleasant flavor and small due to light energy. This problem is quite difficult to solve even by a skilled person in the art, and milk components in white chocolate have been suspected of being the cause of this deterioration.

[0011]

For preventing the deterioration by light of the fat for confectionery, various agents for preventing flavor deterioration have been added to food as substances having a suppressing effect on deterioration by light. For example, Patent Document 9 discloses a combination use of myricetin and quercetin in a specific blending ratio. Patent Document 10 discloses a use of propolis. Patent Document 11 discloses a use of at least one component

selected from chlorogenic acid, caffeic acid or ferulic acid. However, the amount to be added of these additives are restricted because excess use thereof brings out their own flavors, and a sufficient effect using the additives cannot be achieved in white chocolate whose non-fat components are substantially free from cacao components.

[0012]

The applicant discloses in Patent Document 12 that chocolate, whose non-fat components are substantially free from cacao components, containing refined fats having a Y-value of 20 or less as measured using a Lovibond colorimeter after refining treatment as a hard butter, is a white chocolate which is capable of preventing quality deterioration such as unpleasant taste and flavor even when the chocolate is placed under light exposure conditions such as exposure to illumination of fluorescent light, and having resistance to deterioration by light.

[0013]

Patent Document 13 discloses a method of producing catechin-dispersed fat, including adding hexane-soluble fraction of green tea and catechin to fat, heating the mixture to 70 to 130°C, and then grinding.

Prior Art Documents

Patent Documents

[0014]

Patent Document 1: JP H04-316453 A

Patent Document 2: JP S57-36943 A

Patent Document 3: JP H08-298934 A

Patent Document 4: JP 2007-166965 A

Patent Document 5: JP 2000-50852 A

Patent Document 6: JP S63-135483 A

Patent Document 7: JP H06-254378 A

Patent Document 8: JP 2001-131572 A

Patent Document 9: JP 2003-33164 A

Patent Document 10: JP H11-341971 A

Patent Document 11: JP H10-183164 A

Patent Document 12: JP 2006-197830 A

Patent Document 13: JP 2010-41965 A

Summary of the Invention

Problems to be Solved by the Invention

[0015]

As described above, the use of vegetable fat to a conventional frozen confectionery (Patent Documents 1 to 4), is often an invention utilizing the characteristics in physical properties of the fat.

[0016]

As described in Patent Document 5, an improved oxidation stability is desired in the frozen confectionery

similar to fat-containing foods which are circulated at room temperature. The present inventors have started to study with an idea that a quality of frozen confectionery can be improved if an oxidation stability of fat for frozen confectionery and confectionery is improved.

[0017]

In recent years, many stores, such as pastry shop located in the basement of department store, convenience store, and supermarket, often sell various food products while irradiating strong light long by a fluorescent light in the showcase. The food in general utilizing the fat for frozen confectionery and confectionery is required to have a resistance to such a situation. This makes apparent a problem of deterioration by light that components in the displayed food are changed by energy from the irradiated light and unpleasant flavor and smell are generated. Measures to prevent the deterioration by light are important objects in the quality preservation because the deterioration by light causes a decline in the value of food and deterioration of food taste.

[0018]

Patent Document 12 disclosed by the applicant as a method for improving a resistance to deterioration by light of chocolate product with fat for frozen confectionery and confectionery, discloses that non-fat components in

chocolate are substantially free from cacao components. Thus, it has a problem that a range of the application is limited to white chocolate products. The inventors have thought that the range of the application can be expanded to various foods containing various fats for confectionery if a fat for confectionery having resistance to the deterioration by light and whose fat component is not limited. The inventors have further studied on the basis of the thought.

[0019]

It is required that a fat for frozen confectionery and confectionery do not cause a loss of original good taste of food as well as it provides an improvement of oxidation stability and resistance to deterioration by light in the food containing the fat for frozen confectionery and confectionery. Thus, it is important not only to improve oxidation stability but also to obtain good taste. Although a method of improving oxidation stability of fat has also been disclosed, Patent Documents 6 to 8 require an addition of relatively large amounts of emulsifier in order to solubilize the water-soluble antioxidant, as mentioned above. The inventors have repeated study under presumption that undesirable taste is caused by the emulsifier.

[0020]

An object of the present invention is to provide a fat

for frozen confectionery and confectionery having excellent oxidation stability by dispersing water-soluble antioxidant into the fat for frozen confectionery and confectionery with simple method.

Means for Solving the Problems

[0021]

The present inventors have intensively studied in order to solve the above-mentioned problems. As a result, they have found that a fat for frozen confectionery and confectionery containing less amount of emulsifier, and having excellent oxidation stability and good taste are obtained by adding water-soluble tea polyphenols, which are originally hard to dissolve into fat, into fat in a state of a solution of aqueous medium. The present invention has been completed on the basis of these findings.

That is, the present invention is:

(1) a fat for frozen confectionery and confectionery including tea polyphenol at a content of 15 ppm by weight to 500 ppm by weight, where a content of emulsifier in the fat is twice or less as much as a content of the tea polyphenol;

(2) the fat for frozen confectionery and confectionery according to (1), where a content of the tea polyphenol is 30 ppm by weight to 500 ppm by weight, and where value of

A/N is 2.0 or more, where

A represents CDM stability time of the fat for frozen confectionery and confectionery including 30 ppm by weight to 500 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, where the base fat does not include tea polyphenol;

(3) The fat for frozen confectionery and confectionery according to (1) or (2), where a content of the tea polyphenol is 100 ppm by weight to 500 ppm by weight, a content of the emulsifier is 50 ppm by weight to 1000 ppm by weight, a content of the emulsifier is 2 times or less as much as a content of the tea polyphenol, and where value of A/N is 2.0 or more, where

A represents CDM stability time of the fat for frozen confectionery or confectionery including 100 ppm by weight to 500 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, where the base fat does not include tea polyphenol;

(4) A frozen confectionery including the fat for frozen confectionery and confectionery according to any of (1) to (3), where a content of the tea polyphenol derived from the fat for frozen confectionery and confectionery is 3 ppm by weight to 50 ppm by weight;

(5) The frozen confectionery according to (4), including 1 to 20 ppm by weight of the fat for frozen

confectionery and confectionery according to any of (1) to (3) with respect to 100 parts by weight of the frozen confectionery;

(6) The frozen confectionery according to (4) or (5), where a content of the fat for frozen confectionery and confectionery according to any of (1) to (3) in the frozen confectionery is 30 ppm by weight or more with respect to 100 parts by weight of the fat in the frozen confectionery;

(7) A food including the fat for frozen confectionery and confectionery according to any of (1) to (3), where a content of the tea polyphenol in the food is 30 ppm by weight to 500 ppm by weight with respect to whole fat in the food;

(8) A chocolate product including the fat for frozen confectionery and confectionery according to any of (1) to (3), where a content of the tea polyphenol in the chocolate product is 30 ppm by weight to 350 ppm by weight with respect to whole fat in the chocolate product, and where fat content of the chocolate product is 20% by weight to 70% by weight;

(9) The food according to (7), where the food including the fat for frozen confectionery and confectionery according to any of (1) to (3) is selected from the group consisting of chocolate product, cream, margarine and shortening;

(10) The fat for frozen confectionery according to any of (1) to (3), including one or more fats, as a major raw material, selected from the group consisting of milk fat, coconut oil, palm oil and palm kernel oil, where a content of the tea polyphenol is 150 ppm by weight to 400 ppm by weight, a content of the emulsifier is 100 ppm by weight to 500 ppm by weight or less, a content of the emulsifier is 1.5 times or less as much as a content of the tea polyphenol, and where value of A/N is 5.0 or more, where

A represents CDM stability time of the fat for frozen confectionery including 150 ppm by weight to 400 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, where the base fat does not include tea polyphenol;

(11) The fat for confectionery according to any of (1) to (3), where a content of the tea polyphenol is 300 ppm by weight to 500 ppm by weight, a content of the emulsifier is 100 ppm by weight to 750 ppm by weight or less, a content of the emulsifier is 1.5 times or less as much as a content of the tea polyphenol, and where value of A/N is 3.0 or more, where

A represents CDM stability time of the fat for confectionery including 300 ppm by weight to 500 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A,

where the base fat does not include tea polyphenol;

(12) A process for improving a resistance to deterioration by light of frozen confectionery, including using the fat for frozen confectionery and confectionery according to any of (1) to (3);

(13) A process for improving a resistance to deterioration by light of food, including using the fat for frozen confectionery and confectionery according to any of (1) to (3);

(14) A process for preventing a color deterioration of food caused by irradiation, including using the fat for frozen confectionery and confectionery according to any of (1) to (3);

(15) A process for producing the fat for frozen confectionery and confectionery according to any of (1) to (3), including adding tea polyphenol to aqueous medium to form solution, and adding the solution to fat; and

(16) A process according to (15), including adding the tea polyphenol to aqueous medium to form solution, and adding the solution to fat and then removing water under reducing pressure.

Effects of the Invention

[0022]

A fat for frozen confectionery and confectionery

having excellent oxidation stability and good taste may be obtained by simple method without using large amount of emulsifier. The fat for frozen confectionery and confectionery of the present invention enables to provide a food having excellent oxidation stability and good taste. The fat for frozen confectionery and confectionery of the present invention is more effective for a fat-containing product which is exposed to light for a prolonged time (e.g. a product placed on the shelf on around-the-clock convenience store), and prevents a generation of unpleasant taste and flavor after the irradiation in the food containing the fat for frozen confectionery and confectionery of the present invention. In addition, color deterioration of food is also prevented when the food contains raw material such as Matcha green tea.

Mode for Carrying Out the Invention

[0023]

Examples of available fats for the fat for frozen confectionery and confectionery of the present invention include vegetable fat such as soybean oil, rapeseed oil, corn oil, cottonseed oil, peanut oil, sunflower oil, rice oil, benibana oil, safflower oil, olive oil, sesame oil, cacao butter, palm oil, coconut oil and palm kernel oil; animal fat such as beef tallow, lard, and milk fat.

Processed fat thereof such as fractionated fat, hydrogenated fat and interesterified fat, and mixed fat thereof may also be used.

[0024]

If the fat for frozen confectionery and confectionery of the present invention is used as a fat for frozen confectionery, desired available fats include rape seed oil, corn oil, cottonseed oil, sunflower oil, palm oil, coconut oil, palm kernel oil, and milk fat. More preferably, palm oil, coconut oil, palm kernel oil, or milk fat may be used for providing light, but rich taste suitable for frozen confectionery. Processed fat thereof such as fractionated fat, hydrogenated fat and interesterified fat, and mixed fat thereof may also be used.

[0025]

If the fat for frozen confectionery and confectionery of the present invention is used as a fat for confectionery, it may be used for a confectionery in which edible fat is generally added, such as chocolate product, cream, margarine, and shortening. Preferably, it may be used for a food such as chocolate product, cream, margarine, and shortening.

[0026]

As used herein, a chocolate product refers to a food in which fat forms a continuous phase, and includes, but

not limited to a chocolate dough and a quasi-chocolate dough according to Fair Competition Convention on the Show Kind of Chocolate, and also includes processed fat food obtained by using raw materials, such as cacao mass, cocoa, cacao butter, cacao butter substitute, and hard butter.

[0027]

If the fat for frozen confectionery and confectionery is used for a chocolate product, well-known hard butter made from the above-mentioned fat, as well as cacao butter may be used. In addition, it may be a component fat (e.g. palm mid fraction rich in POP, shea butter fraction rich in StOSt, StLSt fat, where P: palmitic acid, O: oleic acid, St: stearic acid, L: linoleic acid) or liquid fat for adjusting melting point and hardness of hard butter. Major hard butter is a fat rich in 1,3-saturated 2-unsaturated triglyceride-type fat, called as CBE; or a fat which is lauric type or high elaidic acid type hard butter. These fats may be used in combination.

[0028]

The chocolate product containing the fat for frozen confectionery and confectionery may be used for coating. Examples of coated food of which surface is coated, include pastry such as cake, chou and eclair; baked confectionery; Japanese confectionery; bakery product such as bread and donut; frozen confectionery; and ice cream.

[0029]

Generally, a non-tempering chocolate product is often desired for a chocolate product used for a coating application because of the ease of use. In addition, it is required to solidify in a short time at room temperature in order to rapidly transfer to packaging process and transportation after coating. Further, it is desired to have a proper gloss and vivid color tones to visually enhance the buying and eating motivation after solidified. Moreover, it is preferable that the food has good meltability and taste, and that the coating is hard to peel off when it is eaten.

[0030]

Tea polyphenol is used as a water-soluble antioxidant in the present invention. The tea polyphenol is used without damaging the function thereof even in combination with an oil-soluble antioxidant such as tocopherol, water-soluble polyphenol such as rosemary extract, and bayberry extract, and water-soluble antioxidant such as ascorbic acid. Examples of the tea polyphenol include water-soluble polyphenols obtained by extracting tea leaves with an aqueous medium such as hot water and alcohol. Example of preferable method of extracting tea polyphenol is extraction with aqueous solution. Tea polyphenol having less bitter taste and less astringency is obtained by

extraction with aqueous solution without using organic solvent. The tea polyphenol contains catechins as major ingredients. It is known that eight kinds of catechins typically present. Examples of gallate catechin include epigallocatechin gallate, epicatechin gallate, catechin gallate and gallocatechin gallated. Examples of a free catechin include epigallocatechin, epicatechin, catechin and gallocatechin. The tea polyphenol also includes oxidized polyphenols generated by oxidization of tea leaves, other than catechins. In the present invention, use of tea polyphenol containing one or more of such polyphenols and catechins are preferable. More preferably, use of commercially available tea polyphenol composition of which polyphenol content is adjusted to a specific range is preferable. Most preferably, water-soluble composition without formulating with emulsifier is preferable. Preferred tea polyphenol composition include, product name: Sunphenon manufactured by Taiyo Kagaku Co., Ltd. and product name: Sunfood manufactured by Mitsubishi-Kagaku Foods Corporation. A content of tea polyphenol in the tea polyphenol composition is as good as high because it is possible to efficiently disperse into fat at high concentration. It is preferable to contain 50% or more of tea polyphenol in the tea polyphenol composition.

[0031]

The fat for frozen confectionery and confectionery contains 15 ppm by weight to 500 ppm by weight of tea polyphenol, preferably 30 ppm by weight to 500 ppm by weight, for example, 30 ppm by weight to 300 ppm by weight. The fat for frozen confectionery and confectionery containing less than 15 ppm by weight may provide insufficient improvement of oxidation stability. More than 500 ppm by weight is not preferable because it is inefficient as compared with the obtained effect. A content of emulsifier is twice or less, preferably 1.5 times or less, more preferably 1.2 times or less, further preferably equal or less as much as a content of the tea polyphenol. When the content of the emulsifier is more than twice as much as the content of the tea polyphenol, undesirable taste derived from the emulsifier is felt, the original good taste of food cannot be obtained.

[0032]

CDM (Conductmetric Determination Method) stability is a value showing an oxidation stability of fat. As used herein, a value obtained from CDM stability test is an index of evaluation of oxidation stability as "CDM stability time". Longer CDM stability time shows more excellent oxidation stability. As used herein, a method for testing CDM stability is based on the method of the JOCS Standard Methods for the Analysis of Fats and Oils

2.5.1.2-1996. More specifically, fat is put into a reaction vessel and clean air is fed into the vessel while heating at 120°C. Then, volatile decomposition product generated by oxidation is collected in water and conductivity of the water is measured continuously. Time to inflection point in which the value of conductivity changes rapidly shows the "CDM stability time".

[0033]

Preferably, a fat for frozen confectionery and confectionery of the present invention contains 30 ppm by weight to 500 ppm by weight of tea polyphenol, and has 2.0 or more of value of A/N, where the value of A/N is obtained as follows:

A: CDM stability time of fat for frozen confectionery and confectionery containing 30 ppm by weight to 500 ppm by weight of tea polyphenol.

B: CDM stability time of base fat of A, where the base fat does not contain tea polyphenol.

[0034]

More preferably, fat for frozen confectionery and confectionery of the present invention contains 100 ppm by weight to 500 ppm by weight of tea polyphenol and 50 ppm by weight to 1000 ppm by weight of emulsifier, and has 2.0 or more of value of A/N, where a content of the emulsifier is twice or less as much as a content of the tea polyphenol,

and where the value of A/N is obtained as follows:

A: CDM stability time of fat for frozen confectionery and confectionery containing 100 ppm by weight to 500 ppm by weight of tea polyphenol.

B: CDM stability time of base fat of A, where the base fat does not contain tea polyphenol.

[0035]

If the fat for frozen confectionery and confectionery of the present invention is used as a fat for frozen confectionery, it preferably contains one or more fats selected from the group consisting of milk fat, coconut oil, palm oil and palm kernel oil, 150 ppm by weight to 400 ppm by weight of tea polyphenol and 100 ppm by weight to 500 ppm by weight of emulsifier, and has 5.0 or more of value of A/N, where a content of the emulsifier is 1.5 times or less as much as a content of the tea polyphenol, and where the value of A/N is obtained as follows:

A: CDM stability time of fat for frozen confectionery and confectionery containing 150 ppm by weight to 400 ppm by weight of tea polyphenol.

B: CDM stability time of base fat of A, where the base fat does not contain tea polyphenol.

[0036]

The fat for frozen confectionery of the present invention preferably contains one or more fats selected

from the group consisting of milk fat, coconut oil, palm oil and palm kernel oil as a major raw material, and also may contain other fats. A content of the other fats is preferably 70% by weight or less, more preferably 50% by weight or less, further preferably 30% by weight or less. Most preferably, one or more fats selected from the group consisting of milk fat, coconut oil, palm oil and palm kernel oil only are used as fat. It is preferable in the viewpoint of obtaining taste and oxidation stability suitable for frozen confectionery.

[0037]

If the fat for frozen confectionery and confectionery of the present invention is used as a fat for confectionery, it preferably contains 300 ppm by weight to 500 ppm by weight of tea polyphenol and 100 ppm by weight to 750 ppm by weight of emulsifier, and has 3.0 or more of value of A/N, where a content of the emulsifier is 1.5 times or less as much as a content of the tea polyphenol, and where the value of A/N is obtained as follows:

A: CDM stability time of fat for frozen confectionery and confectionery containing 300 ppm by weight to 500 ppm by weight of tea polyphenol.

B: CDM stability time of base fat of A, where the base fat does not contain tea polyphenol.

[0038]

If the fat for frozen confectionery and confectionery is used for chocolate, a content of the fat for confectionery is preferably 20 to 70% by weight, more preferably 25 to 70% by weight, further preferably 30 to 70% by weight with respect to whole of the chocolate. The fat for confectionery may be used alone or in combination with the above mentioned fats. Preferably, a content of the fat for confectionery is 5% by weight or more, for example 5% by weight to 100% by weight, more preferably 10% by weight or more, for example 10 to 100% by weight, more preferably 20% by weight or more, for example 20 to 100% by weight with respect to whole of the fat in the chocolate.

[0039]

An emulsifier which is used for the fat for frozen confectionery and confectionery of the present invention is not particularly limited as long as the emulsifier has W/O emulsification property. The emulsifier such as polyglycerol fatty acid ester, sucrose fatty acid ester and sorbitan fatty acid ester may be used. Preferably, polyglycerol condensed ricinoleic acid ester may be used as the emulsifier. For example, examples of the emulsifier include POEM PR-100 and POEM PR-300 manufactured by RIKEN VITAMIN CO., LTD., SY-Glyster CRS-75 and SY-Glyster CR-ED manufactured by Sakamoto Yakuhin Kogyo Co., Ltd., and Sunsoft 818H manufactured by Taiyo Kagaku Co., Ltd.

[0040]

A process for obtaining the fat for frozen confectionery and confectionery of the present invention is not particularly limited as long as a water-soluble tea polyphenol can be dispersed into fat. For example, in the case of obtaining edible fat containing tea polyphenol, edible fat containing tea polyphenol and 0.1% by weight or less of water may be obtained by preparing aqueous solution dissolving 1% by weight of tea polyphenol composition and adding certain amount of the solution to fat and then subjecting to treatment at 50 to 180°C under reduced pressure condition at 0.5 to 100 torr for 15 minutes to 1 hour while stirring to dehydrate sufficiently. A concentration of tea polyphenol dissolved in the solution is preferably 0.1 to 60% by weight, more preferably 1 to 50% by weight. When the concentration is less than 1% by weight, it is not preferable because water content with respect to fat increases and thereby long time is required for dehydration. When the concentration is more than 50% by weight, it is not preferable because tea polyphenol in the tea polyphenol composition precipitates and thereby the content of tea polyphenol in fat reduces. The temperature is preferably 50 to 180°C. The temperature of less than 50°C is not preferable because long time is required for dehydration. The reduced pressure condition is preferably

0.5 to 100 torr, and pressure as low as possible is preferable.

[0041]

A frozen confectionery of the present invention may be obtained by adjusting a content of the above fat for frozen confectionery and confectionery to 1 to 20 parts by weight with respect to 100 parts by weight of the frozen confectionery, and adding other raw materials such as milk, dairy product, sweetener, stabilizer, and flavor in a well-known method of preparing an oil in water emulsion. Examples of the frozen confectionery include ice cream product such as ice cream, ice milk, and lacto ice.

[0042]

In many cases, milk fat is used in a frozen confectionery for adding milk taste and rich taste. In the present invention, a frozen confectionery having excellent oxidation stability and resistance to deterioration by light, and good taste by substituting a part or all of milk fat with the fat for frozen confectionery of the present invention. A content of the fat for frozen confectionery and confectionery of the present invention is preferably 30% by weight or more, more preferably 50% by weight or more, further preferably 60% by weight or more with respect to whole fat in the oil in water emulsion.

[0043]

A typical example of a frozen confectionery of the present invention is ice cream product. For example, components of ice cream product include milk fat, non-fat milk solids, sweetener, stabilizer, emulsifier, flavor, color and water, in the case of ice cream product.

[0044]

Non-fat milk solids have the effect of imparting a milk taste to ice cream product as well as improving constitution and overrun of ice cream product. Examples of the milk solids include skim milk, skim milk powder, and whole milk powder.

[0045]

A sweetener has the effect of increasing a viscosity of frozen confectionery mix to improve constitution of ice cream product as well as adding sweetness to ice cream product. Although sucrose is most commonly used as a sweetener, other sugar such as invert sugar, mixed sugar syrup, and starch may be used. A content of the sweetener is generally about 13 to 17% by weight with respect to the total amount of ice cream product.

[0046]

A stabilizer has the effect of smoothing the constitution, providing appropriate viscosity to the ice cream product, and is involved in an adjustment of overrun. Examples of such a stabilizer include gum such as guar gum,

locust bean gum, xanthan gum and gum arabic, carrageenan, sodium alginate, CMC, water-soluble hemicellulose, gelatin, agar, pectin, corn starch, and a variety of salts such as phosphate. These stabilizers generally may be added at a content of 0.1 to 1.0% by weight with respect to the whole of the product. Since some stabilizer gives sticky texture in the mouth, the amount of the stabilizer may be reduced in such a case.

[0047]

An emulsifier may be used for the purpose of smoothing constitution of frozen confectionery mix, maintaining dispersion of fat, and making aggregation of fat during freezing stable. Commercially available emulsifier may be used. Examples of the emulsifier include lecithin, fractionated lecithin with alcohol, partially hydrolyzed lecithin with acid, alkali or enzyme, sucrose fatty acid ester, propylene glycol fatty acid ester, sorbitan fatty acid ester, glycerol fatty acid ester and polyglycerol fatty acid ester, various organic acid esters of monoglycerides such as acetic acid esters of monoglycerides, tartaric acid esters of monoglycerides, diacetyl-tartaric acid esters of monoglycerides, citric acid esters of monoglycerides, diacetyl tartaric acid esters of monoglycerides, lactic acid esters of monoglycerides, succinic acid esters of monoglycerides and malic acid

esters of monoglycerides. Emulsifier may be used for such a purpose, but it is preferable to minimize a content of the emulsifier, for example 0.1 to 0.5% by weight, in the viewpoint of the taste. Most preferably, no emulsifier is used.

[0048]

A flavor and a colorant are also important additives for ice cream product, and selected and used depending on consumer tastes. There are many flavors, but vanilla flavor is common. Chocolate flavor and strawberry flavor are also generally preferred.

[0049]

A standard production method of ice cream product is as follows. First, raw materials are selected, and then raw materials are mixed, and dissolved or dispersed to prepare an emulsion. In this case, powdered material is mixed, and dissolved or dispersed with particular care because lumps tend to be made. Too high temperature is not preferable. It is usually about 50 to 60°C. The emulsion prepared in the above are homogenized. Conditions such as homogenization pressure cannot be always uniformly defined due to homogenization apparatus such as one-stage pressure or two-stage pressure, but usually 100 to 180 kg/cm^2 in the one-stage pressure and 100 kg/cm^2 in the first bulb and about 40 to 70 kg/cm^2 in the second bulb in the two-stage

pressure. Homogenization temperature is usually about 50 to 70°C.

[0050]

Then, the oil in water emulsion after homogenization is pasteurized or sterilized, usually UHT sterilized. There are two types of UHT sterilization treatment, that is, an indirect heating mode and a direct heating mode. Examples of an apparatus for the indirect heating treatment include, but not limited to, an APV plate-type UHT treatment apparatus (manufactured by APV Co., Ltd.), a CP-UHT sterilization apparatus (manufactured by Climaty Package Co., Ltd.), a Stork tubular-type sterilization apparatus (manufactured by Stork), and a Contherm scraping-type UHT sterilization apparatus (manufactured by Tetrapak Alfa Laval). Examples of the direct heating-type sterilization apparatus include a uperization sterilization apparatus (manufactured by Tetrapak Alfa Laval), a VTIS sterilization apparatus (manufactured by Tetrapak Alfa Laval), a Lagear UHT sterilization apparatus (manufactured by Lagear), a Paralizator (manufactured by Pash and Silkeborg), and a C. P. Vac-Heat UHT sterilization apparatus (manufactured by Climaty Package Co., Ltd.), and any of these apparatuses may be used. A frozen confectionery mix is obtained after the above pasteurization and homogenization.

[0051]

The frozen confectionery mix after pasteurization or sterilization is then temporarily stored at 0 to 5°C for 3 to 24 hours, that is aging (storage). This aging allows each of components in the frozen confectionery mix to be stabilized. Then, flavor is added to the emulsion while stirring the emulsion. And then, the emulsion is subjected to freezing. This step includes blending appropriate amount of air to the frozen confectionery mix while freezing water by rapidly cooling the frozen confectionery mix with a freezer, and dispersing microbubbles, particles of ice crystal, and fat particles into the emulsion to make the emulsion semiliquid like a soft-serve ice cream. This step is important because smooth constitution and texture depends on this step. And then, the emulsion is filled into certain container and packaged, and then rapidly cooled at -20 to -30°C for hardening which is a step of freezing until the emulsion keeps certain shape. The obtained product is stored until shipment.

[0052]

If the fat for frozen confectionery and confectionery of the present invention is used for a chocolate product, milk solids (powdery dairy product such as whole fat powder, skim milk powder, and cheese powder), and sugar as well as well-known materials for chocolate component, cacao

component, vegetable fat, and emulsifier may be used as major raw materials.

[0053]

If the fat for frozen confectionery and confectionery of the present invention is used for a chocolate product, chocolate may be prepared in the usual manner for preparing the common chocolate product. That is, chocolate product may be obtained by a method including choosing appropriate raw materials such as cacao mass, fat, cocoa powder, sugar and milk powder, mixing the raw materials to prepare dough, refining solids in the dough with a refiner to have appropriate particle diameter, conching the dough, and then adding flavor.

Examples

[0054]

The present invention will be explained in more detail by reference to the following Examples. In Examples, all percentages and parts mean a weight basis.

[0055]

<Preparation of fat for frozen confectionery and confectionery>

In the preparation of fat for frozen confectionery and confectionery containing tea polyphenol, Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd. is used as tea

polyphenol composition. A tea polyphenol content of edible fat is calculated on the assumption that a tea polyphenol content of this tea polyphenol composition is 80% by weight because this tea polyphenol composition contains 80% or more of tea polyphenol.

[0056]

<Preparation and evaluation of fat for frozen confectionery>

[0057]

<Preparation process of fat for frozen confectionery A>

An aqueous solution dissolving 10% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S, manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of milk fat (iodine value: 33) which was heated to 50°C, 0.3 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 3.75 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain milk fat containing 300 ppm by weight of tea polyphenol and 300 ppm by weight of

emulsifier (fat for frozen confectionery A).

[0058]

<Preparation process of fat for frozen confectionery B>

An aqueous solution dissolving 1% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S, manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of milk fat (iodine value: 33) which was heated to 50°C, 0.1 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 1.875 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain milk fat containing 150 ppm by weight of tea polyphenol and 100 ppm by weight of emulsifier (fat for frozen confectionery B).

[0059]

<Preparation process of fat for frozen confectionery C>

An aqueous solution dissolving 1% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S, manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg

of milk fat (iodine value: 33) which was heated to 50°C, 0.375 g of the aqueous solution dissolving 1% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain milk fat containing 30 ppm by weight of tea polyphenol (fat for frozen confectionery C).

[0060]

<Preparation process of fat for frozen confectionery D>

An aqueous solution dissolving 1% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S, manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of mixed fat of 70 parts of refined palm oil (product name: refined palm oil, manufactured by Fuji Oil Co., Ltd., iodine value: 52) and 30 parts of refined coconut oil (product name: refined coconut oil, manufactured by Fuji Oil Co., Ltd., iodine value: 8.5), which was heated to 50°C, 0.3 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 3.75 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK

ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain palm-coconut mixed fat containing 300 ppm by weight of tea polyphenol and 300 ppm by weight of emulsifier (fat for frozen confectionery D).

[0061]

<Preparation process of fat for frozen confectionery E>

An aqueous solution dissolving 1% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S, manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of mixed fat of 70 parts of refined palm oil (product name: refined palm oil, manufactured by Fuji Oil Co., Ltd., iodine value: 52) and 30 parts of refined coconut oil (product name: refined coconut oil, manufactured by Fuji Oil Co., Ltd., iodine value: 8.5), which was heated to 50°C, 0.1 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 1.875 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes

while stirring to obtain palm-coconut mixed fat containing 150 ppm by weight of tea polyphenol and 100 ppm by weight of emulsifier (fat for frozen confectionery E).

[0062]

<Evaluation method>

(1) Evaluation method of taste of frozen confectioneries

Taste evaluation of frozen confectioneries was carried out by a smelling sense and taste sense of 10 panelists into ranks "5", "4", "3", "2", and "1" in order of excellent to poor taste, and the average evaluation point was assumed to be an evaluation result. Four point or more was judged as acceptable.

(2) CDM stability time

An oxidation stability of fat for frozen confectionery was evaluated by using CDM testing machine, Rancimat, manufactured by Metrohm AG. Determination of oxidation stability of each edible fat was carried out by comparing time difference caused by extension of CDM stability time in correlation with increase in oxidation stability of edible fat. Measurement conditions: measurement temperature: 120°C, air throughput: 20 L/h, 3 g of fat sample was amounted.

[0063]

(Evaluation of oxidation stability of fat for frozen confectionery)

Oxidation stability was compared and evaluated by calculating A/N value by the following method with using CDM stability time as an index. The evaluation results are shown in table 1.

A: CDM stability time of fats for frozen confectionery A to E

N: CDM stability time of base fat of A, milk fat or palm-coconut mixed fat.

[0064]

[Table 1]

	Fat for frozen confectionery A	Fat for frozen confectionery B	Fat for frozen confectionery C	Milk fat	Fat for frozen confectionery D	Fat for frozen confectionery E	Palm-coconut mixed fat
Tea polyphenol (ppm by weight)	300	150	30	0	300	150	0
CDM stability time	54.0	39.6	14.0	4.9	51.5	42.3	21.6
A/N	10.9	8.0	2.8	(1.0)	2.4	2.0	(1.0)

[0065]

Frozen confectionery was prepared by using the prepared fat for frozen confectionery, and evaluated.

[0066]

[Example 1]

The mixture was prepared by mixing 15 parts of fat for frozen confectionery A, 7 parts of fresh cream (manufactured by Omu milk products co., ltd., fat content: 45%), 11 parts of skim milk powder, 14 parts of granulated sugar, 1.5 parts of pasteurized egg yolk, and 51.5 parts of water. The mixture was pre-emulsified with a Homomixer at 65 to 70°C for 30 minutes, and then sterilized by direct heating with an ultrahigh temperature sterilization apparatus (manufactured by IWAI KIKAI KOGYO CO., LTD.) at 145°C for 4 seconds. The sterilized mixture was homogenized at 150 kg/cm2 of homogenization pressure, and then immediately cooled to 5°C. After the cooling, the mixture was aged for 24 hours to obtain frozen confectionery mix. Formulation of the frozen confectionery mix was summarized in table 2. This emulsion was subject to freezing with a tabletop ice cream maker (manufactured by Delonghi) to obtain frozen confectionery. Overrun: [(Weight of oil-in-water emulsion per given volume)-(weight of whipped cream after whipping per given volume)]/(weight of whipped cream after whipping per given volume)×100, was

adjusted to 30.

The obtained ice cream was filled into container and hardened at -20 to -30°C, then exposed to fluorescent light at 2000 lux of illuminance in the showcase at -18°C, and then sensory evaluation was performed according to the above-described method. The results were summarized in table 4.

[0067]

[Example 2]

Frozen confectionery was prepared in the same formulation and process as those of Example 1 except that 15 parts of fat for frozen confectionery B was used. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0068]

[Example 3]

Frozen confectionery was prepared in the same formulation and process as those of Example 1 except that 15 parts of fat for frozen confectionery C was used. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0069]

[Comparative Example 1]

Frozen confectionery was prepared in the same formulation and process as those of Example 1 except that 15 parts of milk fat was used. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0070]

[Comparative Example 2]

Edible fat was obtained by adding 3000 ppm by weight of oil-soluble tea polyphenol composition (product name: Suncatol M97, manufactured by Taiyo Kagaku Co., Ltd., containing 10% of tea polyphenol, 9% of mixed tocopherols, 64% of glycerol fatty acid ester, and 17% of other food materials) to milk fat. Frozen confectionery was prepared in the same formulation and process as those of Example 1 except that 15 parts of the edible fat was used. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0071]

Frozen confectionery was prepared by using the prepared fat for frozen confectionery, and evaluated.

[0072]

[Example 4]

Frozen confectionery was prepared in the same process as that of Example 1 from the mixture of 7 parts of fat for

frozen confectionery C, 7 parts of fresh cream (manufactured by Omu milk products co., ltd., fat content: 45%), 8 parts of skim milk powder, 14 parts of granulated sugar, 1.5 parts of pasteurized egg yolk, and 62.5 parts of water. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0073]

[Example 5]

Frozen confectionery was prepared in the same process as that of Example 1 from the mixture of 7 parts of fat for frozen confectionery D, 7 parts of fresh cream (manufactured by Omu milk products co., ltd., fat content: 45%), 8 parts of skim milk powder, 14 parts of granulated sugar, 1.5 parts of pasteurized egg yolk, and 62.5 parts of water. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0074]

[Comparative Example 3]

Edible fat was obtained by melting and mixing 70 parts of refined palm oil (product name: refined palm oil, manufactured by Fuji Oil Co., Ltd., iodine value: 52) and 30 parts of refined coconut oil (product name: refined coconut oil, manufactured by Fuji Oil Co., Ltd., iodine

value: 8.5). Frozen confectionery was prepared in the same formulation and process as those of Example 1 except that 7 parts of the edible fat was used. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0075]

[Comparative Example 4]

Edible fat was obtained by melting and mixing 70 parts of refined palm oil (product name: refined palm oil, manufactured by Fuji Oil Co., Ltd., iodine value: 52) and 30 parts of refined coconut oil (product name: refined coconut oil, manufactured by Fuji Oil Co., Ltd., iodine value: 8.5), and adding 3600 ppm by weight of oil-soluble tea polyphenol composition (product name: Suncatol M97, manufactured by Taiyo Kagaku Co., Ltd., containing 10% of tea polyphenol, 9% of mixed tocopherols, 64% of glycerol fatty acid ester, and 17% of other food materials) to the mixture. Frozen confectionery was prepared in the same formulation and process as those of Example 1 except that 7 parts of the edible fat was used. The obtained frozen confectionery was evaluated in the same manner as Example 1. The results were summarized in table 4.

[0076]

[Table 2]

	Examples 1, 2, 3 Comparative Examples 1, 2	Examples 4, 5 Comparative Examples 3, 4
Fat for frozen confectionery	15	7
Fresh cream (fat content: 45%)	7	7
Skim milk powder	11	8
Granulated sugar	14	14
Pasteurized egg yolk	1.5	1.5
Water	51.5	62.5

Unit: part by weight

[0077]

Tea polyphenol content and emulsifier content (in fat for frozen confectionery or in frozen confectionery) of Examples 1 to 6 and Comparative Examples 1 to 4 were summarized in table 3. Emulsifier content (E) relative to tea polyphenol content (C) shows as E/C.

[0078]

[Table 3]

		Example 1	Example 2	Example 3	Comparative Example 1	Comparative Example 2	Example 4	Example 5	Comparative Example 3	Comparative Example 4
Tea polyphenol = C (ppm by weight)	In fat for frozen confectionery	300	150	30	-	300	300	150	-	300
	In frozen confectionery	45	22.5	45	-	45	21	10.5	-	21
Emulsifier = E (ppm by weight)	In fat for frozen confectionery	300	100	-	-	1920	300	100	-	1920
	In frozen confectionery	45	15	-	-	288	21	7	-	134.4
E/C		1.0	0.7	-	-	6.4	1.0	0.7	-	6.4

[0079]

[Table 4]

	Example 1	Example 2	Example 3	Comparative Example 1	Comparative Example 2	Example 4	Example 5	Comparative Example 3	Comparative Example 4
Immediately after the production	5.0	5.0	5.0	5.0	4.5	5.0	5.0	5.0	4.5
After 1 week storage	4.7	4.5	4.2	2.8	4.0	4.8	4.7	3.0	4.0
After 2 weeks storage	4.3	4.2	4.0	1.5	3.8	4.4	4.2	1.8	3.7

[0080]

(Discussion of table 4)

As shown in table 4, the good taste immediately after the production was maintained after the irradiation in the evaluation results of Examples 1 to 5. Strong off-tastes and significantly deterioration of taste of frozen confectionery by the irradiation were shown in Comparative Examples 1 and 3. Off-tastes, which might be derived from emulsifier, were shown immediately after the production in Comparative Examples 2 and 4, that is, the tastes of these frozen confectioneries were inferior to those of Examples 1 to 5.

[0081]

<Preparation and evaluation of fat for confectionery>

[0082]

<Preparation process of fat for confectionery F>

An aqueous solution dissolving 10% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of cacao butter (product name: "GO201", manufactured by Fuji Oil Co., Ltd., iodine value: 36) which was heated to 50°C, 0.1 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 1.25 g of the aqueous solution dissolving 10% by weight of tea

polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain cacao butter containing 100 ppm by weight of tea polyphenol and 100 ppm by weight of emulsifier (fat for confectionery F).

[0083]

<Preparation process of fat for confectionery G>

An aqueous solution dissolving 10% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34) which was heated to 50°C, 0.15 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 1.875 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain hard butter containing 150 ppm by

weight of tea polyphenol and 150 ppm by weight of emulsifier (fat for confectionery G).

[0084]

<Preparation process of fat for confectionery H>

An aqueous solution dissolving 10% by weight of tea polyphenol composition was prepared by adding tea polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34) which was heated to 50°C, 0.3 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 3.75 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain hard butter containing 300 ppm by weight of tea polyphenol and 300 ppm by weight of emulsifier (fat for confectionery H).

[0085]

<Preparation process of fat for confectionery I>

An aqueous solution dissolving 10% by weight of tea polyphenol composition was prepared by adding tea

polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) to water. To 1 kg of hard butter (product name: "Melano NEWSS7, manufactured by Fuji Oil Co., Ltd., iodine value: 34) which was heated to 50°C, 0.3 g of emulsifier (POEM PR-100, manufactured by RIKEN VITAMIN CO., LTD.) was added and dissolved, then 5.0 g of the aqueous solution dissolving 10% by weight of tea polyphenol composition was added, and then the mixture was stirred at 10000 rpm for 10 minutes with a Homomixer (TK ROBO MIX, manufactured by Tokushu Kika Kogyo Co., Ltd.). Then, the mixture was subjected to dehydration treatment at 50°C under a reduced pressure of 10 torr for 30 minutes while stirring to obtain hard butter containing 400 ppm by weight of tea polyphenol and 300 ppm by weight of emulsifier (fat for confectionery I).

[0086]

<Evaluation method>

(1) Evaluation method of taste of chocolates

Taste evaluation of chocolates was carried out by a smelling sense and taste sense of 10 panelists into ranks "5", "4", "3", "2", and "1" in order of excellent to poor taste, and the average evaluation point was assumed to be an evaluation result. Four point or more was judged as acceptable.

(2) CDM stability time

An oxidation stability of fat for confectionery was evaluated by using CDM testing machine, Rancimat, manufactured by Metrohm AG. Determination of oxidation stability of each edible fat was carried out by comparing time difference caused by extension of CDM stability time in correlation with increase in oxidation stability of edible fat. Measurement conditions: measurement temperature: 120°C, air throughput: 20 L/h, 3 g of fat sample was amounted.

(3) Evaluation method of color deterioration of Matcha green tea chocolate

Surface color of Mathca green tea chocolate was evaluated after irradiation at 1000 lux for 2 days.

[0087]

(Evaluation of oxidation stability of fat for confectionery)

Oxidation stability was compared and evaluated by calculating A/N value by the following method with using CDM stability time as an index. The evaluation results are shown in table 1.

A: CDM stability time of fats for confectionery A to D

N: CDM stability time of base fat of A, cacao butter or hard butter.

[0088]

[Table 5]

	Fat for confectionery F	Cacao butter	Fat for confectionery G	Fat for confectionery H	Fat for confectionery I	Hard butter
Tea polyphenol (ppm by weight)	100	-	150	300	400	-
CDM stability time	93.2	43.4	75.8	115.7	146.6	34.2
A/N	2.1	(1:0)	2.2	3.4	4.3	(1:0)

[0089]

Chocolate was prepared by using the prepared fat for confectionery, and evaluated.

[0090]

(Example 6)

To 80 parts of molten white chocolate (manufactured by Fuji Oil Co., Ltd., fat content: about 34%), 20 parts of fat for confectionery F was added followed by adjusting the temperature to 27°C. Then, seed agent (product name: "Chocoseed A", manufactured by Fuji Oil Co., Ltd.) was added to the chocolate at a content of 0.2% with respect to the chocolate. Then, the chocolate was subjected to tempering treatment. Then, the chocolate was cooled and subjected to aging for 1 week to obtain white chocolate (fat content: about 47%). The obtained chocolate was exposed to fluorescent light at 2000 lux of illuminance at 20°C, then, sensory evaluation was performed according to the above-described method. The results were summarized in table 7.

[0091]

(Comparative Example 5)

White chocolate was prepared in the same formulation and process as those of Example 6 except that 20 parts of cacao butter (product name: "GO201", manufactured by Fuji Oil Co., Ltd., iodine value: 36) was used. The obtained

white chocolate was evaluated in the same manner as Example 6. The results were summarized in table 7.

[0092]

(Comparative Example 6)

To 80 parts of molten white chocolate (manufactured by Fuji Oil Co., Ltd., fat content: about 34%), 20 parts of cacao butter (product name: "GO201", manufactured by Fuji Oil Co., Ltd., iodine value: 36) was added, then tea polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) was added in powder form at a content of 25 ppm with respect to whole chocolate. The obtained mixture was stirred and mixed so that raw materials are dispersed throughout the chocolate, and then adjusted the temperature to 31°C. Then, seed agent (product name: "Chocoseed A", manufactured by Fuji Oil Co., Ltd.) was added to the chocolate at a content of 0.2% with respect to the chocolate. Then, the chocolate was subjected to tempering treatment. Then, the chocolate was cooled and subjected to aging for 1 week to prepare white chocolate (fat content: about 47%). The obtained white chocolate was evaluated in the same manner as Example 6. The results were summarized in table 7.

[0093]

(Example 7)

White chocolate was prepared in the same formulation

and process as those of Example 6 except that 20 parts of fat for confectionery G was used. The obtained chocolate was exposed to fluorescent light at 1000 lux of illuminance at 20°C, then, sensory evaluation was performed according to the above-described method. The results were summarized in table 8.

[0094]

(Example 8)

White chocolate was prepared in the same formulation and process as those of Example 6 except that 20 parts of fat for confectionery H was used. The obtained white chocolate was evaluated in the same manner as Example 7. The results were summarized in table 8.

[0095]

(Example 9)

White chocolate was prepared in the same formulation and process as those of Example 6 except that 20 parts of fat for confectionery I was used. The obtained white chocolate was evaluated in the same manner as Example 7. The results were summarized in table 8.

[0096]

(Comparative Example 7)

White chocolate was prepared in the same formulation and process as those of Example 6 except that 20 parts of hard butter (product name: "Melano NEWSS7", manufactured by

Fuji Oil Co., Ltd., iodine value: 34) was used. The obtained white chocolate was evaluated in the same manner as Example 7. The results were summarized in table 8.

[0097]

(Comparative Example 8)

To 80 parts of molten white chocolate (manufactured by Fuji Oil Co., Ltd., fat content: about 34%), 20 parts of hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34) was added, then tea polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) was added in powder form at a content of 37.5 ppm with respect to whole chocolate. Subsequent process was carried out in the same manner as that of Comparative Example 6 to prepare white chocolate. The obtained white chocolate was evaluated in the same manner as Example 7. The results were summarized in table 8.

[0098]

(Comparative Example 9)

To 80 parts of molten white chocolate (manufactured by Fuji Oil Co., Ltd., fat content: about 34%), 20 parts of hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34) was added, then tea polyphenol composition (product name: Sunphenon 90S manufactured by Taiyo Kagaku Co., Ltd.) was added in powder

form at a content of 375 ppm with respect to whole chocolate. Subsequent process was carried out in the same manner as that of Comparative Example 6 to prepare white chocolate. The obtained white chocolate was evaluated in the same manner as Example 7. The results were summarized in table 8.

[0099]

(Comparative Example 10)

Edible fat was obtained by adding 1500 ppm by weight of oil-soluble tea polyphenol composition (product name: Suncatol M97, manufactured by Taiyo Kagaku Co., Ltd., containing 10% of tea polyphenol, 9% of mixed tocopherols, 64% of glycerol fatty acid ester, and 17% of other food materials) to hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34). White chocolate was prepared in the same formulation and process as those of Example 6 except that 20 parts of the edible fat was used. The obtained white chocolate was evaluated in the same manner as Example 7. The results were summarized in table 8.

[0100]

(Example 10)

To 78 parts of molten white chocolate (manufactured by Fuji Oil Co., Ltd., fat content: about 34%), 20 parts of fat for confectionery G and 2 parts of Matcha green tea

powder were added followed by adjusting the temperature to 31°C. Then, seed agent (product name: "Chocoseed A", manufactured by Fuji Oil Co., Ltd.) was added to the chocolate at a content of 0.2% with respect to the chocolate. Then, the chocolate was subjected to tempering treatment. Then, the chocolate was cooled and subjected to aging for 1 week to obtain Matcha green tea chocolate (fat content: about 47%). The obtained chocolate was exposed to fluorescent light at 1000 lux of illuminance at 20°C, then, sensory evaluation and evaluation of color deterioration were performed according to the above-described method. The results were summarized in table 9 and table 10.

[0101]

(Example 11)

Matcha green tea chocolate was prepared in the same formulation and process as those of Example 5 except that 20 parts of fat for confectionery H was used. The obtained chocolate was evaluated in the same manner as Example 10. The results were summarized in table 9 and table 10.

[0102]

(Comparative Example 11)

Matcha green tea chocolate was prepared in the same formulation and process as those of Example 10 except that 20 parts of hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34) was

used. The obtained chocolate was evaluated in the same manner as Example 10. The results were summarized in table 9 and table 10.

[0103]

(Example 12)

To 78 parts of molten white chocolate (manufactured by Fuji Oil Co., Ltd., fat content: about 34%), 20 parts of fat for confectionery G and 2 parts of strawberry powder were added followed by adjusting the temperature to 31°C. Then, seed agent (product name: "Chocoseed A", manufactured by Fuji Oil Co., Ltd.) was added to the chocolate at a content of 0.2% with respect to the chocolate. Then, the chocolate was subjected to tempering treatment. Then, the chocolate was cooled and subjected to aging for 1 week to obtain strawberry chocolate (fat content: about 47%). The obtained chocolate was exposed to fluorescent light at 1000 lux of illuminance at 20°C, then, sensory evaluation and evaluation of color deterioration were performed according to the above-described method. The results were summarized in table 9.

[0104]

(Example 13)

Strawberry chocolate was prepared in the same formulation and process as those of Example 7 except that 20 parts of fat for confectionery H was used. The obtained

chocolate was evaluated in the same manner as Example 12. The results were summarized in table 9.

[0105]

(Comparative Example 12)

Strawberry chocolate was prepared in the same formulation and process as those of Example 5 except that 20 parts of hard butter (product name: "Melano NEWSS7", manufactured by Fuji Oil Co., Ltd., iodine value: 34) was used. The obtained chocolate was evaluated in the same manner as Example 12. The results were summarized in table 9.

[0106]

Tea polyphenol content and emulsifier content (in fat for confectionery, in whole fat of chocolate or in chocolate) of Examples 6 to 13 and Comparative Examples 5 to 12 were summarized in table 6. Emulsifier content in fat for confectionery (E) relative to tea polyphenol content in fat for confectionery (C) shows as E/C.

[0107]

[Table 6]

		Example 6	Comparative Example 5	Comparative Example 6	Example 7	Example 8	Example 9	Comparative Example 7	Comparative Example 8	Comparative Example 9	Comparative Example 10
Tea polyphenol (ppm by weight) = C	In fat for confectionery	100	-	-	150	300	400	-	-	-	150
	In total fat of chocolate	42	-	-	64	127	170	-	-	-	64
	In chocolate	20	-	20	30	60	80	-	30	300	30
Emulsifier (ppm by weight) = E	In fat for confectionery	100	-	-	150	300	300	-	-	-	960
	In chocolate	20	-	-	30	60	60	-	-	-	192
E/C		1.00	-	-	1.00	1.00	0.75	-	-	-	6.40

		Example 10	Example 11	Comparative Example 11	Example 12	Example 13	Comparative Example 12
Tea polyphenol (ppm by weight) = C	In fat for confectionery	150	300	-	150	300	-
	In total fat of chocolate	64	129	-	64	129	-
	In chocolate	30	60	-	30	60	
Emulsifier (ppm by weight) = E	In fat for confectionery	150	300	-	150	300	-
	In chocolate	30	60	-	30	60	-
E/C		1.00	1.00	-	1.00	1.00	-

[0108]

[Table 7]

	Example 6	Comparative Example 5	Comparative Example 6
Immediately after the production	5.0	5.0	5.0
After 1 day storage	4.0	1.5	2.5
After 2 days storage	3.6	1.0	2.5
After 3 days storage	3.8	1.0	1.8

[0109]

(Discussion of table 7)

As shown in table 7, the good taste immediately after the production was maintained and deterioration of taste was prevented after the irradiation in the evaluation results of Example 6. Strong off-tastes and significantly deterioration of taste of chocolate were shown after 1 day irradiation in Comparative Example 5. Although tea polyphenol content was same in Example 6 and Comparative Example 6, deterioration of taste in Comparative Example 6 was significantly faster than that of Example 6.

[0110]

[Table 8]

	Example 7	Example 8	Example 9	Comparative Example 7	Comparative Example 8	Comparative Example 9	Comparative Example 10
Immediately after the production	5.0	5.0	5.0	5.0	5.0	4.5	4.0
After 1 day storage	4.0	4.5	4.5	2.0	3.0	4.0	3.7
After 2 days storage	4.0	4.0	4.3	1.0	2.3	4.0	2.9

[0111]

(Discussion of table 8)

As shown in table 8, the good taste immediately after the production was maintained and deterioration of taste

was prevented after the irradiation in the evaluation results of Examples 7 to 9. Strong off-tastes and significantly deterioration of taste of chocolate were shown after 1 day irradiation in Comparative Example 7. Although tea polyphenol content was same in Example 7 and Comparative Example 8, deterioration of taste in Comparative Example 8 was significantly faster than that of Example 7. Slight catechin taste, which was not suitable for chocolate, was felt in Comparative Example 9 including tea polyphenol at the content of 10 times higher than that of Example 7. Taste deterioration was not felt after the irradiation, but it was inefficient with respect to the added content of tea polyphenol. Off-tastes, which might be derived from emulsifier, were shown immediately after the production in Comparative Example 10, that is, the taste of this chocolate was inferior to that of Examples 7 to 9.

[0112]

[Table 9]

	Example 10	Example 11	Comparative Example 11	Example 12	Example 13	Comparative Example 12
Immediately after the production	5.0	5.0	5.0	5.0	5.0	5.0
After 1 day storage	3.5	3.8	1.5	3.8	4.2	2.5
After 2 days storage	3.2	3.6	1.0	3.5	4.0	1.0

[0113]

(Discussion of table 9)

As shown in table 9, taste deterioration after the irradiation was significantly prevented in Examples 10 to 13. Strong off-tastes and significantly deterioration of taste of chocolate were shown after 1 day irradiation in Comparative Examples 11 and 12.

[0114]

[Table 10]

	Immediately after the production	After 2 days storage
Example 10	Bright green	Slightly discolored, but green
Example 11	Bright green	Slightly discolored, but green
Comparative Example 11	Bright green	Quite-discolored

[0115]

(Discussion of table 10)

As shown in table 10, color deterioration of Matcha green tea after the irradiation was significantly prevented in Examples 10 and 11. In Comparative Example 11, chocolate lost green color and became yellow-brown color, and thus appearance of chocolate was significantly deteriorated.

Industrial Applicability

[0116]

The present invention enables to obtain fat for frozen confectionery and confectionery having excellent oxidation stability and good taste. And the fat for frozen confectionery and confectionery of the present invention

enables to provide a food having excellent oxidation stability and resistance to deterioration by light, and good taste.

CLAIMS

1. A fat for frozen confectionery and confectionery comprising tea polyphenol at a content of 15 ppm by weight to 500 ppm by weight, wherein a content of emulsifier in the fat is twice or less as much as a content of the tea polyphenol.

2. The fat for frozen confectionery and confectionery according to claim 1, wherein a content of the tea polyphenol is 30 ppm by weight to 500 ppm by weight, and wherein value of A/N is 2.0 or more, wherein

A represents CDM stability time of the fat for frozen confectionery and confectionery comprising 30 ppm by weight to 500 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, wherein the base fat does not comprise tea polyphenol.

3. The fat for frozen confectionery and confectionery according to claim 1 or 2, wherein a content of the tea polyphenol is 100 ppm by weight to 500 ppm by weight, a content of the emulsifier is 50 ppm by weight to 1000 ppm by weight, a content of the emulsifier is 2 times or less as much as a content of the tea polyphenol, and wherein value of A/N is 2.0 or more, wherein

A represents CDM stability time of the fat for frozen confectionery or confectionery comprising 100 ppm by weight to 500 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, wherein the base fat does not comprise tea polyphenol.

4. A frozen confectionery comprising the fat for frozen confectionery and confectionery according to any one of claims 1 to 3, wherein a content of the tea polyphenol derived from the fat for frozen confectionery and confectionery is 3 ppm by weight to 50 ppm by weight.

5. The frozen confectionery according to claim 4, comprising 1 to 20 ppm by weight of the fat for frozen confectionery and confectionery according to any one of claims 1 to 3 with respect to 100 parts by weight of the frozen confectionery.

6. The frozen confectionery according to claim 4 or 5, wherein a content of the fat for frozen confectionery and confectionery according to any one of claims 1 to 3 in the frozen confectionery is 30 ppm by weight or more with respect to 100 parts by weight of the fat in the frozen confectionery.

7. A food comprising the fat for frozen confectionery and confectionery according to any one of claims 1 to 3, wherein a content of the tea polyphenol in the food is 30 ppm by weight to 500 ppm by weight with respect to whole fat in the food.

8. A chocolate product comprising the fat for frozen confectionery and confectionery according to any one of claims 1 to 3, wherein a content of the tea polyphenol in the chocolate product is 30 ppm by weight to 350 ppm by weight with respect to whole fat in the chocolate product, and wherein fat content of the chocolate product is 20% by weight to 70% by weight.

9. The food according to claim 7, wherein the food comprising the fat for frozen confectionery and confectionery according to any one of claims 1 to 3, is selected from the group consisting of chocolate product, cream, margarine and shortening.

10. The fat for frozen confectionery according to any one of claims 1 to 3, comprising one or more fats, as a major raw material, selected from the group consisting of milk fat, coconut oil, palm oil and palm kernel oil, wherein a content of the tea polyphenol is 150 ppm by

weight to 400 ppm by weight, a content of the emulsifier is 100 ppm by weight to 500 ppm by weight or less, a content of the emulsifier is 1.5 times or less as much as a content of the tea polyphenol, and wherein value of A/N is 5.0 or more, wherein

A represents CDM stability time of the fat for frozen confectionery comprising 150 ppm by weight to 400 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, wherein the base fat does not comprise tea polyphenol.

11. The fat for confectionery according to any one of claims 1 to 3, wherein a content of the tea polyphenol is 300 ppm by weight to 500 ppm by weight, a content of the emulsifier is 100 ppm by weight to 750 ppm by weight or less, a content of the emulsifier is 1.5 times or less as much as a content of the tea polyphenol, and wherein value of A/N is 3.0 or more, wherein

A represents CDM stability time of the fat for confectionery comprising 300 ppm by weight to 500 ppm by weight of tea polyphenol, and

N represents CDM stability time of base fat of A, wherein the base fat does not comprise tea polyphenol.

12. A process for improving a resistance to

deterioration by light of frozen confectionery, comprising using the fat for frozen confectionery and confectionery according to any one of claims 1 to 3.

13. A process for improving a resistance to deterioration by light of food, comprising using the fat for frozen confectionery and confectionery according to any one of claims 1 to 3.

14. A process for preventing a color deterioration of food caused by irradiation, comprising using the fat for frozen confectionery and confectionery according to any one of claims 1 to 3.

15. A process for producing the fat for frozen confectionery and confectionery according to any one of claims 1 to 3, comprising adding tea polyphenol to aqueous medium to form solution, and adding the solution to fat.

16. A process according to claim 15, comprising adding the tea polyphenol to aqueous medium to form solution, and adding the solution to fat and then removing water under reducing pressure.