

Description

Title of Invention: FERMENTED MILK FOOD PRODUCT AND METHOD FOR PRODUCING SAME

Technical Field

[0001] The present invention relates to a fermented milk food and a production method therefor.

Background Art

[0002] In recent years, attention has been focused on improving effects and the like of viable cells of fermentation microorganisms such as lactic acid bacteria on an intestinal environment of a person who ingests the cells, and studies have been made to incorporate the viable cells of fermentation microorganisms into foods other than hitherto known fermented milk foods such as yogurt.

For example, Patent Literature 1 describes a method for producing a fermented milk food, which involves mixing an edible solid fat with fermented milk to prepare a water-in-oil emulsion in the technical field of producing a fermented milk food containing a fermentation microorganism in a state of viable cells.

This literature describes Example in which a spread-like fermented milk food was obtained by feeding each of an edible solid fat cooled to 10°C and fermented milk cooled to 10°C into a mixing machine, followed by inline mixing in the mixing machine.

[0003] In addition, Patent Literature 2 describes a lactic acid

fermented food composition obtained by subjecting raw materials including cacao mass, water, and sugar to lactic acid fermentation with lactic acid bacteria.

This literature describes Example in which a fermented product (i.e. i.e. a lactic acid fermented food composition), which was obtained by inoculating a chocolate-containing product with a starter of lactic acid bacteria, followed by culture, and which was left to stand still at -80°C for several hours to obtain a frozen product, and the frozen product was freeze-dried to remove water, to thereby obtain a solid product (i.e. freeze-dried fermented chocolate).

[0004] In addition, Patent Literature 3 describes a method for producing water-containing chocolate, involving using as an emulsifier saponin or an extract containing saponin as a main ingredient in producing water-containing chocolate by adding an aqueous ingredient to a chocolate material.

This literature also describes that fermented milk such as yogurt may be used as the aqueous ingredient to be added to the chocolate material.

Citation List

Patent Literatures

[0005] [Patent Literature 1] JP 2006-333755 A

[Patent Literature 2] JP 2008-167747 A

[Patent Literature 3] JP 09-248132 A

Summary of Invention

Problems to be Solved by the Invention

[0006] As described above, Patent Literature 1 describes Example in which an edible solid fat capable of being fed at 10°C was mixed with fermented milk capable of being fed at 10°C to obtain a fermented milk food. The fermented milk food obtained in this Example is obtained by mixing the ingredients capable of being fed at 10°C and does not have a solid form at a temperature of 10°C or below.

As described above, Patent Literature 2 describes the freeze-dried fermented chocolate obtained through the steps such as freeze-drying. The freeze-dried fermented chocolate is a fine porous solid product having a crispy texture obtained by freezing the water dispersed in the lactic acid fermented food composition and then removing the water by sublimation.

As described above, Patent Literature 3 suggests that the water-containing chocolate is produced by adding the fermented milk such as yogurt to the chocolate material. However, the saponin as the emulsifier is essential for producing the water-containing chocolate of Patent Literature 3. Therefore, there inevitably occur an astringent taste derived from the saponin and an unpleasant texture remaining in the pharynx.

An object of the present invention is to provide a fermented milk food in a solid form, including viable cells of a fermentation

microorganism and having a satisfactory taste and flavor, rapid melt-in-the-mouth property, and a smooth texture, and a production method therefor.

Means for Solving the Problems

[0007] The inventors of the present invention have made intensive studies in order to solve the above-mentioned problems. As a result, the inventors have found that a fermented milk food in a solid form, including viable cells of a fermentation microorganism (i.e. a microorganism for fermentation) and having a satisfactory taste and flavor, rapid melt-in-the-mouth property, and a smooth texture can be obtained by cooling a water-in-oil emulsion to 10°C or less, in which the water-in-oil emulsion is one obtained by mixing an edible oil and fat having a melting point of from 30 to 40°C with fermented milk and/or natural cheese. Thus, the present invention has been completed.

[0008] The present invention provides the following items [1] to [8].

[1] A fermented milk food in a solid form, which comprises viable cells of a fermentation microorganism, and which is obtained by cooling a water-in-oil emulsion to 10°C or less,

wherein the water-in-oil emulsion is an emulsion obtained by mixing an edible oil and fat having a melting point of from 30 to 40°C with fermented milk and/or natural cheese.

[2] The fermented milk food according to the above-mentioned

item [1], in which the edible oil and fat includes cacao butter.

[3] The fermented milk food according to the above-mentioned item [1] or [2], in which the viable cells of the fermentation microorganism include lactic acid bacteria, Bifidobacteria, propionic acid bacteria, or the like.

[4] The fermented milk food according to the above-mentioned item [3], in which the lactic acid bacteria include *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

[5] The fermented milk food according to any one of the above-mentioned items [1] to [4], in which the fermented milk food includes: an oil and fat-based confectionery material having a cacao butter content of 3 wt% or more and a viable cell count of the fermentation microorganism of 1×10^6 cfu/g or more; confectionery (i.e. confections, snacks, sweets, or candies) containing the oil and fat-based confectionery material and another material; or a food obtained by incorporating natural cheese into the edible oil and fat.

[6] A method for producing the fermented milk food of any one of the above-mentioned items [1] to [5], which includes: a mixing step of mixing an edible oil and fat having a melting point of from 30 to 40°C whose temperature is adjusted within a range of from -2°C to +4°C with reference to the melting point (i.e. a range of from "(the melting point)-2°C" to "(the melting point)+4°C") with fermented milk and/or natural cheese to obtain a water-in-oil emulsion having a temperature within a range of from -2°C to +4°C

with reference to the melting point of the edible oil and fat; and a cooling step of cooling the water-in-oil emulsion to 10°C or less to obtain a fermented milk food in a solid form including viable cells of a fermentation microorganism.

[7] The method for producing the fermented milk food according to the above-mentioned item [6], in which the mixing step is performed by mixing an emulsion including an oil phase, which contains the edible oil and fat, and a water phase with fermented milk.

[8] The method for producing the fermented milk food according to the above-mentioned item [7], in which the emulsion to be used in the mixing step is produced by mixing a material for forming the oil phase containing the edible oil and fat with a material for forming the water phase, stirring the mixture at a temperature of 50°C or more, followed by cooling to 20°C or less, and then increasing the temperature of the mixture to a temperature within a range of from -2°C to +4°C with reference to the melting point of the edible oil and fat.

Advantageous Effects of the Invention

[0009] The fermented milk food of the present invention includes viable cells of a fermentation microorganism, and hence can impart various effects such as an improving effect on an intestinal environment of a person who ingests the food.

In addition, the fermented milk food of the present invention is a food in a solid form having a satisfactory taste and flavor

(in particular, taste and flavor derived from the fermented milk), rapid melt-in-the-mouth property, and a smooth texture, and hence can be produced as chocolate, a chocolate-flavored food (e.g., ganache, a chocolate-flavored chilled dessert, or a chocolate-flavored natural cheese-containing food), a yogurt-flavored food (e.g., a yogurt-flavored chilled dessert or a yogurt-flavored natural cheese-containing food), or the like.

In addition, the fermented milk food of the present invention has satisfactory properties even without being blended with an emulsifier other than an emulsifier that does not adversely affect a taste and flavor or a texture (e.g., lecithin or polyglycerin having a diglycerin content of 3% or less), and hence can be provided as a food that does not have an unpleasant taste and flavor or texture derived from the emulsifier (excluding the emulsifier that does not affect a taste and flavor or a texture, such as lecithin). The lecithin or the like, which has an emulsifying action, has hitherto been used as an emulsifier in the food industry or the like and is known not to impart an astringent taste and an unpleasant texture.

Further, when the fermented milk food of the present invention is stored in a refrigerator at 10°C or less, the viable cell count of the fermentation microorganism can be maintained at an appropriate one (e.g., 1×10^5 cfu/g or more) for a long period of time (e.g., 3 to 4 weeks) to suppress a deterioration in taste and flavor due to an increase in sour taste.

Embodiments for Carrying Out the Invention

[0010] A fermented milk food of the present invention is a food which includes viable cells of a fermentation microorganism, which is obtained by cooling a water-in-oil emulsion to 10°C or less, in which the water-in-oil emulsion is an emulsion which is obtained by mixing an edible oil and fat having a melting point of from 30 to 40°C with fermented milk and/or natural cheese.

Examples of the edible oil and fat having a melting point of from 30 to 40°C include cacao butter, lard, refined palm oil having a medium melting point (exemplary melting point: 34 to 36°C), hydrogenated rapeseed oil, hydrogenated soybean oil (especially one having a lower melting point among various hydrogenated soybean oils; exemplary melting point: 39°C), and tallow.

The cacao butter has a melting point of from 32 to 36°C, and hence is preferably used in the case of producing an oil and fat-based confectionery material (e.g., chocolate) in the present invention. In this Description, the oil and fat-based confectionery material encompasses both of a material to be used in combination with another material for producing confectionery as a finished product (e.g., chocolate as one of the materials for ganache), and a material that corresponds to the fermented milk food of the present invention by itself without being used in combination with another material (e.g., one constituting chocolate as a finished product).

When the fermented milk food of the present invention is an oil and fat-based confectionery material, the ratio of the cacao

butter in the edible oil and fat having a melting point of from 30 to 40°C is preferably from 10 to 100 wt%, more preferably from 20 to 100 wt%, still more preferably from 30 to 100 wt%, and particularly preferably from 40 to 100 wt%, from the viewpoint of imparting a satisfactory chocolate taste and flavor.

[0011] In addition, when the fermented milk food of the present invention is an oil and fat-based confectionery material, the ratio of the cacao butter in the fermented milk food is preferably 3 wt% or more, more preferably 6 wt% or more, still more preferably 12 wt% or more, and particularly preferably 18 wt% or more, from the viewpoint of imparting a satisfactory chocolate taste and flavor. The upper limit value of the ratio is preferably 90 wt%, more preferably 80 wt%, still more preferably 70 wt%, and particularly preferably 60 wt%, from the viewpoint of obtaining a water-in-oil emulsion having satisfactory properties.

The refined palm oil having a medium melting point has, for example, a melting point of from 34 to 36°C, and hence may be used in combination with, for example, cacao butter in order to produce an oil and fat-based confectionery material. The refined palm oil having a medium melting point has hitherto been widely used as a material for an oil and fat in an oil and fat-based confectionery material such as chocolate.

The ratio of the edible oil and fat having a melting point of from 30 to 40°C in the fermented milk food of the present invention is preferably from 25 to 60 wt%, more preferably from 30 to 55 wt%,

and still more preferably from 35 to 50 wt%, from the viewpoint of obtaining a water-in-oil emulsion having satisfactory properties.

[0012] In the present invention, in addition to the edible oil and fat having a melting point of from 30 to 40°C, there may be used any one or both of an edible oil and fat having a melting point of less than 30°C and an edible oil and fat having a melting point of more than 40°C.

In this Description (i.e. in the present invention), the "edible oil and fat having a melting point of from 30 to 40°C," in the case where the edible oil and fat includes a plurality of ingredients, means not only a compound (i.e. oil and fat) having a melting point of from 30 to 40°C and having a specific chemical structure (e.g., chemical formula or crystal structure), but also an entire edible oil and fat which partly includes a compound (i.e. oil and fat) whose melting point does not fall within a range of from 30 to 40°C, and which has a melting point of from 30 to 40°C as a whole. For example, although the cacao butter includes a compound (i.e. oil and fat) having a melting point of less than 30°C, the cacao butter has a melting point of from 30 to 40°C as a whole, and hence corresponds to the "edible oil and fat having a melting point of from 30 to 40°C." In addition, the amount of the edible oil and fat having a melting point of from 30 to 40°C is not expressed as the amount of the compound (i.e. oil and fat) having a melting point of from 30 to 40°C and having a specific chemical structure, but is expressed as the amount of the entire

edible oil and fat which includes a compound (i.e. oil and fat) whose melting point does not fall within a range of from 30 to 40°C (e.g., the total amount of the cacao butter).

[0013] Examples of the edible oil and fat having a melting point of less than 30°C include rapeseed oil, soybean oil, and the like.

The amount of the edible oil and fat having a melting point of less than 30°C is preferably from 0 to 30 parts by weight, more preferably from 0 to 20 parts by weight, and still more preferably from 0 to 10 parts by weight, with respect to 100 parts by weight of the edible oil and fat having a melting point of from 30 to 40°C, from the viewpoint of making satisfactory the solid form of the fermented milk food of the present invention.

Examples of the edible oil and fat having a melting point of more than 40°C include tallow (exemplary melting point: 41°C), hydrogenated soybean oil (especially, one having a higher melting point among various hydrogenated soybean oils; exemplary melting point: 42°C), and the like.

The amount of the edible oil and fat having a melting point of more than 40°C is preferably from 0 to 20 parts by weight, more preferably from 0 to 10 parts by weight, and still more preferably from 0 to 5 parts by weight, with respect to 100 parts by weight of the edible oil and fat having a melting point of from 30 to 40°C, from the viewpoint of, for example, workability in mixing with fermented milk and/or natural cheese.

In the case of using the edible oil and fat having a melting

point of more than 40°C, the melting point of the edible oil and fat is preferably 55°C or less, more preferably 50°C or less, and still more preferably 45°C or less.

[0014] In this Description, the fermented milk refers to one obtained by subjecting raw materials including raw material milk to fermentation.

Examples of the raw material milk include animal milk such as cow's milk or processed products thereof (for example, skim milk, whole milk powder, skim milk powder, condensed milk, casein, milk serum, fresh cream, compound cream, butter, or butter milk powder), plant milk such as soybean milk derived from soybean, and the like.

An example of the raw materials of the fermented milk is one called fermented milk raw material mix.

The fermented milk raw material mix refers to a mixture including raw material milk and other ingredients, and may be obtained, for example, by dissolving raw materials to be generally used for producing fermented milk such as raw material milk, water, and other optional ingredients (e.g., sugar, saccharides, sweeteners, acidulants, minerals, vitamins, and flavorings) by heating, and mixing the raw materials. In addition, a thickener or a gelling agent such as pectin, guar gum, xanthan gum, carrageenan, or modified starch may be added to a culture solution including skim milk powder, a whey degradation product, or the like to produce fermented milk having a viscosity of from 100 to 5,000 mPa·s.

[0015] One kind or two or more kinds selected from, for example:

rod-shaped lactic acid bacteria such as *Lactobacillus bulgaricus*, *Lactobacillus lactis*, *Lactobacillus gasseri*, and *Lactobacillus helveticus*; coccus-shaped lactic acid bacteria such as *Streptococcus thermophilus*; Bifidobacteria; propionic acid bacteria; and yeast may be used as the fermentation microorganism to be inoculated as a starter into the raw materials of the fermented milk. In addition to viable cells of those fermentation microorganisms, dead cells of fermentation microorganisms each having, for example, an improving effect for improving an intestinal environment may be contained.

Of those, so-called yogurt (i.e. one specified in the international standard), which is a combination of *Lactobacillus bulgaricus* and *Streptococcus thermophilus*, is preferably used from the viewpoint of, for example, producing a fermented milk food having a large viable cell count easily and efficiently under the conditions of the production method of the present invention.

A fermentation temperature in obtaining the fermented milk is from 30 to 48°C, preferably from 35 to 48°C, more preferably from 37 to 45°C, and still more preferably from 38 to 43°C, from the viewpoint of, for example, the production efficiency of the fermented milk.

A fermentation time is from 2 to 20 hours, preferably from 2 to 15 hours, more preferably from 3 to 10 hours, and still more preferably from 3 to 6 hours, from the viewpoint of, for example, the production efficiency of the fermented milk.

[0016] The milk fat content of the fermented milk to be used in the present invention is not particularly limited from the viewpoint of forming the water-in-oil emulsion of the present invention, and is preferably from 0.5 to 8 wt%, more preferably from 1 to 7 wt%, still more preferably from 2 to 6 wt%, and particularly preferably from 3 to 5 wt%, from the viewpoint of imparting a satisfactory taste and flavor to the fermented milk food.

 The milk solids non-fat (i.e. solids-not-fat) of the fermented milk to be used in the present invention is preferably from 1 to 30 wt%, more preferably from 3 to 25 wt%, still more preferably from 4 to 20 wt%, and particularly preferably from 5 to 15 wt%, from the viewpoints of, for example, securing the viable cell count of the fermentation microorganism and imparting a satisfactory taste and flavor to the fermented milk food.

 The pH of the fermented milk is preferably from 3 to 5, and more preferably from 3.5 to 4.5. When the pH is 3 or more, the pH of the mixture of the edible oil and fat and the fermented milk can be increased, and hence emulsification can be performed more smoothly, as compared to the case where the pH is less than 3. When the pH is 5 or less, the fermented milk has a property of being easily emulsified with the edible oil and fat, and hence emulsification can be performed more smoothly, as compared to the case where the pH is more than 5.

 As the fermented milk, there may be used a water-in-oil emulsion as well as an oil-in-water emulsion (i.e. normal fermented milk).

[0017] The ratio of the fermented milk in the fermented milk food of the present invention is preferably 5 wt% or more, more preferably 10 wt% or more, still more preferably 15 wt% or more, and particularly preferably 20 wt% or more, from the viewpoints of imparting the taste and flavor of the fermented milk to the fermented milk food and increasing the viable cell count of the fermentation microorganism. The upper limit value of the ratio is preferably 70 wt%, more preferably 60 wt%, still more preferably 50 wt%, and particularly preferably 40 wt%, from the viewpoint of sufficiently securing the amount of the edible oil and fat having a melting point of from 30 to 40°C.

Examples of the natural cheese to be used in the present invention include Edam, Emmentaler, Camembert, cream (i.e. cream cheese), Gouda, Cheddar, Parmesan, blue cheese, Quark, and Mascarpone. Of the natural cheeses, Quark, Mascarpone, or cream cheese is preferably used in the present invention, due to the taste, texture, and characteristics thereof including appropriate physical properties.

[0018] Examples of the viable cells of the fermentation microorganism contained in the natural cheese to be used in the present invention include lactic acid bacteria, Bifidobacteria, propionic acid bacteria, and yeast. Preferred examples of the viable cells include propionic acid bacteria.

The fermented milk food of the present invention may contain other ingredients other than the edible oil and fat and the fermented

milk and/or natural cheese.

Such other ingredients are not particularly limited as long as the ingredients each correspond to a food, a food additive, or a mixture thereof, and examples thereof include lecithin, a flavoring, and water for preparing an emulsion to be described later containing an edible oil and fat before being mixed with fermented milk.

The ratio of water (i.e. water in the fermented milk and/or natural cheese, and any other water) in the fermented milk food (which means oil and fat-based confectionery material in the case where the fermented milk food is confectionery containing an oil and fat-based confectionery material) of the present invention is preferably from 20 to 80 wt%, more preferably from 30 to 70 wt%, and still more preferably from 40 to 60 wt%, from the viewpoint of obtaining a water-in-oil emulsion having satisfactory properties.

[0019] The fermented milk food of the present invention is one obtained by cooling a water-in-oil emulsion to 10°C or less, in which the water-in-oil emulsion is one obtained using the above-mentioned edible oil and fat and the above-mentioned fermented milk and/or natural cheese. The cooling to 10°C or less can provide a solid form that can be eaten with the first two fingers of a person.

In this Description, the "solid form" refers to a form that does not have such fluidity enough for being applied like margarine or fat spread, and at least is finally broken into two or more pieces when an external force is gradually applied thereto at a temperature of 10°C.

The fermented milk food in a solid form (which means oil and fat-based confectionery material in the case where the fermented milk food is confectionery containing an oil and fat-based confectionery material) of the present invention has a viable cell count of a fermentation microorganism of preferably 1×10^6 cfu/g or more, more preferably 1×10^7 cfu/g or more, and particularly preferably 1×10^8 cfu/g or more immediately after its production.

The fermented milk food in a solid form of the present invention has a viable cell count of a fermentation microorganism of preferably 1×10^5 cfu/g or more, more preferably 1×10^6 cfu/g or more, and particularly preferably 1×10^7 cfu/g or more at the time point after 2 weeks from its production.

[0020] Examples of the fermented milk food of the present invention include chocolates, confectionery containing chocolates, a chilled dessert, and a food obtained by incorporating natural cheese into an edible oil and fat.

Specifically, examples of the chocolates include chocolate, quasi chocolate, chocolate confectionery, and quasi chocolate confectionery. The chocolates may be ones that can be stored at normal temperature, or may be ones to be kept refrigerated that need to be stored at 10°C or less (e.g., fresh cream chocolate).

An example of the confectionery containing chocolates is ganache.

An example of the chilled dessert is a chocolate mousse-like food. In this case, an example of the chocolate mousse-like food

is a dessert obtained by mixing a W/O chocolate-like continuous phase containing yogurt as a water phase (first liquid; corresponding to the oil and fat-based confectionery material described above) into a gelation liquid (second liquid) such as an agar-agar liquid and dispersing the mixture, followed by solidification.

An example of the food obtained by incorporating natural cheese into an edible oil and fat is a food obtained by incorporating natural cheese having fluidity comparable (i.e. almost the same or the like) to that of yogurt into an edible oil and fat.

[0021] Next, a method for producing the fermented milk food of the present invention is described.

The method for producing the fermented milk food of the present invention includes: a mixing step of mixing an edible oil and fat having a melting point of from 30 to 40°C whose temperature is adjusted within a range of from -2°C to +4°C with reference to the melting point with fermented milk and/or natural cheese to obtain a water-in-oil emulsion having a temperature within a range of from -2°C to +4°C with reference to the melting point of the edible oil and fat; and a cooling step of cooling the water-in-oil emulsion to 10°C or less to obtain a fermented milk food in a solid form including viable cells of a fermentation microorganism.

Each of the steps is described in detail below.

[0022] [Mixing step]

First, the temperature of an edible oil and fat having a melting point of from 30 to 40°C is adjusted within a range of from -2°C

to +4°C, preferably within a range of from -1°C to +3°C, and more preferably within a range of from 0°C to +3°C, with reference to the melting point of the edible oil and fat. The adjustment of the temperature in this step is performed with reference to the melting point of the edible oil and fat having a melting point of from 30 to 40°C even when the entire edible oil and fat to be mixed with fermented milk and/or natural cheese includes an edible oil and fat as an optional ingredient whose melting point does not fall within a range of from 30 to 40°C.

When the temperature is to be adjusted to less than -2°C with reference to the melting point, it becomes difficult to obtain the water-in-oil emulsion by mixing the edible oil and fat with the fermented milk and/or natural cheese.

When the temperature is to be adjusted to more than +4°C with reference to the melting point, it becomes difficult to allow a water phase to be contained in the continuous phase of the edible oil and fat. As a result, after the cooling of the water-in-oil emulsion obtained by mixing the edible oil and fat with the fermented milk and/or natural cheese, an oil content floats up to the surface of a hardened water-in-oil emulsion (i.e. fermented milk food in a solid form), which causes a deterioration in external appearance, or a water droplet floats up to the surface of a hardened water-in-oil emulsion, which causes a deterioration in storage stability of the fermented milk food, such as an increase in susceptibility of the fermented milk food to mold growth.

In the case of using two or more kinds of the edible oils and fats each having a melting point of from 30 to 40°C, one kind thereof only needs to satisfy the condition of "within a range of from -2°C to +4°C with reference to the melting point." However, it is preferable that all of the two or more kinds satisfy the condition of "within a range of from -2°C to +4°C with reference to the melting point." In particular, when the edible oil and fat contains cacao butter, the temperature of the edible oil and fat is adjusted within a range of from -2°C to +4°C, preferably within a range of from -1°C to +3°C, and more preferably within a range of from 0°C to +3°C, with reference to the melting point of the cacao butter.

[0023] The temperature and amount of the fermented milk and/or natural cheese with which the edible oil and fat is mixed need to be such a temperature and amount that a water-in-oil emulsion having a temperature within a range of from -2°C to +4°C with reference to the melting point of the edible oil and fat having a melting point of from 30 to 40°C can be prepared.

For example, when the melting point of the edible oil and fat is 36°C, the temperature of the water-in-oil emulsion obtained by mixing the edible oil and fat with the fermented milk and/or natural cheese only needs to fall within a range of from 34 to 40°C, and the temperature of the fermented milk and/or natural cheese may be less than 34°C or more than 40°C.

The temperature of the fermented milk and/or natural cheese before being mixed with the edible oil and fat falls preferably

within a range of from -4°C to $+6^{\circ}\text{C}$, more preferably within a range of from -3°C to $+5^{\circ}\text{C}$, still more preferably within a range of from -2°C to $+4^{\circ}\text{C}$, and particularly preferably within a range of from -1°C to $+3^{\circ}\text{C}$, with reference to the melting point of the edible oil and fat having a melting point of from 30 to 40°C , from the viewpoint of obtaining a water-in-oil emulsion having more satisfactory properties.

[0024] It is preferable that the edible oil and fat having a melting point of from 30 to 40°C is formed into an emulsion form before being mixed with the fermented milk and/or natural cheese.

In this case, an example of a method for producing the edible oil and fat having an emulsion form is a method involving: preparing a material for forming an oil phase containing 40 to 80 wt% of an edible oil and fat (in the case of containing an edible oil and fat whose melting point does not fall within a range of from 30 to 40°C , this ratio means the ratio of the entire oil and fat including this edible oil and fat) and 0.1 to 3 wt% of lecithin, provided that the amount of the entire emulsion is defined as 100 wt%; and then mixing the material for forming an oil phase with a material for forming a water phase containing 19.9 to 59.9 wt% of water and a water-soluble ingredient (e.g., a flavoring) that may be optionally blended, to thereby obtain an emulsion.

[0025] Next, the edible oil and fat having a melting point of from 30 to 40°C is mixed with the fermented milk and/or natural cheese.

The viscosity of the edible oil and fat at the time of the mixing (in the case of using an edible oil and fat whose melting point does not fall within a range of from 30 to 40°C in combination, this viscosity means the viscosity of the entire oil and fat including this edible oil and fat; and in the case that the edible oil and fat has an emulsion form, this viscosity means the viscosity of the emulsion) and the viscosity of the fermented milk and/or natural cheese are each preferably from 100 to 5,000 mPa·s, more preferably from 500 to 4,000 mPa·s, and still more preferably from 1,000 to 3,000 mPa·s, from the viewpoint of, for example, ease of formation of the water-in-oil emulsion.

It is preferable that the viscosity of the edible oil and fat is comparable (i.e. almost the same or the like) to the viscosity of the fermented milk and/or natural cheese, from the viewpoint of, for example, ease of formation of the water-in-oil emulsion. A difference between the viscosity of the edible oil and fat and the viscosity of the fermented milk is preferably 2,000 mPa·s or less, more preferably 1,000 mPa·s or less, and still more preferably 500 mPa·s or less.

An example of the mixing method is a method involving feeding each of the edible oil and fat and the fermented milk and/or natural cheese through sanitary piping, followed by inline mixing in a mixing machine.

The sanitary piping refers to piping whose inside has been brought into an aseptic state so as to avoid a risk of contamination

of an object to be fed with microorganisms.

The inline mixing refers to mixing using facilities connected via sanitary piping in all the supply (i.e. feeding), mixing, and storing after the mixing, of the edible oil and fat and the fermented milk and/or natural cheese.

[0026] [Cooling step]

After the above-mentioned mixing step, the resultant water-in-oil emulsion is cooled to 10°C or less to obtain a fermented milk food in a solid form containing viable cells of a fermentation microorganism.

The temperature of the cooling is preferably 10°C or less, more preferably 9°C or less, and still more preferably 8°C or less, from the viewpoints of preventing a steep increase in viable cell count of the fermentation microorganism and suppressing a deterioration in taste and flavor due to an increase in sour taste of the fermented milk food.

The lower limit value of the temperature of the cooling is preferably 0°C, more preferably 1°C, and still more preferably 2°C, from the viewpoint of inhibiting a decrease in viable cell count of the fermentation microorganism.

Examples

[0027] The present invention is now described by way of Example. In Example and Comparative Examples, "%" means "wt% (weight percent)" except for the case of lactic acid acidity.

[Example 1]

A material for forming an oil phase was prepared by mixing 30% (ratio in 100% of the total amount of cacao butter-containing fat spread; the same applies hereinafter) of refined palm oil having a medium melting point (melting point: 34°C) heated to 60°C, 30% of cacao butter (melting point: 34°C) heated to 60°C, and 0.5% of lecithin. On the other hand, a material for forming a water phase was prepared by mixing 39.5% of water heated to 60°C and a small amount of a flavoring. Next, the material for forming a water phase was added to the material for forming an oil phase. The resultant mixture was preliminarily emulsified by stirring at about 60°C for 10 minutes and then subjected to pasteurization treatment at 95°C for 30 minutes. After that, the mixture was quickly cooled to 10°C and then kneaded to obtain cacao butter-containing fat spread having an oil and fat content of 60%.

[0028] Meanwhile, 80% (ratio in 100% of the total amount of fermented milk; the same applies hereinafter) of water, 10% of skim milk powder, and 10% of fresh cream having a milk fat content of 47% were dissolved and homogenized by mixing/stirring and then subjected to heat pasteurization at 90°C for 5 minutes. After that, the mixture was cooled to about 40°C and inoculated with *Lactobacillus bulgaricus* and *Streptococcus thermophilus* as lactic acid bacteria. Mixing was conducted so that the lactic acid bacteria became homogeneous, and then the mixture was fermented at 40°C. At the time point when the lactic acid acidity became 1.0% (i.e. the time

point of 6 hours after the inoculation with the lactic acid bacteria), the fermented product was cooled to 10°C and the fermentation was stopped to obtain fermented milk having a milk fat content of 4.7% and a milk solid non-fat content of 10%.

[0029] The resultant fat spread (i.e. water-in-oil emulsion) and the resultant fermented milk were each heated to 35°C, fed with a pump (product name: Heishin Mohno Pump (registered trademark), manufactured by HEISHIN Ltd.) so that the flow rates were 105 kg/h and 45 kg/h, respectively, and subjected to inline mixing through use of a mixing machine (product name: Micro Blender, manufactured by IZUMI FOOD MACHINERY Co., Ltd.) at a rotation number of 3,000 rpm to obtain a water-in-oil emulsion having a weight ratio "fat spread:fermented milk" of 70:30.

The viscosities of the fat spread (i.e. water-in-oil emulsion) and the fermented milk at the time of the mixing were 2,100 mPa·s and 2,500 mPa·s, respectively.

The water-in-oil emulsion was poured into a mold and cooled in a refrigerator (accommodating space temperature: 5°C) overnight (about 15 hours) so that the temperature of the emulsion became 10°C or less.

The water-in-oil emulsion after the cooling had a solid form similar to that of normal chocolate, and was able to be eaten with the first two fingers of a person, although the water-in-oil emulsion contained the fermented milk.

The water-in-oil emulsion had a viable cell count of lactic

acid bacteria of 15×10^7 cfu/g immediately after its production, and had a viable cell count of lactic acid bacteria of 5×10^7 cfu/g at the time point after the emulsion was stored in a refrigerator at a temperature of 10°C for 2 weeks.

It was confirmed that the resultant water-in-oil emulsion had a rapid melt-in-the-mouth property and a smooth texture at the time point immediately after its production and at the time point after the emulsion was stored in a refrigerator for 2 weeks after its production, and was able to be provided as chocolate containing 21% of cacao butter with no oil or the like floating up to the surface.

[0030] [Comparative Example 1]

An experiment was performed in the same manner as in Example 1 except that the temperature of each of the cacao butter-containing fat spread and the fermented milk before being fed for inline mixing was changed from 35°C to 10°C or less (about 8°C).

As a result, the cacao butter-containing fat spread was not able to be fed to be extruded into a mixing machine, and a water-in-oil emulsion was not able to be obtained.

[0031] [Comparative Example 2]

An experiment was performed in the same manner as in Example 1 except that the temperature of each of the cacao butter-containing fat spread and the fermented milk before being fed for inline mixing was changed from 35°C to 50°C.

As a result, a mixture of the cacao butter-containing fat spread and the fermented milk was not formed into a water-in-oil emulsion,

and a solid product as a water-in-oil emulsion was not able to be obtained even when the mixture was cooled in a refrigerator.

In addition, the product obtained through the cooling in a refrigerator was in a solid form but was not a water-in-oil emulsion, and hence was poor in taste and flavor and texture (in particular, smooth texture) as compared to the water-in-oil emulsion obtained in Example 1. Also, oil floated up to the surface of the solid product after the cooling.

Further, the examination of viable cells of lactic acid bacteria contained in the solid product after the cooling showed that the lactic acid bacteria were killed and the viable cell count was 1×10^5 cfu/g or less.

Claims

1. A method for producing a fermented milk food in a solid form, comprising :

a mixing step of mixing an edible oil and fat having a melting point of from 30 to 40⁰C whose temperature is adjusted within a range of from -2⁰C to +4⁰C with reference to the melting point with fermented milk and/or natural cheese to obtain a water-in-oil emulsion having a temperature within a range of from -2⁰C to +4⁰C with reference to the melting point of the edible oil and fat; and

a cooling step of cooling the water-in-oil emulsion to 10⁰C or less to obtain the fermented milk food in a solid form comprising viable cells of a fermentation microorganism.

2. The method for producing the fermented milk food according to claim 1, wherein the edible oil and fat comprises cacao butter.

3. The method for producing the fermented milk food according to claim 1 or 2, wherein the viable cells of the fermentation microorganism comprise lactic acid bacteria.

4. The method for producing the fermented milk food according to claim 3, wherein the lactic acid bacteria comprise *Lactobacillus bulgaricus* and *Streptococcus thermophilus*.

5. The method for producing the fermented milk food according to any one of claims 1 to 4, wherein the fermented milk food comprises: an oil and fat-based confectionery material having a cacao butter content of 3 wt% or more and a viable cell count of the fermentation microorganism of 1×10^6 cfu/g or more; confectionery containing the oil and fat-based confectionery material and another material; or a food obtained by incorporating natural cheese into the edible oil and fat.

6 . The method for producing the fermented milk food according to any one of claims 1 to 5, wherein the mixing step is performed by mixing an emulsion comprising an oil phase, which contains the edible oil and fat, and a water phase with fermented milk and/or natural cheese.

7. The method for producing the fermented milk food according to claim 6, wherein the emulsion to be used in the mixing step is produced by mixing a material for forming the oil phase containing the edible oil and fat with a material for forming the water phase, stirring the mixture at a temperature of 50°C or more, followed by cooling to 20°C or less, and then increasing a temperature of the mixture to a temperature within a range of from -2°C to +4°C with reference to the melting point of the edible oil and fat.