

DESCRIPTION

**FRESH CREAM HAVING RICH BODY TASTE AND METHOD FOR
PRODUCING SAME**

Technical Field

[0001]

The present invention relates to a fresh cream having rich body taste and to a method for producing the fresh cream.

Background Art

[0002]

JP 2008-109940 A (Patent Literature 1 mentioned below) discloses a method for producing a cream including subjecting raw milk to a membrane concentration treatment and conducting centrifugation. This document discloses filtration treatments using an RO (reverse osmosis) membrane, an NF (nano filtration) membrane and an UF (ultrafiltration) membrane as examples of the membrane concentration treatment. Furthermore, this document discloses that water, potassium and sodium can be decreased by conducting a membrane concentration treatment by using a nano filtration membrane (paragraph [0016]). In addition, Example 1 of this document discloses a result of the working in which raw milk including solids not fat (SNF) with a concentration of 8.9% was subjected to a nano filtration membrane treatment to obtain condensed milk with an SNF concentration of 13.4%, and the condensed milk was centrifuged to obtain a cream (paragraph [0027]). It was considered that the cream obtained in Example 1 of this document includes fat at a content of 47.5% and solids not fat at a content of 7%.

[0003]

JP 2002-51699 A (Patent Literature 2 mentioned below) discloses a method for

producing processed milk, including centrifuging raw milk and subjecting the product to a reverse osmosis (RO) membrane treatment.

[0004]

JP 2002-253116 A (Patent Literature 3 mentioned below) discloses a method for producing processed milk, including centrifuging raw material milk and subjecting the product to a membrane treatment to thereby increase the concentration of solids not fat and the concentration of calcium and decrease the concentration of sodium. This document discloses processed milk containing 10% by weight or more and 12 % by weight or less of solids not fat, and containing calcium and sodium at a concentration ratio of 2.5 or more and 4 or less (paragraph [0009]).

Citation List

Patent Literature

[0005]

Patent Literature 1: JP 2008-109940 A

Patent Literature 2: JP 2002-51699 A

Patent Literature 3: JP 2002-253116 A

Summary of Invention

Technical Problem

[0006]

The present invention aims at providing a fresh cream that has a relatively low fat content yet has rich body taste and to a method for producing the fresh cream.

[0007]

The present invention aims at providing a fresh cream that is stable at a relatively low overrun and has a suitable viscosity and to a method for producing the fresh cream.

Solution to Problem

[0008]

The present invention is essentially based on the finding that a fresh cream that contains relatively low fat yet has rich body taste can be obtained by controlling the concentration of solids not fat (SNF) and the concentration of salts to obtain desalted condensed milk, and centrifuging this desalted condensed milk.

[0009]

The first aspect of the present invention relates to a method for producing a fresh cream. This method includes a first nano filtration treatment step and a centrifugation step. The first nano filtration treatment step is a step for obtaining nano-filtered condensed milk by conducting a desalination treatment including concentrating raw material milk by using a nano filtration membrane to adjust the residual rate of the sodium to 35% or more and 70% or less. The centrifugation step is a step for obtaining a fresh cream by centrifuging the nano-filtered condensed milk. The nano-filtered condensed milk has a solid content concentration of 20% by weight or more and 35% by weight or less. The fresh cream contains 20% by weight or more and 55% by weight or less of a fat content and contains 9% by weight or more and 11% by weight or less of solids not fat.

[0010]

In a preferable embodiment of the first aspect of the present invention, the method for producing a fresh cream further includes a dilution step and a second nano filtration treatment step after the first nano filtration treatment step, and also includes a centrifugation step after these steps. The dilution step is a step including adding a water content to the nano-filtered condensed milk obtained in the first nano filtration treatment step to obtain nano-filtered milk. The second nano filtration treatment step is a step including concentrating the nano-filtered milk obtained in the dilution step by

using a nano filtration membrane to obtain desalted condensed milk. The centrifugation step is a step for obtaining a fresh cream by centrifuging the desalted condensed milk. The nano-filtered condensed milk is sufficiently desalted by diluting the nano-filtered condensed milk obtained in the first nano filtration treatment step with a water content, and subjecting again the dilution to a nano filtration treatment step.

[0011]

In a preferable embodiment of the first aspect of the present invention, the raw material milk is formed of a skimmed milk component, and the method for producing a fresh cream includes a first nano filtration treatment step and a centrifugation step. The skimmed milk component is obtained by centrifuging a milk raw material. The first nano filtration treatment step is a step for obtaining desalted skimmed condensed milk by conducting a desalination treatment on the skimmed milk component obtained by centrifuging the milk raw material by using a nano filtration membrane to thereby adjust the residual rate of the sodium contained in the skimmed milk component to 35% or more and 70% or less. The centrifugation step is a step for obtaining a fresh cream by centrifuging a mixture of a cream component obtained by centrifuging the milk raw material and the desalted skimmed condensed milk. By subjecting only the skimmed milk component to the nano filtration treatment, a membrane separation treatment can be conducted after reducing the treating fluid under the reduction or absence of milk fat components having relatively high particle sizes and the like. Therefore, suppression of the contamination and clogging (fouling) of the treatment membrane (in accordance with this, the burden of washing of the treatment membrane after each nano filtration treatment step (the amount of a detergent, the washing time and the like) can be decreased) and lowering of the surface area of the treatment membrane can be expected, and thus efficient nano filtration treatments are enabled.

[0012]

In a preferable embodiment of the first aspect of the present invention, the first

nano filtration treatment step is a step of conducting a dialysis filtration treatment by using a nano filtration membrane. By conducting the dialysis filtration treatment by using a nano filtration membrane, the desalination rate can be improved. Therefore, the concentration of the salts (salt content) in the fresh cream is easily adjusted to a desired concentration.

[0013]

In a preferable embodiment of the first aspect of the present invention, the method for producing a fresh cream further includes a reverse osmosis filtration treatment step, a desalted milk obtaining step and a step of obtaining desalted condensed milk after the first nano filtration treatment step, and also includes a centrifugation step after these steps. The reverse osmosis filtration treatment step is a step for obtaining a permeate of a reverse osmosis membrane by subjecting the permeate obtained in the first nano filtration treatment step to a reverse osmosis filtration treatment. The desalted milk obtaining step is a step for obtaining desalted milk (desalted diluted milk) by adding either or both of the permeate of the reverse osmosis membrane and a water content to the nano-filtered condensed milk obtained in the first nano filtration treatment step. The centrifugation step is a step for obtaining a fresh cream by centrifuging the desalted condensed milk. The water content obtained by the reverse osmosis filtration treatment of the permeate can be reused in the dilution step and the like.

[0014]

The second aspect of the present invention relates to a method for producing a whipped cream. This method includes a step of stirring a fresh cream obtained by any of the above-mentioned methods for producing a fresh cream. In the whipped cream obtained by this way, the overrun can be adjusted to 70% or more and 85% or less, and the viscosity (stickiness) can be adjusted to 100 mPa·s or more and 200 mPa·s or less. At this time, a whipped cream containing relatively low fat and having excellent rich body taste and stickiness can be produced based on the method for producing a fresh

cream of the present invention.

[0015]

The third aspect of the present invention relates to a fresh cream obtained by any of the above-mentioned methods for producing a fresh cream.

[0016]

The fourth aspect of the present invention relates to a fresh cream-containing food product. This food product is a fresh cream-containing food product containing the above-mentioned fresh cream and an acidic solution (an acidulant or the like) having a pH of 1 or more and 5 or less, wherein the fresh cream is 50 parts by weight to 90 parts by weight and the acidic solution is 10 parts by weight to 50 parts by weight when the fresh cream-containing food product is 100 parts by weight. At this time, the fresh cream-containing food product containing the fresh cream of the present invention and the acidic solution in combination can suppress the lowering of the pH even the food product contains a large amount of the acidic solution, and thus the fresh cream of the present invention can mask acidic flavor.

Advantageous Effects of Invention

[0017]

Therefore, according to the present invention, a fresh cream that has a relatively low fat content yet has rich body taste and a method for producing the fresh cream can be provided.

[0018]

Furthermore, according to the present invention, a fresh cream that is stable at a relatively low overrun and has a suitable viscosity and a method for producing the fresh cream can be provided.

Brief Description of Drawings

[0019]

Fig. 1 is a graph as an alternative to a drawing, showing the result of the sensory evaluation of the fresh creams in Test Example 4.

Fig. 2 is a graph as an alternative to a drawing, showing the result of the sensory evaluation of the fresh creams in Test Example 5.

Description of Embodiments

[0020]

The first aspect of the present invention relates to a method for producing a fresh cream. This method includes a first nano filtration treatment step and a centrifugation step. The first nano filtration treatment step is a step for obtaining nano-filtered condensed milk by conducting a desalination treatment including concentrating raw material milk by using a nano filtration membrane to adjust the residual rate of the sodium to 35% or more and 70% or less. The centrifugation step is a step for obtaining a fresh cream by centrifuging the nano-filtered condensed milk. Furthermore, the nano-filtered condensed milk has a solid content concentration of 20% by weight or more and 35% by weight or less. Furthermore, the fresh cream contains 20% by weight or more and 55% by weight or less of a fat content and contains 9% by weight or more and 11% by weight or less of solids not fat.

[0021]

A general method for producing a fresh cream is already known. In the present invention, a fresh cream can be produced by using an already-known apparatus for producing a fresh cream, and by suitably adopting conditions known to persons skilled in the art. The method for producing a fresh cream will be explained below. However, the present invention is not limited to the following examples, and also encompasses methods obtained by suitably modifying the examples explained below within the scope that is obvious to persons skilled in the art.

[0022]

Raw material milk generally contains a cream component and a skimmed milk component. A fresh cream can be generally obtained by centrifuging raw material milk to thereby separate the raw material milk into a cream component and a skimmed milk component. The raw material milk may be raw milk, or may be non-homogenized milk or the like. Desalted full-fat condensed milk and desalted skimmed condensed milk are milk that contains solid contents with a more enhanced concentration than those in raw milk and the like, and contains much solids not fat.

[0023]

The nano filtration treatment step is a step for obtaining nano-filtered condensed milk by concentrating and desalinating raw material milk. By suitably adjusting the conditions of the desalination, the desalination rate can be adjusted, and the concentrations of the other unpleasant taste components and salts (sodium, potassium and the like) can be adjusted. By adjusting the concentrations of the other unpleasant taste components and salts, the flavor of the obtained fresh cream is finely adjusted. It is preferable to concentrate the nano-filtered condensed milk so as to have a solid content concentration of 20% by weight or more and 35% by weight or less by the nano filtration treatment step. By conducting such concentration treatment, although the operations of the steps for the production of the fresh cream increase, it becomes possible to obtain a fresh cream having rich body taste and excellent flavor yet containing relatively low fat, with an increased concentration of solids not fat.

[0024]

In the nano filtration treatment step, the treatment temperature is preferably 1°C or more and 30°C or less, and further preferably 1°C or more and 10°C or less from the viewpoint of suppression of the growth of bacteria.

[0025]

In the nano filtration treatment step, the treatment conditions therefor during

the filtration may be either under a negative pressure or under pressurization.

Furthermore, in the case when the filtration is conducted under pressurization, the treatment pressure therefor is, for example, preferably 1 MPa or more and 5 MPa or less, and further preferably 1 MPa or more and 3 MPa or less from the viewpoint of increasing of the filtration velocity by suppressing the clogging of the filtration.

[0026]

In the nano filtration treatment step, one of or a combination of two or more of reverse osmosis (RO) filtration, a nano filtration (NF) method and a dialysis filtration (DF) method can be used. In the present invention, filtration using nano filtration or dialysis filtration is preferable, and filtration using dialysis filtration using a nano filtration membrane is further preferable. Since the other unpleasant taste components and salts are removed by adopting these methods, the obtained fresh cream has fine flavor. Furthermore, in the nano filtration treatment step, it is preferable to decrease sodium salts or potassium salts without losing calcium salts. After the nano filtration step has been conducted, the residual rate of the calcium salts is preferably 80% by weight or more, more preferably 90% by weight or more, and further preferably 95% by weight or more.

[0027]

The reverse osmosis (RO) filtration is a method in which filtration is conducted by using a reverse osmosis membrane (RO membrane) and utilizing an osmotic pressure. The RO membrane is a separation membrane that mainly allows the permeation of water. Examples of the material of the RO membrane include polyamides. Examples of the shape of the RO membrane include a plane membrane, a spiral membrane, a plate-like membrane and the like.

[0028]

The nano filtration (NF) is a method in which filtration is conducted by using a nano filtration membrane (an NF membrane: for example, a membrane-like filter having

nano-sized through-holes (pore size: 0.5 to 2 nm, and the like)) and utilizing an osmotic pressure. The NF membrane is a separation membrane that mainly allows the permeation of monovalent ions and water. In the present invention, for example, monovalent ions (sodium ion, potassium ion, and chloride ion), urea, lactic acid and the like can be decreased. Therefore, a desalination treatment for decreasing sodium and potassium can be conducted while retaining bivalent ions (calcium, magnesium and the like) and decreasing these bivalent ions little, by using the nano filtration membrane.

[0029]

Examples of the material for the NF membrane include polyamides, cellulose acetate, polyethersulfones, polyesters, polyimides, vinyl polymers, polyolefins, polysulfones, regenerated celluloses and polycarbonates. In the present invention, in order to efficiently decrease salts, polyamides, cellulose acetates and polyethersulfones are preferable as the materials for the NF membrane, and specifically, NF45 manufactured by Dow Chemical Company (trade name "NF-3838/30-FF") is more preferable. Examples of the shape of the NF membrane include a plane membrane, a spiral membrane, a plate-like membrane and the like. Examples of the handling of the pressure in the nano filtration include pressure filtration and filtration under a reduced pressure. Examples of the handling of the treated liquid in the nano filtration include a dead-end filtration method and a cross flow filtration method. Meanwhile, it is commercially preferable to use a cross flow filtration method from the viewpoints of suppression of clogging of the nano filtration membrane to thereby increase the filtration velocity, and by this way, the variation of the components and the like in the condensed milk prepared from the raw material milk can be suppressed to thereby maintain the quality of the fresh cream constant.

[0030]

Furthermore, a retentate (nano-filtered condensed milk) and a permeate are obtained from the raw material milk by this nano filtration. By changing the degrees

of the pressurization or reduction of the pressure depending on the NF membrane that is actually used, the ratio of the amount of the retentate (nano-filtered condensed milk) and the amount of the permeate is changed. In the retentate obtained by nano filtration (NF condensed milk), the total solids (TS) in the raw material milk have been concentrated within the range of generally 1.5 to 2.5 times, preferably 1.6 to 2.2 times, more preferably 1.7 to 2.1 times, and further preferably 1.8 to 2 times (for example, about 2 times). Specifically, the total solids in the nano-filtered condensed milk (full-fat condensed milk) can be, for example, 20% by weight or more and 35% by weight or less, preferably 21% by weight or more and 30% by weight or less, more preferably 22% by weight or more and 28% by weight or less, further preferably 23% by weight or more and 26% by weight or less (for example, about 26% by weight).

[0031]

In the retentate obtained by nano filtration, among the total solids (TS) in the raw material milk, milk fat (FAT), proteins that are major solids not fat (SNF) and lactose, as well as a part of vitamins and salts have been concentrated. In the present specification, the condensed milk obtained by nano filtration is also referred to as nano-filtered condensed milk. The permeate obtained by the nano filtration contains much of the water content in the raw material milk, and a part of water-soluble vitamins and salts (especially monovalent ions), whereas contains little of the total solids in the raw material milk. As used herein, the vitamins and salts are collective terms of Vitamins A, B1 and B2, niacin and the like, and inorganic substances such as sodium (Na), potassium (K), magnesium (Mg), calcium (Ca), chlorine (Cl) and phosphorus (P).

[0032]

It is a preferable embodiment of the present invention to add an electrolyte that does not permeate an NF membrane to the raw material milk before conducting nano filtration. In some cases, desalination can be promoted by adding the electrolyte that does not permeate an NF membrane. Examples of the electrolyte that does not

permeate an NF membrane include milk fat, milk casein, whey protein, lactose, vitamins and salts.

[0033]

The centrifugation step is a step for obtaining a cream by centrifuging the condensed milk. In the centrifugation step, the condensed milk is centrifuged by generally using a centrifugal machine to thereby separate the condensed milk into a cream and skimmed milk. The cream contains much milk fat, whereas the skimmed milk contains little milk fat. The centrifugal machine may be an already-known centrifugal machine, and conditions that are known in the production of creams, powder skimmed milk and the like can be suitably adopted as the treatment conditions for the centrifugation.

[0034]

However, in the present invention, since the centrifuged condensed milk contains more solids not fat than that contained in conventional raw material milk that is centrifuged into a cream and skimmed milk, the conditions for the treatment in the centrifugation may be somewhat different. Specifically, if the difference in the specific gravities of the cream and skimmed milk increases due to the much solids not fat contained in the centrifuged condensed milk, then the cream and skimmed milk are easily separated. The treatment temperature in the centrifugation is, for example, preferably 30°C or more and 80°C or less, and more preferably 35°C or more and 70°C or less, especially preferably 40°C or more and 60°C or less from the viewpoints of the flavors of the cream and butter, and the like.

[0035]

In a preferable embodiment of the first aspect of the present invention, the steps for producing a fresh cream can further include a dilution step including adding a water content to the nano-filtered condensed milk obtained in the first nano filtration treatment step to dilute the nano-filtered condensed milk, and a second nano filtration treatment

step. Specifically, the dilution step is a step for obtaining nano-filtered milk by adding a water content to the nano-filtered condensed milk obtained in the first nano filtration treatment step. For example, the nano-filtered milk can be obtained by adding a water content to the nano-filtered condensed milk until the amount becomes the amount of the milk before the filtration and the like. The second nano filtration treatment step is a step including concentrating the nano-filtered milk obtained in the dilution step by using a nano filtration membrane to obtain desalted condensed milk.

[0036]

In the first nano filtration treatment step, in some cases, for example, in the case when the concentration of the salts (salt content) in the raw material milk is high, the salts are not sufficiently decreased even a desalination treatment is conducted. In this case, the concentration of the salts of the actually produced fresh cream is not lowered to a desired concentration. Therefore, the desalination treatment can be sufficiently conducted by diluting the nano-filtered condensed milk that has been once subjected to a nano filtration treatment, with water or the like, and subjecting again the dilution to a nano filtration treatment. By this way, the nano-filtered condensed milk is sufficiently desalted, and thus the concentration of the salts in the fresh cream can be lowered to a desired concentration.

[0037]

In a preferable embodiment of the first aspect of the present invention, a skimmed milk component obtained by centrifuging a milk raw material can be used as the raw material milk. In this case, the first nano filtration treatment step is a step for obtaining desalted skimmed condensed milk by subjecting the skimmed milk component to a desalination treatment for adjusting the residual rate of the sodium contained in the skimmed milk component to 35% or more and 70% or less. Furthermore, the centrifugation step is a step for obtaining a fresh cream by centrifuging a mixture of a cream component obtained by centrifuging the milk raw material and the

desalted skimmed condensed milk.

[0038]

Meanwhile, the raw material milk refers to a starting raw material that is treated in the first nano filtration treatment step. The milk raw material refers to a raw material that can be separated into a skimmed milk component and a cream component by centrifugation. The milk raw material may be raw milk, or may be non-homogenized milk or the like. In this case, the skimmed milk component obtained from the milk raw material is a starting raw material of the first nano filtration treatment step as raw material milk. The skimmed milk component is subjected to a nano filtration treatment so as to decrease the salts included in the skimmed milk component to obtain desalted skimmed condensed milk. The desalted skimmed condensed milk is mixed with a cream component derived from the milk raw material, and the mixture is centrifuged to obtain a fresh cream. By subjecting only the skimmed milk component of the raw material milk to the desalination treatment, a nano filtration treatment can be conducted after reducing the treating fluid under the reduction or absence of milk fat components having relatively high particle sizes and the like. Therefore, suppression of the contamination and clogging (fouling) of the nano filtration membrane and decreasing of the surface area of the nano filtration membrane can be expected, and thus efficient nano filtration treatments are enabled.

[0039]

In a preferable embodiment of the first aspect of the present invention, the first nano filtration treatment step can also be a step of conducting a dialysis filtration treatment by using a nano filtration membrane. The dialysis filtration (DF) is a method in which a water content is added to milk and the like that have been concentrated by filtration (retentate) to dilute the retentate to thereby return the amount of the milk and the like (the amount of the retentate) to an amount that is close to the amount of the milk and the like before the filtration, and the diluted retentate is further

filtered, or a method in which the milk and the like (retentate) that are in the processes of filtration and concentration are further filtered while the retentate is diluted by adding a water content thereto. In the present invention, the dialysis filtration is, for example, a method in which a water content is added to condensed milk obtained by nano filtration (nano-filtered condensed milk) to thereby dilute the condensed milk, and the diluted condensed milk is further subjected to nano filtration, or a method in which the condensed milk obtained by nano filtration (the milk and the like in the process of concentration) is further nano-filtered while the condensed milk is diluted by adding a water content thereto.

[0040]

Furthermore, a retentate (nano-filtered condensed milk) and a permeate are obtained from the raw material milk by this dialysis filtration using a nano filtration membrane. By changing the degree of the pressurization or reduction of the pressure depending on the NF membrane actually used, the ratio of the amount of the retentate (nano-filtered condensed milk) and the amount of the permeate is changed. In the nano-filtered condensed milk obtained by nano filtration, the total solids (TS) in the raw material milk have been concentrated within the range of generally 1.5 to 2.5 times, preferably 1.6 to 2.2 times, more preferably 1.7 to 2.1 times, and further preferably 1.8 to 2 times (for example, about 2 times). Specifically, the total solids in the nano-filtered condensed milk (full-fat condensed milk) can be, for example, 20% by weight or more and 35% by weight or less, preferably 21% by weight or more and 30% by weight or less, more preferably 22% by weight or more and 28% by weight or less, further preferably 23% by weight or more and 26% by weight or less (for example, about 26% by weight). By conducting a dialysis filtration treatment using a nano filtration membrane, the desalination rate can be improved as compared to the case when a desalination treatment is conducted by a single membrane treatment using a nano filtration membrane (the nano filtration treatment is conducted once). By this

way, the concentration of the salts and the like in the fresh cream are easily adjusted to desired concentrations.

[0041]

In the retentate obtained by dialysis filtration using a nano filtration membrane, among the total solids (TS) in the raw material milk, milk fat (FAT), proteins that are major solids not fat (SNF), lactose, as well as a part of vitamins and salts have been concentrated. In the present specification, the condensed milk obtained by nano filtration is also referred to as nano-filtered condensed milk. The permeate obtained by the nano filtration contains much of the water content in the raw material milk, and a part of water-soluble vitamins and salts (especially monovalent ions), whereas contains little of the total solids in the raw material milk. As used herein, the vitamins and salts are collective terms of Vitamins A, B1 and B2, niacin and the like, and inorganic substances such as sodium (Na), potassium (K), magnesium (Mg), calcium (Ca), chlorine (Cl) and phosphorus (P).

[0042]

It is a preferable embodiment of the present invention to add an electrolyte that does not permeate an NF membrane to the raw material milk before conducting dialysis filtration using a nano filtration membrane. In some cases, desalination can be promoted by adding the electrolyte that does not permeate an NF membrane. Examples of the electrolyte that does not permeate an NF membrane include milk fat, milk casein, whey protein, lactose, vitamins and salts.

[0043]

A preferable embodiment of the first aspect of the present invention further includes a reverse osmosis filtration treatment step, a desalted milk obtaining step and a step of obtaining desalted condensed milk after the first nano filtration treatment step, and also includes a centrifugation step after these steps. The reverse osmosis filtration treatment step is a step for obtaining a permeate of a reverse osmosis membrane by

subjecting the permeate obtained in the first nano filtration treatment step to a reverse osmosis filtration treatment. The desalted milk obtaining step is a step for obtaining desalted milk (desalted diluted milk) by adding either or both of the permeate of the reverse osmosis membrane and a water content to the nano-filtered condensed milk obtained in the first nano filtration treatment step. The centrifugation step is a step for obtaining a fresh cream by centrifuging the desalted condensed milk.

[0044]

The permeate obtained in the nano filtration treatment step or the dialysis filtration treatment step using a nano filtration membrane contains salts (mainly sodium ion, potassium ion and chloride ion). By subjecting the permeate to a reverse osmosis filtration treatment, only a water content can be mainly obtained. The water content obtained by this way can be used in the dilution step. By doing so, it becomes possible to reuse the permeate of the NF membrane.

[0045]

The method for producing a fresh cream according to the present invention may suitably include known steps relating to the production of a fresh cream. Examples of such steps include a step of fermenting the raw material milk, a step of mixing the cream with fermented milk, a sterilization step, a cooling step and a packaging step.

[0046]

The second aspect of the present invention relates to a method for producing a whipped cream. This method includes a step of stirring a fresh cream obtained by any of the above-mentioned methods for producing a fresh cream. In the whipped cream obtained by this way, the overrun can be adjusted to 70% or more and 85% or less, and the viscosity (stickiness) can be adjusted to 100 mPa·s or more and 200 mPa·s or less. At this time, a whipped cream containing relatively low fat and having excellent rich body taste and stickiness can be produced based on the method for producing a fresh

cream of the present invention.

[0047]

In the method for producing a whipped cream of the present invention, the fresh cream is stirred by generally using a mixer or a whipping machine, and mixing with granulated sugar and the like as necessary. The mixer or whipping machine may be an already-known machine, and conditions that are known in the production of a conventional whipped cream can be suitably adopted as the treatment conditions for the whipping.

[0048]

The third aspect of the present invention relates to a fresh cream obtained by any of the above-mentioned methods for producing a fresh cream. The components of this fresh cream contain 20% by weight or more and 55% by weight or less of a fat content and contain 9% by weight or more and 11% by weight or less of solids not fat, preferably contain 30% by weight or more and 50% by weight or less of a fat content and contain 9% by weight or more and 10.5% by weight or less of solids not fat, more preferably contain 40% by weight or more and 46% by weight or less of a fat content and contain 9.5% by weight or more and 10.5% by weight or less of solids not fat. In the fresh cream obtained by any of the above-mentioned production methods, the concentration of the solids not fat (SNF) is high and the concentration of the milk fat is relatively low as compared to a conventional fresh cream, but the fresh cream has unique rich body taste in which other unpleasant taste and salty taste are little.

[0049]

The fourth aspect of the present invention relates to a fresh cream-containing food product. This food product is a fresh cream-containing food product containing the above-mentioned fresh cream and an acidic solution having a pH of 1 or more and 5 or less, wherein the fresh cream is 50 parts by weight to 90 parts by weight and the acidic solution is 10 parts by weight to 50 parts by weight when the fresh

cream-containing food product is 100 parts by weight.

[0050]

In the present invention, examples of the acidic solution having a pH of 1 or more and 5 or less include fruit juice beverages such as grape beverages, and liquids and acidulants containing citrus-based fruit juices, and the like. The acidic solution has a pH of, preferably 2 or more and 5 or less, more preferably 3 or more and 5 or less, further preferably 3 or more and 5 or less, and a beverage or food product by which acidic flavor is felt is preferable. In the fresh cream obtained by any of the above-mentioned production methods, the rich body taste has been enhanced, and the fresh cream has such a pH buffering ability that acidic flavor can be suppressed when the fresh cream is combined with an acidic solution, and thus a fresh cream-containing food product having fine flavor and taste can be obtained in the present invention.

[Example 1]

[0051]

Full-fat condensed milk was obtained by concentrating full-fat milk (solid content: 13% by weight) up to a solid content of 26% by weight by using a nano filtration (NF) method (NF full-fat condensed milk). As the NF membrane, NF-3838/30-FF (NF45) manufactured by Dow Chemical Company was used. This NF full-fat condensed milk was centrifuged and sterilized according to conventional methods to obtain a fresh cream (an NF-filtered product (NF45)). The NF-filtered product had a composition of 45.2% by weight of a milk fat content and 9.7% by weight of solids not fat.

[Example 2]

[0052]

Full-fat condensed milk was obtained by concentrating full-fat milk (solid content: 13% by weight) up to a solid content of 26% by weight by using a nano filtration (NF) method (NF full-fat condensed milk). Water was added to this NF

full-fat condensed milk until the solid content became 13% by weight, and this was concentrated again by using a nano filtration (NF) method up to a solid content of 26% by weight to thereby give full-fat condensed milk (DF full-fat condensed milk). Furthermore, this DF full-fat condensed milk was centrifuged and sterilized according to conventional methods to obtain a fresh cream (a DF-filtered product (DF45)). The DF-filtered product had a composition of 44.3% by weight of a milk fat content and 9.8% by weight of solids not fat.

[0053]

[Comparative Example 1]

A general fresh cream (fat content: 45% by weight) was prepared from full-fat milk (solid content: 13% by weight) (a control product (FC45)). The FC45 had a composition of 45.2% by weight of a milk fat content and 4.1% by weight of solids not fat.

[0054]

[Test Example 1]

For the fresh creams obtained in Example 1 and Example 2 and the fresh cream obtained in Comparative Example, the respective physical properties were evaluated and compared. With respect to the whipping time, a special bowl for a table mixer (MEISTER 5, manufactured by DITO SAMA (France)) was filled with 900 g of the cream and 63 g of granulated sugar, and the time until the penetration became 280 to 310 was measured under stirring (mixing) at an initiation temperature of 5°C and at 6 on the dial. With respect to the overrun, a special plastic container (inner volume: 95.09 ml, weight: 5.53 g) was filled with just a spoonful of the whipped cream, the weight thereof was measured by a weighing device (ELECTERIC READING BALANCE, manufactured by Shimadzu Corporation), and the overrun was calculated by comparing with the volume and weight of a liquid-like cream. The penetration was measured by filling a special container for a penetration tester (manufactured by Marubishi Science

Machine Manufacturing Co., Ltd.) with just a spoonful of the whipped cream, and freely dropping a special shaft (with a predetermined weight) on the whipped cream. The viscosity (measurement temperature: 5°C) was measured by dispensing 200 ml of the cream in a special tall beaker (inner volume: 200 ml), and stirring (rotating) the cream for 30 seconds by using a rotor No. 2 in a viscometer (DIGITAL VISCOMETER, manufactured by TOKIMEC) and automatically stopping the rotation, and measuring the viscosity. The results are shown in Table 1. In the fresh creams obtained in Example 1 and Example 2, the overrun was lowered as compared to that of the fresh cream obtained in Comparative Example. Therefore, it was supposed in the present invention that the overrun is lowered also in a fresh cream in which the fat concentration is designed to be similar to that of a conventional fresh cream and the concentration of the solids not fat is designed to be relatively high.

[0055]

[Table 1]

Table 1. Relationship between composition and physical properties of cream

Item		Comparative Example (FC45)	Example 1 (NF45)	Example 2 (DF45)
Total solids	[% by weight]	50.0	54.9	54.1
Fat	[% by weight]	45.2	45.2	44.3
Solids not fat	[% by weight]	4.8	9.7	9.8
Sodium (Na)	[mg/100g]	22.9	32.8	29.3
Potassium (K)	[mg/100g]	93.2	123.0	108.2
Desalination rate	[%]	—	32	40
Whipping time (WT)	[min:sec]	02:30	02:45	03:53
Overrun (OR)	[%]	101	75	84
Penetration	[—]	294	300	278
Viscosity	[mPa·s]	57.3	165.4	123.9

[0056]

[Test Example 2]

For the fresh creams obtained in Example 1 and Example 2 and the fresh cream obtained in Comparative Example, the respective aromatic odor components were analyzed and compared. The aromatic odor components were evaluated by the values of peak areas obtained by using the collection operation in the solid-phase microextraction method (SPME method) and the analysis of GC/MS in combination.

[0057]

The protocol for the evaluation of the aromatic odor components was as follows.

- (1) A sample (weight: 2.5 g) and saturated saline (weight: 7.5 g) are collected in a vial bottle (volume: 20 mL), and the bottle is tightly closed.
- (2) The vial bottle is warmed (60°C, 40 min).
- (3) The "aromatic odor components" that are present in the head space of the vial bottle are extracted by solid phase microfibers (CAR/DVB/PDMS).
- (4) A chromatogram is obtained by the analysis of the GC/MS (column: DB-WAX).
- (5) The mass spectra of the peaks in the chromatogram are compared with the NIST mass spectral library to thereby qualify the aromatic odor components.
- (6) The peak areas of the major fragment ions of the aromatic odor components are considered as detection amounts.

[0058]

The results are shown in Table 2. In the fresh creams obtained in Example 1 and Example 2, the detection values of the free fatty acids were increased as compared to those of the fresh cream obtained in Comparative Example. Therefore, it is considered that milk flavor that corresponds to that of a conventional fresh cream having a high fat content and flavor by which rich body taste is felt are presented despite a relative low fat content in the present invention. Furthermore, in the fresh cream obtained in Example 2, the detection values of the sulfur compounds and lactones were decreased as compared to those of the fresh cream obtained in Comparative

Example. Meanwhile, in the fresh cream obtained in Example 1, the detection values of the sulfur compounds and lactones were not decreased as compared to those of the fresh cream obtained in Comparative Example. From these matters, it is considered that the fresh cream obtained in Example 2 had low other unpleasant taste as compared to the fresh cream obtained in Example 1 or Comparative Example.

[0059]

[Table 2]

Table 2. Analysis of aromatic odor components of cream

Item	Example 2/Comparative Example		
	Example 1/Comparative Example	(DF45/FC45)	
	(NF45/FC45)		
Ketones	Acetone	1.41	0.52
	2-Butanone	0.99	0.49
	2-Pentanone	1.24	0.85
	2-Heptanone	1.26	0.88
	2-Nonanone	1.04	0.82
	2-Undecanone	1.54	0.87
Aldehydes	Hexanol	0.52	0.65
Alcohols	1-Hexanol-2-ethyl	1.00	1.57
	1-Octanol	1.44	0.72
Sulfur compounds	Dimethyl sulfate	1.10	0.53
	Methyl disulfide	0.94	1.16
Free fatty acids	Butanoic acid	4.45	1.99
	Hexanoic acid	3.99	1.79
Lactones	d-Octanolactone	1.81	0.75
	d-Decalactone	1.63	0.79
	d-Dodecalactone	2.84	0.68

* Cream (2.5g) + Saturated NaCl (7.5g) + MIBK (20μg/L) (→ 4-Times dilution)
Treatment ; 60°C, 30 min (cream 0702.m)
Fibers ; 50/30μm, DVB/CAR/PDMS, 2cm (372)
GC/MS (Center MS5975) GEN 40.M (EM=1329)

[0060]

[Test Example 3]

For the fresh creams obtained in Example 1 (and Example 2) and the fresh cream obtained in Comparative Example, the respective pH buffering abilities were evaluated and compared. The pH buffering ability was evaluated by adding a grape beverage (pH = 3.43) by each volume to 200 ml of the fresh cream, and measuring the pH. The results are shown in Table 3. In the fresh creams obtained in Example 1 (and Example 2), the lowering of the pH in accordance with the increase in the addition amount of the grape beverage was mild as compared to that in the fresh cream obtained in Comparative Example. Therefore, it was found that the milk flavor and rich body taste were enhanced in the fresh creams obtained in Example 1 (and Example 2) as compared to those of the fresh cream obtained in Comparative Example, and thus the fresh creams had such a pH buffering ability that acidic flavor can be suppressed when combined with a food product (acidic solution) by which acidic flavor is felt.

[0061]

[Table 3]

Table 3. Evaluation of acid resistance (pH buffering ability) of cream
(Relationship between addition amount of grape beverage and change in pH)

Addition amount of grape beverage[ml] (pH buffering ability)	pH [—]	
	Comparative Example (FC45)	Example 1 (NF45)
0 / 200 ml	6.76	6.54
3 / 200 ml	6.50	6.40
8 / 200 ml	6.12	6.25
12 / 200 ml	5.90	6.12
20 / 200 ml	5.56	5.84
50 / 200 ml	4.86	5.38
70 / 200 ml	4.52	5.08
150 / 200 ml	4.02	4.45

* pH of grape beverage = 3.43

[0062]

[Test Example 4]

Sensory evaluation by specialized panels (18 persons) was conducted for the fresh creams obtained in Example 1 and the fresh cream obtained in Comparative Example. At that time, the creams were scored in such a manner that the item at the same level as Comparative Example got 0 points, the item being (slightly strong) got 1 point, the item being (strong) got 2 points and the item being (very strong) got 3 points, and the scores were counted. The results are shown in Table 4. The summary of the results in Table 4 is shown in Fig. 1. In the case when the fresh cream obtained in Example 1 and the fresh cream obtained in Comparative Example were subjected to sensory evaluation, there were significant differences in the respective items of degree of sweetness and degree of fat taste; therefore, it can be considered that the fresh cream obtained in Example 1 was highly evaluated and thus was excellent in flavor. Furthermore, the fresh cream obtained in Example 1 was highly evaluated in the respective items of degree of dense taste, degree of milk flavor and general evaluation, and thus it can be considered that the fresh cream was excellent in flavor.

[0063]

[Table 4]

Table 4. Sensory evaluation of creams (1)

Conducted on October 13, 2009

	Degree of salty taste	Degree of sweetness	Degree of dense taste	Degree of fat taste	Degree of milk flavor	General evaluation
X>0	1	13	6	3	11	11
X=0	12	3	2	4	3	1
X<0	5	2	10	11	4	6
Significant difference	-	**	-	*	-	-

	Degree of salty taste	Degree of sweetness (**)	Degree of dense taste	Degree of fat taste (*)	Degree of milk flavor	General evaluation
Comparative Example (FC45)	0	0	0	0	0	0
Example 1 (NF45)	0.22	2.82	0.99	0.84	0.93	0.89

(*): Significant difference with a critical region of 5%

(**): Significant difference with a critical region of 1%

[0064]

[Test Example 5]

Sensory evaluation by specialized panels (18 persons) was conducted for also the fresh creams obtained in Example 2 and the fresh cream obtained in Comparative Example in a similar manner to that of Test Example 1. The results are shown in Table 5. The summary of the results in Table 5 is shown in Fig. 2. In the case when the fresh cream obtained in Example 2 and the fresh cream obtained in Comparative Example were subjected to sensory evaluation, there were significant differences in the respective items of degree of sweetness, milk fragrance before drinking, general evaluation, degree of dense taste and degree of milk flavor; therefore, it can be considered that the fresh cream obtained in Example 1 was highly evaluated and thus was excellent in flavor. Furthermore, the fresh cream obtained in Example 1 was highly evaluated in the item of degree of fat taste, and thus it can be considered that the fresh cream was excellent in flavor.

[0065]

[Table 5]

Table 5. Sensory evaluation of creams (2)

Conducted on October 13, 2009

	Milk fragrance before drinking	Degree of sweetness	Degree of dense taste	Degree of fat taste	Degree of milk flavor	General evaluation
X>0	15	21	13	14	16	17
X=0	3	0	3	1	0	0
X<0	3	0	5	6	5	4
Significant difference	**	**	*	-	*	**

	Milk fragrance before drinking (**)	Degree of sweetness (**)	Degree of dense taste (*)	Degree of fat taste	Degree of milk flavor (*)	General evaluation (**)
Comparative Example (FC45)	0	0	0	0	0	0
Example 2 (DF45)	0.86	2.43	0.86	0.62	0.71	0.76

(*): Significant difference with a critical region of 5%

(**): Significant difference with a critical region of 1%

CLAIMS

1. A method for producing a fresh cream, comprising:
 - a first nano filtration treatment step for obtaining nano-filtered condensed milk by conducting a desalination treatment concentrating raw material milk and adjusting a residual rate of sodium contained in the raw material milk to 35% or more and 70% or less by using a nano filtration membrane, and
 - a centrifugation step for obtaining a fresh cream by centrifuging the nano-filtered condensed milk,
 - wherein the nano-filtered condensed milk has a solid content concentration 20% by weight to 35% by weight, and
 - the fresh cream contains a fat content at 20% by weight to 55% by weight and contains solids not fat at 9% by weight to 11% by weight.
2. The method for producing a fresh cream according to claim 1, wherein
 - the method further comprises, after the first nano filtration treatment step,
 - a dilution step of adding a water content to the nano-filtered condensed milk obtained in the first nano filtration treatment step to obtain nano-filtered milk, and
 - a second nano filtration treatment step of concentrating the nano-filtered milk obtained in the dilution step by using a nano filtration membrane to obtain desalted condensed milk, and
 - the centrifugation step is
 - a step for obtaining the fresh cream by centrifuging the desalted condensed milk.
3. The method for producing a fresh cream according to claim 1, wherein
 - the raw material milk comprises of a skimmed milk component obtained by

centrifuging a milk raw material,

the first nano filtration treatment step is a step for obtaining desalted skimmed condensed milk by conducting a desalination treatment against the skimmed milk component by using a nano filtration membrane to thereby adjust a residual rate of sodium contained in the skimmed milk component to be 35% to 70%,

and the centrifugation step is a step for obtaining a fresh cream by centrifuging a mixture of a cream component obtained by centrifuging the milk raw material and the desalted skimmed condensed milk.

4. The method for producing a fresh cream according to claim 1, wherein the first nano filtration treatment step is a step of conducting a dialysis filtration treatment by using a nano filtration membrane.

5. The method for producing a fresh cream according to claim 4, wherein the method further comprises, after the first nano filtration treatment step, a reverse osmosis filtration treatment step of conducting a reverse osmosis filtration treatment against a permeate obtained in the first nano filtration treatment step to obtain a permeate of a reverse osmosis membrane,

a desalted milk obtaining step of adding either or both of the permeate of the reverse osmosis membrane and a water content into the nano-filtered condensed milk obtained in the first nano filtration treatment step to obtain desalted milk, and

a step of obtaining desalted condensed milk by concentrating the desalted milk obtained in the desalted milk obtaining step by using a nano filtration membrane,

and the centrifugation step is

a step for obtaining a fresh cream by centrifuging the desalted condensed milk.

6. A method for producing a whipped cream having an overrun of 70% to 85% and a viscosity of 100 mPa·s to 200 mPa·s,
wherein the method comprising a step of stirring a fresh cream obtained by the method for producing a fresh cream according to any one of claims 1 to 5.