

DESCRIPTION

TITLE OF INVENTION

METHOD FOR PRODUCING FOOD COMPOSITION

5

TECHNICAL FIELD

[0001]

10 The present invention relates to a food composition, and more particularly to a condensed milk-like composition. The present invention also relates to a method for producing a food composition, and more particularly to a method for producing a condensed milk-like composition.

BACKGROUND ART

[0002]

15 Sweetened condensed milk is generally produced by dissolving sucrose in raw milk, then evaporating water, and concentrating the resultant to 2 to 3 times. In addition, when a solid content of the sweetened condensed milk is increased, the water activity is reduced to about 0.8 to 0.9, which prevents the growth of microorganisms and improves storability, allowing the sweetened condensed milk to be distributed at room temperature.

20 The production of general sweetened condensed milk includes many steps such as reception of raw milk, storage, standardization, rough boiling, homogenization, sterilization, concentration, cooling, and seeding. In addition, facilities corresponding to these are required, and in particular, large-scale facilities and equipment may be required in the steps of reception of raw milk, storage, and concentration.

25 [0003]

For the purpose of preventing the cost of raw materials, a condensed milk-like milk product obtained by adding sucrose and vegetable oils and fats as substitutes for a milk fat to reduced milk obtained by dissolving whole milk powder and skim milk powder in water without using the raw milk, and concentrating under reduced pressure or concentrating under
30 heating has been marketed in Japan and overseas. Various production methods have been proposed for the condensed milk-like milk product.

For example, there has been proposed a condensed milk-like whey composition obtained by adding water, sucrose, dextrin, a milk protein concentrate, and a hardened

coconut oil to a liquid whey obtained as a by-product of the production of a milk product, and concentrating the liquid whey. (Patent Literature 1)

As a method for simplifying the production step, there has been proposed a method for producing a condensed milk-like milk product having the same functional properties and physical properties as those of sweetened condensed milk by reducing a concentration step by mixing raw materials of defatted concentrated milk, skim milk powder, whole milk powder, and sucrose in a multifunctional tank or the like at a high concentration. (Patent Literatures 2 and 3)

As a method for reducing a seeding step, a production method has been proposed using concentrated milk obtained by subjecting raw material milk to a membrane treatment and removing lactose. (Patent Literature 4)

CITATION LIST

PATENT LITERATURE

[0004]

Patent Literature 1: Japanese Patent No. 6012177

Patent Literature 2: JP-A-2003-199492

Patent Literature 3: JP-A-2014-226139

Patent Literature 4: JP-A-H9-224566

SUMMARY OF INVENTION

TECHNICAL PROBLEM

[0005]

An object of the present invention is to provide a condensed milk-like composition having the same flavor, viscosity characteristics, and storability as that of a condensed milk-like composition of related art by a simple production method.

SOLUTION TO PROBLEM

[0006]

For the purpose of simplifying the production step, a high concentration raw material mixing method in which the concentration step is reduced is applied, but when a solid content concentration similar to that of the sweetened condensed milk is maintained, the amount of dissolving water is reduced, and powder dissolution becomes difficult.

Insufficient dissolution causes poor flavor, poor structure, increased viscosity, and burning during heating. Therefore, it is necessary to use concentrated milk or defatted concentrated milk in which a milk protein is in a hydrated state in advance, or to prepare a high-performance dissolving machine for improving solubility.

When the amount of dissolving water is increased for the purpose of improving the solubility, a solid concentration is reduced, and the flavor and properties become thin and poor compared to those of the sweetened condensed milk of related art. In addition, the increase in the water activity promotes the growth of microorganisms, thereby impairing the storability. By increasing the amount of dissolving water while maintaining an appropriate solid concentration with low water activity, it becomes easier to dissolve the powder while maintaining the condensed milk-like flavor.

[0007]

The present inventors have intensively studied to solve the above problems, have found that use of a sugar alcohol and a concentrated milk protein powder that has been subjected to a lactose removal treatment in advance can simplify the production step and provide a condensed milk-like composition having the same flavor, viscosity characteristics, and good storability at the time of refrigeration and at room temperature, and have completed the present invention.

[0008]

The present invention is specifically as follows.

<1> A condensed milk-like composition, containing: a sugar alcohol; a concentrated milk protein powder; and a milk powder, in which a content of lactose is 21 wt% or less in terms of a concentration of lactose in water.

<2> The condensed milk-like composition according to <1>, in which 18 wt% or more of a milk protein contained in the condensed milk-like composition is derived from the concentrated milk protein powder.

<3> The condensed milk-like composition according to <1> or <2>, in which in the milk protein contained in the condensed milk-like composition, a ratio of a milk protein derived from the concentrated milk protein powder to a milk protein derived from the milk powder is 1:4 to 4:1.

<4> The condensed milk-like composition according to any one of <1> to <3>, further containing a vegetable oil and fat and/or saccharides.

<5> A method for producing a condensed milk-like composition, including: adding a

sugar alcohol, a concentrated milk protein powder, and a milk powder to dissolving water and mixing them to obtain a condensed milk-like mix; and sterilizing the condensed milk-like mix to obtain a condensed milk-like composition, in which a content of lactose in the condensed milk-like composition is 21 wt% or less in terms of a concentration of lactose in water.

5 <6> The method for producing a condensed milk-like composition according to <5>, in which 18 wt% or more of a milk protein contained in the condensed milk-like composition is derived from the concentrated milk protein powder.

<7> The method for producing a condensed milk-like composition according to <5> or <6>, in which in a milk protein contained in the condensed milk-like composition, a ratio of a
10 milk protein derived from the concentrated milk protein powder to a milk protein derived from the milk powder is 1:4 to 4:1.

<8> The method for producing a condensed milk-like composition according to any one of <5> to <7>, which does not include a seeding step.

[0009]

15 The present invention also includes the following embodiments.

<1> A condensed milk-like composition, containing: a sugar alcohol; a concentrated milk protein powder; and a milk powder, in which a content of lactose is 21 wt% or less in terms of a concentration of lactose in water.

<2> The condensed milk-like composition according to <1>, in which 18 wt% or more
20 of a milk protein contained in the condensed milk-like composition is derived from the concentrated milk protein powder.

<3> The condensed milk-like composition according to <1> or <2>, in which in the milk protein contained in the condensed milk-like composition, a ratio of a milk protein derived from the concentrated milk protein powder to a milk protein derived from the milk powder is
25 1:4 to 4:1.

<4> The condensed milk-like composition according to any one of <1> to <3>, further containing a vegetable oil and fat and/or saccharides.

<5> The condensed milk-like composition according to any one of <1> to <4>, containing 1 wt% to 30 wt% of the sugar alcohol, 1 wt% to 20 wt% of the concentrated milk
30 protein powder, 1 wt% to 30 wt% of the milk powder, and 20 wt% to 60 wt% of water, on a basis of the condensed milk-like composition, in which the content of lactose is 21 wt% or less in terms of the concentration of lactose in water.

<6> The condensed milk-like composition according to any one of <1> to <5>, in which

the concentrated milk protein powder contains 50 wt% to 99 wt% of a milk protein, 0.01 wt% to 8 wt% of lactose, and 0 to 8 wt% of water.

<7> The condensed milk-like composition according to any one of <1> to <6>, in which the milk powder contains 10 wt% to 50 wt% of a milk protein, 10 wt% to 80 wt% of lactose, and 0 to 8 wt% of water.

<8> The condensed milk-like composition according to any one of <1> to <3>, in which the sugar alcohol is at least one selected from the group consisting of glycerin, erythritol, mannitol, maltitol, sorbitol, xylitol, ribitol, inositol, D-traitol, L-traitol, D-arabinitol, and L-arabinitol.

<9> The condensed milk-like composition according to any one of <1> to <3>, in which a content of a condensed milk is 50 wt% or less, and preferably 30 wt% or less, on a basis of the condensed milk-like composition.

<10> The condensed milk-like composition according to any one of <1> to <9>, in which the concentrated milk protein powder is at least one selected from the group consisting of a milk protein concentrate, a whey protein concentrate, a whey protein isolate, and a milk protein isolate.

<11> A method for producing a condensed milk-like composition, including: adding a sugar alcohol, a concentrated milk protein powder, and a milk powder to dissolving water and mixing them to obtain a condensed milk-like mix; and sterilizing the condensed milk-like mix to obtain a condensed milk-like composition, in which a content of lactose in the condensed milk-like composition is 21 wt% or less in terms of a concentration of lactose in water.

<12> The method for producing a condensed milk-like composition according to <11>, in which 18 wt% or more of a milk protein contained in the condensed milk-like composition is derived from the concentrated milk protein powder.

<13> The method for producing a condensed milk-like composition according to <11> or <12>, in which in the milk protein contained in the condensed milk-like composition, a ratio of a milk protein derived from the concentrated milk protein powder to a milk protein derived from the milk powder is 1:4 to 4:1.

<14> The method for producing a condensed milk-like composition according to any one of <11> to <13>, which does not include a seeding step.

<15> The method for producing a condensed milk-like composition according to any one of <11> to <14>, in which the condensed milk-like composition contains 1 wt% to 30 wt% of the sugar alcohol, 1 wt% to 20 wt% of the concentrated milk protein powder, 1 wt% to 30

wt% of the milk powder, and 20 wt% to 60 wt% of water, on a basis of the condensed milk-like composition.

<16> The method for producing a condensed milk-like composition according to any one of <11> to <15>, in which the concentrated milk protein powder contains 50 wt% to 99 wt% of a milk protein, 0.01 wt% to 8 wt% of lactose, and 0 to 8 wt% of water.

<17> The method for producing a condensed milk-like composition according to any one of <11> to <16>, in which the milk powder contains 10 wt% to 50 wt% of a milk protein, 10 wt% to 80 wt% of lactose, and 0 to 8 wt% of water.

<18> The method for producing a condensed milk-like composition according to any one of <11> to <17>, in which the sugar alcohol is at least one selected from the group consisting of glycerin, erythritol, mannitol, maltitol, sorbitol, xylitol, ribitol, inositol, D-traitol, L-traitol, D-arabinitol, and L-arabinitol.

<19> The method for producing a condensed milk-like composition according to any one of <11> to <18>, in which a content of a condensed milk in the condensed milk-like composition is 50 wt% or less, and preferably 30 wt% or less, on a basis of the condensed milk-like composition.

ADVANTAGEOUS EFFECTS OF INVENTION

[0010]

It is possible to provide a condensed milk-like composition having the same flavor, viscosity characteristics, and storability at the time of refrigeration and at room temperature as that of a condensed milk-like composition of related art by a simple production method.

DESCRIPTION OF EMBODIMENTS

[0011]

1. Condensed Milk-like Composition (Sugar Alcohol)

In the present specification, a sugar alcohol means a carbohydrate having an alcohol group (OH group), which is produced by reducing saccharides (for example, monosaccharide, disaccharide, or the like). By adding the sugar alcohol to a condensed milk-like composition, the water content can be increased while reducing the water activity, and thus the solubility of a powder raw material can be improved. In addition, by adding the sugar alcohol to the condensed milk-like composition, it is possible to increase the water content while reducing

the water activity, so that the generation of microorganisms can be prevented, and therefore the storage at room temperature becomes possible. When a solid content concentration is the same as that of sweetened condensed milk, a carbohydrate concentration becomes high, and the food becomes a high-calorie food. However, by using the sugar alcohol, a total solid content can be reduced to reduce the calories.

[0012]

Examples of the sugar alcohol that can be used in the condensed milk-like composition of the present invention include, but are not limited to, glycerin, erythritol, mannitol, maltitol, sorbitol, xylitol, ribitol, inositol, D-traitol, L-traitol, D-arabinitol, and L-arabinitol. In consideration of the high solubility in water and the effect of reducing the water activity, it is preferable to use one or more selected from the group consisting of sorbitol, xylitol, erythritol, and glycerin. Two or more of these sugar alcohols may be used in combination.

[0013]

A blending amount of the sugar alcohol is not limited to the following, but is 1 wt% to 30 wt%, preferably 2 wt% to 20 wt%, more preferably 3 wt% to 15 wt%, and most preferably 5 wt% to 10 wt% on the basis of the condensed milk-like composition in consideration of the flavor and physical properties of the condensed milk-like composition and the operability at the time of production.

[0014]

(Concentrated Milk Protein Powder)

In the present specification, the concentrated milk protein powder is a powder raw material from which lactose has been removed and which contains a milk protein as a main component. In the concentrated milk protein powder, lactose is removed by means or operation such as a membrane treatment. In the concentrated milk protein powder, a content of the milk protein may be, for example, 50 wt% to 99 wt%, 60 wt% to 99 wt%, 70 wt% to 99 wt%, or 80 wt% to 99 wt%. In the concentrated milk protein powder, a content of the lactose may be, for example, 0.01 wt% to 8 wt%, and more preferably 0.1 wt% to 4 wt%. The content of water in the concentrated milk protein powder may be 0 to 8 wt%. The concentrated milk protein powder may contain ash, a fat and lipid, and the like. However, the content of the ash or the fat and lipid is preferably small. In this case, a content of the milk protein may be preferably 70 wt% to 99 wt%, and more preferably 80 wt% to 99 wt%.

[0015]

Examples of the concentrated milk protein powder that can be used in the condensed milk-like composition of the present invention include, but are not limited to, a milk protein concentrate (MPC), a whey protein concentrate (WPC), a whey protein isolate (WPI), and a milk protein isolate (MPI). Two or more of these concentrated milk protein powders may be used in combination. MPC and/or WPC are preferably used.

[0016]

MPC is obtained by concentrating milk or skim milk with a filtration membrane such as an ultrafiltration membrane and powdering milk protein in the milk. In MPC, lactose is removed by a filtration treatment. MPC may also be referred to as a total milk protein (TMP). MPI is prepared in the same process as MPC, but MPI is obtained by further concentrating and isolating only milk protein in milk by ion exchange chromatography or the like, and generally has a milk protein content higher than that of MPC.

WPC is obtained by isolating lactose, minerals, and vitamins from whey and recovering and powdering the whey protein. WPC is produced by concentrating and drying the whey protein by treating milk-derived liquid containing a whey protein, such as cheese whey or acid whey, with a filtration membrane such as an ultrafiltration membrane or a dia-filtration membrane. WPI is prepared in the same step as WPC, but WPI is obtained by concentrating and isolating only proteins in whey by ion exchange chromatography or the like, and generally has a protein content higher than that of WPC.

[0017]

The blending amount of the concentrated milk protein powder is not limited to the following, but is 1 wt% to 20 wt%, preferably 1 wt% to 15 wt%, more preferably 1 wt% to 10 wt%, and still more preferably 1.8 wt% to 10 wt%, on the basis of the condensed milk-like composition, in consideration of the flavor and physical properties of the condensed milk-like composition.

The concentrated milk protein powder may be added to the condensed milk-like composition such that the amount of the milk protein derived from the concentrated milk protein powder in the condensed milk-like composition is, but is not limited to, 1.5 wt% to 15 wt%, preferably 1.5 wt% to 10 wt%, more preferably 1.5 wt% to 8 wt%, in consideration of the flavor and physical properties of the condensed milk-like composition.

[0018]

The concentrated milk, skim milk powder, whey powder, and the like, which have not been subjected to a lactose treatment, have a high lactose content, and when the solid

content is the same as that of the general sweetened condensed milk, the concentration of lactose in water is high. Therefore, when these raw materials are used, coarse crystallization of lactose becomes a problem. Therefore, a seeding step is required in order to prevent the coarse crystallization of lactose. Seeding is a step of adding crushed lactose and precipitating fine lactose crystals in advance. The lactose used in the seeding step needs to be crushed (pulverized) as a pretreatment. Since lactose is added at a predetermined temperature, temperature control is necessary, and the operation is performed in an open system. Therefore, the process control becomes complicated, and the risk of contamination with foreign substances or contamination with microorganisms also occurs.

By using the powdered milk raw material, the raw material cost becomes relatively low, and the raw material procurement, the raw material storage, and the handling property become simple.

[0019]

By using the concentrated milk protein powder in combination and adjusting the concentration of lactose, it is possible to eliminate the need for the seeding step. In addition, by using concentrated milk protein powder, which is a powder raw material, instead of a liquid milk raw material, the concentration step can be reduced. In addition, the use of the concentrated milk protein powder can simplify the steps. The concentrated milk protein powder is relatively inexpensive, easily procured, and can be stored at room temperature.

[0020]

(Milk Powder)

In the present specification, the milk powder is a powder raw material which is not subjected to a lactose removal treatment and contains milk as a raw material, and examples thereof include a whole milk powder, a skim milk powder, and a whey powder.

The content of milk protein in the milk powder may be, for example, 10 wt% to 50 wt%, 10 wt% to 45 wt%, 10 wt% to 40 wt%, or 10 wt% to 38 wt%. The content of lactose in the milk powder may be, for example, 10 wt% to 80 wt%, 20 wt% to 65 wt%, 30 wt% to 65 wt%, or 35 wt% to 60 wt%. The content of water in the milk powder may be 0 to 8 wt%. The milk powder may contain ash, a fat and lipid, and the like. However, the content of the ash or the fat and lipid is preferably small. In this case, the content of lactose may be preferably 35 wt% to 80 wt%, more preferably 40 wt% to 70 wt%, and still more preferably 50 wt% to 60 wt%.

The blending amount of the milk powder is not limited to the following, but is 1

wt% to 30 wt%, preferably 2 wt% to 20 wt%, and more preferably 3 wt% to 20 wt%, on the basis of the condensed milk-like composition, in consideration of the flavor and physical properties of the condensed milk-like composition and the amount of lactose brought in from the milk powder.

5 The milk powder may be added to the condensed milk-like composition of the present invention such that the amount of the milk protein derived from the milk powder in the condensed milk-like composition is, but is not limited to, 3.0 wt% to 20 wt%, preferably 3.0 wt% to 18 wt%, and more preferably 3.0 wt% to 15 wt%, in consideration of the flavor and physical properties of the condensed milk-like composition and the amount of lactose
10 brought in from the milk powder.

[0021]

(Milk Protein Contained in Condensed Milk-like Composition)

The amount of the milk protein contained in the condensed milk-like composition of the present invention is, but is not limited to, for example, 1 wt% to 30 wt%, preferably 2
15 wt% to 20 wt%, more preferably 3 wt% to 15 wt%, and most preferably 5.0 wt% to 10 wt%, on the basis of the condensed milk-like composition. The amount of milk protein contained in the condensed milk-like composition can be measured by a Kjeldahl method. The Kjeldahl method is one of nitrogen quantitative conversion methods, and is an analysis method for determining the amount of nitrogen contained in a sample by a chemical
20 treatment.

In the condensed milk-like composition produced by the production method of the present invention, preferably 18 wt% or more, more preferably 18 wt% to 80 wt%, even more preferably 18 wt% to 60 wt%, and even more preferably 20 wt% to 50 wt% of the milk protein to be contained is derived from the concentrated milk protein powder, in consideration
25 of the flavor and physical properties of the condensed milk-like composition and the amount of lactose brought in from the milk powder.

[0022]

(Ratio of Milk Protein)

In the milk protein contained in the condensed milk-like composition of the present
30 invention, the ratio of the milk protein derived from the concentrated milk protein powder to the milk protein derived from the milk powder (milk protein derived from the concentrated milk protein powder : milk protein derived from the milk powder) is preferably 1:4 to 4:1, more preferably 1:3 to 3:1, still more preferably 1:3 to 2:1, and most preferably 1:3 to 1:1 in

terms of weight, in consideration of the flavor, color tone, and physical properties of the concentrated milk protein powder and the amount of lactose brought in from the milk powder.

[0023]

(Other Proteins)

5 If necessary, the condensed milk-like composition of the present invention may contain a protein source other than the milk protein, for example, a plant-derived protein such as soybean, but preferably does not contain the protein other than the milk protein. Specifically, the amount of the proteins other than the milk protein in the proteins in the condensed milk-like composition of the present invention is 10 wt% or less, and preferably 5
10 wt% or less.

A liquid milk (liquid milk such as milk, skim milk, and concentrated milk) may be added as a raw material to the condensed milk-like composition of the present invention, but it is preferable not to add the liquid milk.

[0024]

15 (Lactose)

In the present specification, lactose is a disaccharide contained in milk, and has a structure in which D-glucose (glucose) and D-galactose are bound to each other. In the condensed milk-like composition produced by the production method of the present invention, the concentration of lactose in water is 21 wt% or less, preferably 20 wt% or less, more
20 preferably 18 wt% or less, and most preferably 15 wt% or less. A lower limit of the concentration of lactose in water may be 0.01 wt% or more, or 0.1 wt% or more. The concentration of lactose in water in the condensed milk-like composition can be measured by a Lan-Eynon method. A specific procedure can be performed in accordance with a Lan-Eynon method described in “a. Quantification method of lactose” of “7. Quantification
25 method of sugar content of milk products” of “(7) Test method of compositional standards of milk and the like” in “Japanese Ministerial Ordinance on Milk and Milk Products Concerning Compositional Standards and the like”.

In the condensed milk-like composition of the present invention, the content of lactose is 21 wt% or less in terms of the concentration of lactose in water. In the condensed
30 milk-like composition, since lactose is present in a state of being dissolved in water in the condensed milk-like composition, and the solubility of lactose is related to the amount of water and the amount of lactose, the concentration of lactose in water is expressed as a concentration based on water. The “concentration (wt%) of lactose in water” is calculated

by [weight of lactose in composition/(weight of lactose in composition + weight of water in composition) $\times$ 100].

[0025]

(Other Raw Materials)

5 A fat component in the condensed milk contributes to imparting a rich feeling and physical properties peculiar to the condensed milk, but milk fat derived from the raw milk is expensive. As an alternative, inexpensive oil and fat raw materials, preferably vegetable oil and fat raw materials can be used. It is also possible to use the milk fat as a raw material for imparting the fat component. It is preferable to use salad oils such as rapeseed salad oil and
10 soybean salad oil in consideration of relatively low cost, low melting point, no crystallization even at low temperatures, and no taste or odor.

 The fat and oil raw material is preferably contained in the condensed milk-like composition of the present invention in an amount of 0 to 10 wt%, more preferably 1 wt% to 10 wt%, and still more preferably 2 wt% to 8 wt%. It should be noted that a lower amount
15 of fat leads to a reduction in calories, but can cause a lack of rich feeling and thickening phenomena.

[0026]

(Saccharides)

 The condensed milk-like composition of the present invention may contain
20 saccharides preferably in an amount of 5 wt% to 60 wt% on the basis of the condensed milk-like composition. In the present specification, the term "saccharides" contained in the condensed milk-like composition means monosaccharides, disaccharides, and polysaccharides except for the lactose described above. The sugar alcohol is not included in the saccharides. As the monosaccharides, glucose, galactose, mannose, fructose, or the like can be used. As
25 the disaccharides, sucrose, maltose, trehalose, cellobiose, or the like can be used. As the trisaccharides, raffinose, maltotriose, and the like can be used. As the polysaccharides, dextrin or the like can be used. It is preferable to blend dextrin for imparting sweetness and adjusting viscosity. By using a carbohydrate (dextrin or the like) having a lower sweetness degree than sucrose in combination, it is possible to have a neat flavor with prevented
30 sweetness. As the dextrin, one or more of DE10 to DE25 can be selected. DE is an equivalent of dextrose and refers to a saccharification rate of starch. DE is a value with glucose as 100. The lower the value is, the lower the sweetness degree tends to be, and the higher the viscosity tends to be. By blending one or more types of dextrin, it is possible to

adjust appropriate sweetness degree, viscosity, and rich feeling.

In the condensed milk-like composition of the present invention, it is preferable to combine various saccharides such as trehalose. By combining various saccharides, it is possible to impart a refreshing sweetness and appropriate physical properties.

5 In the condensed milk-like composition of the present invention, one or more emulsifiers may be blended in order to stabilize the emulsification of fats and oils. As the emulsifier, those used in foods can be appropriately adopted. The blending amount of the emulsifier in the condensed milk-like composition can be appropriately selected in consideration of the emulsion stability of the oils and fats.

10 The condensed milk-like composition of the present invention contains saccharides such as sucrose, dextrin, and trehalose in an amount of preferably 10 wt% to 60 wt%, more preferably 20 wt% to 50 wt%, still more preferably 30 wt% to 50 wt%, and most preferably 35 wt% to 45 wt%.

[0027]

15 (Water)

The condensed milk-like composition of the present invention may contain water in an amount of 20 wt% to 60 wt%, preferably 20 wt% to 50 wt%, more preferably 25 wt% to 45 wt%, and still more preferably 30 wt% to 45 wt%, on the basis of the condensed milk-like composition.

20 [0028]

(Condensed Milk)

The condensed milk is obtained by concentrating milk, skim milk, and the like. The condensed milk is classified into a non-sugar condensed milk, a sweetened condensed milk, a non-sugar defatted condensed milk, and a sweetened defatted condensed milk in
25 “Japanese Ministerial Ordinance on Milk and Milk Products Concerning Compositional Standards and the like” (Japanese Ministerial Ordinance on Milk and the like for short).

The condensed milk-like composition of the present invention contains the concentrated milk protein powder, the milk powder, and the like as a raw material. Therefore, the condensed milk-like composition of the present invention is a “condensed
30 milk-like composition” that does not correspond to the condensed milk on Japanese ministerial ordinance on milk and the like, but has the same flavor, appearance, and physical properties as that of the condensed milk.

The condensed milk-like composition of the present invention may contain

condensed milk as a raw material, but preferably does not contain or substantially does not contain the condensed milk from the viewpoint of flavor and calorie. Specifically, a content of the condensed milk in the condensed milk-like composition of the present invention may be 50 wt% or less, 40 wt% or less, 30 wt% or less, 20 wt% or less, 10 wt% or less, or 5 wt% or less, on the basis of the condensed milk-like composition.

[0029]

(Condensed Milk-like Composition)

The condensed milk-like composition of the present invention preferably has a maximum viscosity of 500 mPa·s to 5000 mPa·s at 20°C when a shear rate is $0\text{s}^{-1} \rightarrow (2\text{min}) \rightarrow 200\text{s}^{-1} \rightarrow (2\text{min}) \rightarrow 0\text{s}^{-1}$ using HAAKE VT550 (manufactured by HAAKE) and a rotor VIIS.

The condensed milk-like composition of the present invention is preferably a sweetened condensed milk-like composition or a sweetened defatted condensed milk-like composition.

[0030]

The condensed milk-like composition of the present invention preferably has the water activity of 0.8 to 0.9. The condensed milk-like composition of the present invention can maintain low water activity and can be distributed at room temperature.

The condensed milk-like composition of the present invention can prevent generation of coarse lactose crystals even during storage at a low temperature. The solubility of the lactose dissolved in the solvent is decreased as the temperature is decreased. Therefore, the texture is more likely to deteriorate during storage at a low temperature due to the formation of coarse lactose crystals. It is convenient when the condensed milk and the condensed milk-like composition can be distributed at room temperature, but after being opened at home or in a store, the condensed milk and the condensed milk-like composition are often stored in a refrigerator or the like to improve storability. In addition, even when the condensed milk and the condensed milk-like composition can be distributed at room temperature, the condensed milk and the condensed milk-like composition may be distributed in a refrigerated state depending on circumstances of the store or delivery vehicle. Therefore, the condensed milk and the condensed milk-like composition are required to have storability both at the time of storage at room temperature and at the time of storage at a low temperature.

In the present specification, storing at “room temperature” means storing at $25 \pm$

1°C.

In the present specification, storing at a “low temperature” means storing at $5 \pm 1^\circ\text{C}$.

The condensed milk-like composition of the present invention can have good storability at both the room temperature and low temperature. The phrase “having good storability” means that, for example, coarse lactose crystals are not detected in any environment of $25 \pm 1^\circ\text{C}$ for 7 days or $5 \pm 1^\circ\text{C}$ for 7 days.

[0031]

2. Method for Producing Condensed Milk-like Composition

(Step of Obtaining Condensed Milk-like Mix)

A method for producing a condensed milk-like composition of the present invention includes a step of adding a sugar alcohol, a concentrated milk protein powder, and a milk powder to dissolving water and mixing them to obtain a condensed milk-like mix. In the step of obtaining the condensed milk-like mix, the dissolving water, the sugar alcohol, the concentrated milk protein powder, and the milk powder are mixed such that the content of lactose in the condensed milk-like mix is 21 wt% or less in terms of a concentration of lactose in water. A dissolution temperature can be appropriately adjusted according to the production amount, the production facility, the type of the raw material, and the like. As the sugar alcohol, the concentrated milk protein powder, and the milk powder, those described above can be used. In the method for producing a condensed milk-like composition of the present invention, a powdered sugar alcohol or a liquid sugar alcohol may be used.

[0032]

An order in which the sugar alcohol, the concentrated milk protein powder, and the milk powder are added is not particularly limited, and can be appropriately adjusted according to the production amount, the production facility, the type of the raw material, and the like. After the preparation of the premix, that is, after the sugar alcohol, the concentrated milk protein powder, the milk powder, and if necessary, other raw materials are mixed in advance, the mixture may be added to the dissolving water. The sugar alcohol, the concentrated milk protein powder, and the milk powder may be first put into a production device, and then dissolving water may be put into the production device. A part of the raw materials may be dissolved in water in advance to prepare a solution, and the solution may be added to the dissolving water. The dissolving water does not need to be pure water, and may contain other components as long as the effects of the present invention can be obtained and the raw

materials can be dissolved.

[0033]

(Sterilization Step)

5 The method for producing a condensed milk-like composition of the present invention includes a step of sterilizing a condensed milk-like mix to obtain a condensed milk-like composition. In the present specification, the term “sterilization” means reducing or completely killing microorganisms present in the condensed milk-like mix by heating or the like. In an emulsifying machine, mixed powder raw materials, vegetable oils and fats, sugar alcohols, water, and the like can be put, and preliminary mixing and emulsification can
10 be performed. It is preferable to perform preliminary mixing and emulsification under a temperature condition of 50°C to 60°C before sterilization.

The preliminarily mixed and emulsified mix may be sterilized at 85°C to 95°C for 90 seconds to 150 seconds. A sterilization treatment can be performed by a plate type heat exchanger, a tube type heat exchanger, a steam injection type sterilizer, a steam infusion type
15 sterilizer, an electric heating type sterilizer, or the like after mixing and emulsification. Retort sterilization can also be performed after filling. The sterilization method, the sterilization time, and the sterilization temperature are examples, and those skilled in the art can appropriately adjust the sterilization method, the sterilization time, and the sterilization temperature in consideration of the formulation of the condensed milk-like composition, the
20 container, and the like. After sterilization, the mixture is cooled to obtain a composition for condensed milk.

[0034]

(Seeding Step)

In the present specification, the seeding step is a treatment in which lactose serving
25 as a nucleus is externally added to precipitate fine lactose crystals in advance so that coarse crystals are not formed during storage or during distribution. The seeding step can be performed by adding the crushed lactose to the condensed milk-like composition at a predetermined temperature and cooling the mixture to a lactose precipitation temperature (20°C to 35°C).

30 [0035]

By using the concentrated milk protein powder in combination and adjusting the concentration of lactose, it is possible to eliminate the need for the seeding step. In addition, by using concentrated milk protein powder, which is a powder raw material, instead of a

liquid milk raw material, the concentration step can be reduced. In addition, the use of the concentrated milk protein powder can simplify the steps. The concentrated milk protein powder is relatively inexpensive, easily procured, and can be stored at room temperature.

[0036]

5 Although the solubility of lactose has temperature dependency, crystallization is promoted when the solubility is exceeded, and the formation of coarse crystals is caused when the treatment is not performed. When coarse crystals are formed, a feeling of roughness is generated in a tongue when ingested, and the texture is extremely deteriorated.

10 The method for producing a condensed milk-like composition of the present invention may include the seeding step, but preferably does not include the seeding step from the viewpoint of simplifying the production step.

[0037]

(Liquid Milk)

15 In the present specification, the term “liquid milk” refers to a milk raw material to be added to the composition for condensed milk in a liquid state, and examples thereof includes milk, skim milk, and concentrated milk.

20 Liquid milk is relatively expensive due to restrictions on the source. In addition, refrigeration facilities are required for receiving and storing, and the investment and transportation of facilities are very costly. In addition, since a large amount of water is contained, the concentration step may be indispensable.

 The method for producing a composition for condensed milk of the present invention may include a step of adding liquid milk to dissolving water, but preferably does not include the step of adding liquid milk to dissolving water from the viewpoint of cost reduction and process simplification.

25 [0038]

(Condensed Milk)

 The product produced by the production method of the present invention contains the concentrated milk protein powder, the milk powder, and the like as a raw material. Therefore, the product produced by the production method of the present invention is a
30 “condensed milk-like composition” that does not correspond to the condensed milk on Japanese Ministerial Ordinance on Milk and the like, but has the same flavor, appearance, and physical properties as that of the condensed milk.

 The method for producing a composition for condensed milk of the present

invention may include a step of adding condensed milk, but preferably does not include the step of adding condensed milk from the viewpoint of cost reduction and process simplification.

A general process for producing sweetened condensed milk is complicated and has a very large number of steps, and it is necessary to install a large-scale production line. In addition, the producing cost tends to increase due to the reason described above. Therefore, a production method in which the process is further simplified is required.

[0039]

The method for producing a condensed milk-like composition of the present invention can be provided by filling a usual packaging container such as a metal can, a paper container combined with a metal foil or a plastic film, a pouch such as an aluminum pouch, a plastic container, a vinyl container, or a glass bottle, and a volume thereof is not particularly limited.

[0040]

Examples of the production facility used in the method for producing a condensed milk-like composition of the present invention include an emulsifying machine having a heating function and a stirring function.

[0041]

Hereinafter, the present invention is specifically described with reference to examples, but these examples do not limit the scope of the present invention. In the present specification, “%” refers to wt% unless otherwise specified.

[Example]

[0042]

Example 1 (Simple Production Method)

420 g of skim milk powder, 158 g of milk protein concentrate (MPC), 385 g of sucrose, 595 g of dextrin, 350 g of trehalose, and 8 g of emulsifiers (sucrose stearate and succinic acid fatty acid monoglyceride) were mixed in a powder state to obtain a powder raw material. The powder raw material, 140 g of rapeseed salad oil, 280 g of glycerin, and 760 g of water were put into an emulsifying machine, heated by steam injection, and dissolved for 10 minutes after reaching 60°C. After the dissolution, a flavor was added, and the mixture was further subjected to a heat treatment by steam injection, followed by sterilization at 88°C to 95°C for 120 seconds to obtain a sweetened condensed milk-like composition. A total amount of added water was adjusted to 1150 g to 1200 g, and the number of revolutions of the

stirrer was 1800 rpm.

As a result of conducting sensory tests by five panelists, the sweetened condensed milk-like composition prepared by the method in Example 1 had the same flavor, color luster, and viscosity as those of the sweetened condensed milk-like composition prepared by a concentration method in Comparative Example 1. In addition, even after storage at room temperature (25°C) and cold temperature (5°C) for 7 days, crystals of lactose were not generated, and neither flavor nor color luster was changed.

[0043]

Example 2

420 g of skim milk powder, 70 g of milk protein concentrate (MPC), 438 g of sucrose, 630 g of dextrin, 350 g of trehalose, and 8 g of emulsifiers (sucrose stearate and succinic acid fatty acid monoglyceride) were mixed in a powder state to obtain a powder raw material. 140 g of rapeseed salad oil, 280 g of glycerin, and 720 g of water were put into an emulsifying machine, heated by steam injection, and dissolved for 10 minutes after reaching 60°C. After the dissolution, a flavor was added, and the mixture was further subjected to a heat treatment by steam injection, followed by sterilization at 88°C to 95°C for 120 seconds to obtain a sweetened condensed milk-like composition. A total amount of added water was adjusted to 1150 g to 1200 g, and the number of revolutions of the stirrer was 1800 rpm.

As a result of conducting sensory tests by five panelists, the sweetened condensed milk-like composition prepared by the method in Example 2 had a better texture than the sweetened condensed milk-like composition prepared by a concentration method in Comparative Example 1. Although acceptable, the flavor lacked a little milkiness and richness, and the color luster was a little diluted. In addition, even after storage at room temperature (25°C) and cold temperature (5°C) for 7 days, crystals of lactose were not generated, and neither flavor nor color luster was changed.

[0044]

Example 3

420 g of skim milk powder, 158 g of whey protein concentrate (WPC), 427 g of sucrose, 543 g of dextrin, 350 g of trehalose, and 8 g of emulsifiers (sucrose stearate and succinic acid fatty acid monoglyceride) were mixed in a powder state to obtain a powder raw material. The powder raw material, 140 g of rapeseed salad oil, 280 g of glycerin, and 720 g of water were put into an emulsifying machine, heated by steam injection, and dissolved for 10 minutes after reaching 60°C. After the dissolution, a flavor was added, and the mixture

was further subjected to a heat treatment by steam injection, followed by sterilization at 88°C to 95°C for 120 seconds to obtain a sweetened condensed milk-like composition. A total amount of added water was adjusted to 1150 g to 1200 g, and the number of revolutions of the stirrer was 1800 rpm.

As a result of conducting sensory tests by five panelists, the sweetened condensed milk-like composition prepared by the method in Example 3 had a slightly grassy flavor derived from whey as compared with the sweetened condensed milk-like composition prepared by a concentration method in Comparative Example 1, but had a flavor acceptable as the sweetened condensed milk-like composition. The color luster and viscosity were at the same levels as those of the sweetened condensed milk. In addition, even after storage at room temperature (25°C) and cold temperature (5°C) for 7 days, crystals of lactose were not generated, and neither flavor nor color luster was changed.

[0045]

Comparative Example 1 (Production Method (Concentration Method) of related art)

167 g of skim milk powder, 41 g of sucrose, 80 g of dextrin, 67 g of trehalose, and 1.3 g of emulsifiers (sucrose stearate, glycerin fatty acid ester, and soybean lecithin) were mixed in a powder state to obtain a powder raw material. The powder raw material, 33 g of rapeseed salad oil, and 53 g of glycerin were dissolved in 1557 g of water at 60°C. After the dissolution, a homogenization treatment (homogenization pressure: 50 kgf) was performed, and a sterilization treatment was performed at 80°C to 90°C for 10 minutes. After the sterilization treatment, the mixture was cooled with water, water was evaporated under reduced pressure, and the mixture was concentrated until Brix became 63.9 from 21.5. After the concentration, addition of a flavor and a seeding operation were performed to obtain a sweetened condensed milk-like composition.

As a result of conducting sensory tests by five panelists, the obtained sweetened condensed milk-like composition had a good taste and flavor with neat sweetness and milk feeling.

The color luster and viscosity were also at the same levels as those of the sweetened condensed milk.

By performing the seeding operation, coarse lactose crystals were not observed even after storage at room temperature (25°C) and cold temperature (5°C) for 7 days.

[0046]

Comparative Example 2

770 g of skim milk powder, 1330 g of sucrose, 350 g of trehalose, and 8 g of emulsifiers (sucrose stearate and succinic acid fatty acid monoglyceride) were mixed in a powder state to obtain a powder raw material. 140 g of rapeseed salad oil and 500 g of water were put into an emulsifying machine, heated by steam injection, and dissolved for 10 minutes after reaching 60°C. After the dissolution, a flavor was added, and the mixture was further subjected to a heat treatment by steam injection, followed by sterilization at 88°C to 95°C for 120 seconds to obtain a sweetened condensed milk-like composition. A total amount of water added was adjusted to 900 g to 950 g, and the number of revolutions of the stirrer was 1800 rpm.

As a result of conducting sensory tests by five panelists, the obtained sweetened condensed milk-like milk product had a sweetened condensed milk-like color luster. Although acceptable, the sweetened condensed milk-like composition had a strong sweetness and a rich flavor. The viscosity was 19900 mPa·s, which was much higher than that of the sweetened condensed milk. When stored at room temperature (25°C) and cold temperature (5°C) for 7 days, a large amount of coarse lactose crystals were generated, the roughness in a mouth was strong, and the texture was impaired.

[0047]

Comparative Example 3

770 g of skim milk powder, 385 g of sucrose, 385 g of dextrin, 350 g of trehalose, and 8 g of emulsifiers (sucrose stearate and succinic acid fatty acid monoglyceride) were mixed in a powder state to obtain a powder raw material. 140 g of rapeseed salad oil, 280 g of glycerin, and 720 g of water were put into an emulsifying machine, heated by steam injection, and dissolved for 10 minutes after reaching 60°C. After the dissolution, a flavor was added, and the mixture was further subjected to a heat treatment by steam injection, followed by sterilization at 88°C to 95°C for 120 seconds to obtain a sweetened condensed milk-like composition. A total amount of added water was adjusted to 1150 g to 1200 g, and the number of revolutions of the stirrer was 1800 rpm.

As a result of conducting sensory tests by five panelists, the obtained sweetened condensed milk-like composition had a good taste and flavor with neat sweetness and milk feeling. The color luster and viscosity were at the same levels as those of the sweetened condensed milk.

After storage at room temperature (25°C) and cold temperature (5°C) for 7 days, coarse lactose crystals were partially observed, and poor texture was observed.

[0048]

Comparative Example 4

648 g of skim milk powder, 56 g of milk protein concentrate (MPC), 420 g of sucrose, 434 g of dextrin, 350 g of trehalose, and 8 g of emulsifiers (sucrose stearate and succinic acid fatty acid monoglyceride) were mixed in a powder state to obtain a powder raw material. 140 g of rapeseed salad oil, 280 g of glycerin, and 720 g of water were put into an emulsifying machine, heated by steam injection, and dissolved for 10 minutes after reaching 60°C. After the dissolution, a flavor was added, and the mixture was further subjected to a heat treatment by steam injection, followed by sterilization at 88°C to 95°C for 120 seconds to obtain a sweetened condensed milk-like composition. A total amount of added water was adjusted to 1150 g to 1200 g, and the number of revolutions of the stirrer was 1800 rpm.

As a result of conducting sensory tests by five panelists, the obtained sweetened condensed milk-like composition had a good taste and flavor with neat sweetness and milk feeling. The color luster and viscosity were at the same levels as those of the sweetened condensed milk.

After storage at room temperature (25°C) and cold temperature (5°C) for 7 days, the texture at room temperature was good, but coarse lactose crystals were partially observed under refrigeration, and poor texture was observed.

[0049]

A raw material blending ratios of Examples and Comparative Examples are shown in Table 1. A content of proteins in each of Examples and Comparative Examples is shown in Table 2. A ratio of the protein derived from skim milk powder and a ratio of the protein derived from MPC in each of the proteins in Examples and Comparative Examples is shown in Table 3. The skim milk powder contains about 36% of protein, the MPC contains about 82% of protein, and the WPC contains about 81% of protein. A concentration of lactose in water calculated from the raw material blending ratio of each of Examples and Comparative Examples is shown in Table 4. The content of lactose in used MPC was about 2.3%, and the content of lactose in used WPC was about 4.0%. The content of lactose in the used skim milk powder was about 51.5%. Table 5 shows a list of evaluation results of Examples and Comparative Examples.

[0050]

[Table 1]

Raw material blending ratio [%]

	Example 1	Example 2	Example 3	Comparative Example 1 (method of related art)	Comparative Example 2	Comparative Example 3	Comparative Example 4
Skim milk powder	12.0	12.0	12.0	25.0	22.0	22.0	18.5
MPC	4.5	2.0	-	-	-	-	1.6
WPC	-	-	4.5	-	-	-	-
Sucrose	10.5	12.5	12.2	6.2	38.0	11.0	12.0
Dextrin	17.5	18.0	15.5	12.0		11.0	12.4
Trehalose	8.0	10.0	10.0	10.0	10.0	10.0	10.0
Emulsifier	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Salad oil	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Glycerin	8.0	8.0	8.0	8.0	-	8.0	8.0
Flavor	Appropriate amount	Appropriate amount	Appropriate amount	Appropriate amount	Appropriate amount	Appropriate amount	Appropriate amount
Seeding lactose	No	No	No	Appropriate amount	No	No	No
Water	33.3	33.3	33.5	33.6	25.8	33.8	33.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[0051]

5 [Table 2]

Ratio [%] of protein on basis of condensed milk-like composition

	Example 1	Example 2	Example 3	Comparative Example 1 (method of related art)	Comparative Example 2	Comparative Example 3	Comparative Example 4
Derived from skim milk powder	4.36	4.36	4.36	9.08	7.99	7.99	6.72
Derived from MPC	3.68	1.64	0	0	0	0	1.31
Derived from WPC	0	0	3.65	0	0	0	0
Total	8.04	6.00	8.01	9.08	7.99	7.99	8.03

[0052]

[Table 3]

Ratio [%] of protein derived from each raw material

	Example 1	Example 2	Example 3	Comparative Example 1 (method of related art)	Comparative Example 2	Comparative Example 3	Comparative Example 4
Derived from skim milk powder	54.2	72.7	54.4	100	100	100	83.7
Derived from MPC or derived from WPC	45.8	27.3	45.6	0	0	0	16.3
Total	100	100	100	100	100	100	100

[0053]

5 [Table 4]

Concentration [%] of lactose in water

	Example 1	Example 2	Example 3	Comparative Example 1 (method of related art)	Comparative Example 2	Comparative Example 3	Comparative Example 4
Skim milk powder + (derived from MPC or derived from WPC)	14.8	14.8	14.8	26.1	29.0	23.7	21.1

[0054]

[Table 5]

Evaluation results of each example and comparative example

		Example 1	Example 2	Example 3	Comparative Example 1 (method of related art)	Comparative Example 2	Comparative Example 3	Comparative Example 4
Flavor		A	B	B	A	B	A	A
Color luster		A	B	A	A	A	A	A
Viscosity (mPa·s)		950	670	1400	970	19900	580	580
Texture with or without coarse lactose crystals	Room temperature	A	A	A	-	C	C	A
	Refrigeration	A	A	A	-	C	C	C

A: Same level as sugar condensed milk; B: Acceptable, but inferior to sugar condensed milk; C: Clearly inferior to sugar condensed milk.

The viscosity shown in the table is the maximum value at 20°C when a shear rate is $0\text{s}^{-1} \rightarrow (2\text{min}) \rightarrow 200\text{s}^{-1} \rightarrow (2\text{min}) \rightarrow 0\text{s}^{-1}$ using HAAKE VT550 (manufactured by HAAKE) and a rotor VISt.

[0055]

Although the present invention has been described in detail with reference to specific examples, it is apparent to those skilled in the art that it is possible to add various alterations and modifications without departing from the spirit and the scope of the present invention.

The present application is based on Japanese Patent Application (No. 2019-165012) filed on September 11, 2019, the entirety of which is incorporated by reference. In addition, all references cited here are entirely incorporated.

INDUSTRIAL APPLICABILITY

[0056]

It is possible to provide a low-calorie, refreshing condensed milk-like composition with the same flavor, viscosity characteristics, and storability as that of sweetened condensed milk of related art using a simple production method.

CLAIMS

[Claim 1]

A condensed milk-like composition comprising: a sugar alcohol; a concentrated
5 milk protein powder; and a milk powder, wherein a content of lactose is 21 wt% or less in
terms of a concentration of lactose in water.

[Claim 2]

The condensed milk-like composition according to claim 1, wherein 18 wt% or
more of a milk protein contained in the condensed milk-like composition is derived from the
10 concentrated milk protein powder.

[Claim 3]

The condensed milk-like composition according to claim 1 or 2, wherein in a milk
protein contained in the condensed milk-like composition, a ratio of a milk protein derived
from the concentrated milk protein powder to a milk protein derived from the milk powder is
15 1:4 to 4:1.

[Claim 4]

The condensed milk-like composition according to any one of any one of claims 1
to 3, further comprising a vegetable oil and fat and/or saccharides.

[Claim 5]

A method for producing a condensed milk-like composition, comprising: adding a
20 sugar alcohol, a concentrated milk protein powder, and a milk powder to dissolving water and
mixing them to obtain a condensed milk-like mix; and sterilizing the condensed milk-like mix
to obtain a condensed milk-like composition, wherein a content of lactose in the condensed
milk-like composition is 21 wt% or less in terms of a concentration of lactose in water.

[Claim 6]

The method for producing a condensed milk-like composition according to claim 5,
wherein 18 wt% or more of a milk protein contained in the condensed milk-like composition
is derived from the concentrated milk protein powder.

[Claim 7]

The method for producing a condensed milk-like composition according to claim 5
or 6, wherein in a milk protein contained in the condensed milk-like composition, a ratio of a
milk protein derived from the concentrated milk protein powder to a milk protein derived
from the milk powder is 1:4 to 4:1.

[Claim 8]

The method for producing a condensed milk-like composition according to any one of claims 5 to 7, which does not comprise a seeding step.