

DESCRIPTION

Title of Invention: CHEESE-LIKE FOOD AND METHOD FOR PRODUCING
CHEESE-LIKE FOOD

5

Technical Field

[0001]

The present invention relates to a cheese-like food and a method for
producing a cheese-like food.

10

Background Art

[0002]

In recent years, cheese has been used in various dishes, and the demand for
cheese tends to increase. On the other hand, the production volume of milk used
for cheese production is decreasing year by year for a reason such as a decrease in
livestock farmers. Because of this, it has become difficult to supply a sufficient
amount of cheese to the market to meet the demand, and for this reason, a cheese-
like food that can be produced without using milk is attracting attention.

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[0003]

Patent Literature 1 discloses a technique relating to a molded cheese-like
food containing an acid-treated starch. In addition, Patent Literature 2 discloses
a technique relating to a heat-resistant cheese-like processed food containing an
acid-treated starch.

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Citation List

Patent Literature

[0004]

Patent Literature 1: Japanese Unexamined Patent Application Publication No.
2015-065948

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Patent Literature 2: Japanese Patent No. 6222788

Summary of Invention

Technical Problem

[0005]

When producing a cheese-like food, a raw material including a starch, water, an oil or fat, and the like is stirred while being heated to emulsify the raw material. Then, the emulsified raw material is cooled for solidification to produce a cheese-like food.

5 [0006]

However, a problem of the production step of a cheese-like food is that the productivity is poor because it takes time to cool the emulsified raw material for solidification. On the other hand, it can also be considered to improve the productivity by shortening the solidification time of the raw materials during the cooling by changing the proportions of the raw materials, but a problem is that the texture of the cheese-like food deteriorates depending on the proportions of the raw materials.

[0007]

In view of the above problems, an object of the present invention is to improve the productivity of a cheese-like food and to provide a cheese-like food having an appropriate texture and a method for producing a cheese-like food.

Solution to Problem

[0008]

The method for producing a cheese-like food according to one aspect of the present invention includes: a step of providing a mixture including at least a starch including an acid-treated starch, moisture, and an oil or fat; a step of stirring the mixture while heating to emulsify the mixture; and a step of cooling the emulsified mixture for solidification, in which a mass ratio of the starch to the moisture included in the mixture is 0.55 or more and 0.92 or less, and a mass ratio of the oil or fat to the starch included in the mixture is 0.25 or more and 1.80 or less.

[0009]

In the above method for producing a cheese-like food, the mass ratio of the starch to the moisture may be 0.60 or more and 0.86 or less.

[0010]

In the above method for producing a cheese-like food, the mass ratio of the starch to the moisture may be 0.62 or more and 0.80 or less.

[0011]

In the above method for producing a cheese-like food, the proportion of the starch included in the mixture may be 21.0% by mass or more and 35.3% by mass or less.

[0012]

5 In the above method for producing a cheese-like food, the proportion of the oil or fat included in the mixture may be 8.0% by mass or more and 40.0% by mass or less.

[0013]

10 In the above method for producing a cheese-like food, a hydroxypropylated starch may be further included as the starch.

[0014]

In the above method for producing a cheese-like food, the proportion of the hydroxypropylated starch included in the mixture may be 5.5% by mass or less.

[0015]

15 In the above method for producing a cheese-like food, the hydroxypropylated starch may be hydroxypropylated tapioca starch.

[0016]

In the above method for producing a cheese-like food, the acid-treated starch may be an acid-treated potato starch.

20 [0017]

In the above method for producing a cheese-like food, the acid-treated starch may be acid-treated acetylated potato starch.

[0018]

25 In the above method for producing a cheese-like food, the mixture may further include an emulsifying agent.

[0019]

In the above method for producing a cheese-like food, the emulsifying agent may be starch sodium octenylsuccinate.

[0020]

30 In the above method for producing a cheese-like food, the moisture may include at least one of water, soymilk, and coconut milk.

[0021]

The cheese-like food according to one aspect of the present invention includes a starch including at least an acid-treated starch, moisture, and an oil or

fat, in which the mass ratio of the starch to the moisture is 0.55 or more and 0.92 or less, and the mass ratio of the oil or fat to the starch is 0.25 or more and 1.80 or less.

5 Advantageous Effects of Invention

[0022]

According to the present invention, it is possible to improve the productivity of a cheese-like food and to provide a cheese-like food having an appropriate texture and a method for producing a cheese-like food.

10

Description of Embodiments

[0023]

<Cheese-like food>

The cheese-like food according to the present embodiment includes a starch
15 including at least an acid-treated starch, moisture, and an oil or fat, in which the mass ratio of the starch to the moisture is 0.55 or more and 0.92 or less, and the mass ratio of the oil or fat to the starch is 0.25 or more and 1.80 or less. Further, the mass ratio of the starch to the moisture is preferably 0.60 or more and 0.86 or less, more preferably 0.62 or more and 0.80 or less, and further preferably 0.65 or
20 more and 0.77 or less.

[0024]

In the cheese-like food according to the present embodiment, by setting the mass ratio of the starch to the moisture in the above range, the hardening rate can be increased when the emulsified raw material is cooled for solidification in the
25 production step of the cheese-like food. Therefore, the production step can be shortened, and thus the productivity of the cheese-like food can be improved. Further, in the cheese-like food according to the present embodiment, by setting the mass ratio of the starch to the moisture in the above range, the hardness of the cheese-like food after production can be set in an appropriate range. Therefore,
30 the texture of the cheese-like food can be brought close to that of cheese, and thus a cheese-like food having an appropriate texture can be provided.

[0025]

Hereinafter, the cheese-like food according to the present embodiment will be described in detail.

[0026]

(Starch)

The starch used in the cheese-like food according to the present embodiment is a starch including at least an acid-treated starch. In the present embodiment, it is preferable to use an acid-treated potato starch as the acid-treated starch, and it is more preferable to use an acid-treated acetylated starch. The acid-treated acetylated starch is a starch obtained by subjecting a raw material starch to an acid treatment and an acetylation treatment. As the raw material starch, for example, at least one selected from the group consisting of potato starch, tapioca starch, waxy corn starch, corn starch, high amylose corn starch, sweet potato starch, wheat starch, rice starch, and sago starch can be used, but the raw material starch is not limited to these. In the present embodiment, it is preferable to use potato starch as the raw material starch.

[0027]

The acid-treated acetylated starch used in the present embodiment may be a starch obtained by acetylating an acid-treated starch or a starch obtained by acid-treating an acetylated starch. When the acetylated starch is acid-treated, some acetyl groups may be eliminated during the acid treatment. Because of this, in consideration of reaction efficiency, it is preferable to use an acid-treated acetylated starch obtained by acid-treating and then acetylating a starch. In addition, the acid-treated acetylated starch may be a starch that has been subjected to another processing treatment (for example, crosslinking treatment, etherification treatment, or enzyme treatment) as long as the starch has been subjected to an acid treatment and an acetylation treatment.

[0028]

In the cheese-like food according to the present embodiment, the proportion of the starch included in the cheese-like food (that is, the total amount of the starch in the cheese-like food) is 21.0% by mass or more and 35.3% by mass or less, preferably 23.3% by mass or more and 34.0% by mass or less, and more preferably 24.0% by mass or more and 32.5% by mass or less. By setting the proportion of the starch in this range, the productivity of the cheese-like food can be improved, and the texture of the cheese-like food can be set in an appropriate range.

[0029]

In addition, in the cheese-like food according to the present embodiment, the proportion of the acid-treated acetylated starch included in the cheese-like food is preferably 21.0% or more and 31.0% or less.

[0030]

5 In the present embodiment, a hydroxypropylated starch may be further included as the above starch. The hydroxypropylated starch is a starch obtained by subjecting a raw material starch to a hydroxypropylation treatment. The raw material starch of the hydroxypropylated starch is not particularly limited, and it is preferable to use tapioca starch in the present embodiment. That is, in the
10 present embodiment, it is preferable to use hydroxypropylated tapioca starch as the hydroxypropylated starch.

[0031]

In the cheese-like food according to the present embodiment, the proportion of the hydroxypropylated starch included in the cheese-like food can be 5.5% by
15 mass or less. By setting the proportion of the hydroxypropylated starch included in the cheese-like food in this range, it is possible to improve the texture of the cheese-like food while improving the productivity of the cheese-like food. When a hydroxypropylated starch is included in the starch, the total amount of the above starch is the total amount of the acid-treated acetylated starch and the
20 hydroxypropylated starch. In addition, in the present embodiment, an acetylated starch such as acetylated tapioca starch may be used in addition to the hydroxypropylated starch.

[0032]

(Oil or fat)

25 Examples of the oil or fat used in the cheese-like food according to the present embodiment include, but are not limited to, palm oil, palm kernel oil, coconut oil, soybean oil, rapeseed oil, corn oil, cottonseed oil, rice oil, sunflower oil, safflower oil, sesame oil, olive oil, and processed oils/fats obtained by subjecting these oils or fats to one or two or more processing selected from the
30 group consisting of transesterification, hydrogenation, fractionation, and hardening. These edible oils/fats may be used singly or in combinations of two or more. In this embodiment, it is particularly preferable to use palm oil, palm kernel oil, and coconut oil.

[0033]

In the cheese-like food according to the present embodiment, the proportion of the oil or fat included in the cheese-like food is 8.0% by mass or more and 40.0% by mass or less, preferably 10.0% by mass or more and 38.8% by mass or less, and more preferably 10.0% by mass or more and 30.0% by mass or less. By setting the proportion of the oil or fat in this range, the productivity of the cheese-like food can be improved, and the texture of the cheese-like food can be set in an appropriate range.

[0034]

In particular, in the present embodiment, the mass ratio of the oil or fat to the starch is preferably 0.25 or more and 1.80 or less, preferably 0.28 or more and 1.67 or less, and more preferably 0.30 or more and 1.50 or less.

[0035]

(Moisture)

The content of the moisture in the cheese-like food according to the present embodiment can be 32.0% by mass or more and 51.0% by mass or less. In the present embodiment, the "content of the moisture" is the amount of raw material water (blending water) added when producing a cheese-like food, excluding the amount of moisture included in the starch itself. The content of the moisture can be appropriately adjusted according to the amount of the starch. That is, in the present embodiment, the content of the moisture can be adjusted such that the mass ratio of the starch to the moisture is within the above range. In addition, the cheese-like food according to the present embodiment includes a starch, an oil or fat, and moisture as the main raw materials, and thus for example, when adjusting the mass ratio of the starch to the moisture and the mass ratio of the oil or fat to the starch in the above ranges, the amount of the moisture may be appropriately adjusted.

[0036]

In the cheese-like food according to the present embodiment, the moisture may be other than water. Examples of the moisture that may be used include a plant emulsified liquid such as soymilk, coconut milk, almond milk, or rice milk; an animal emulsified liquid such as raw milk, low-fat milk, or non-fat milk; a vegetable juice; and a fruit juice. As described above, by including a liquid other than water as the moisture, a flavor can be added to the cheese-like food.

[0037]

(Emulsifying agent)

The cheese-like food according to the present embodiment may include an emulsifying agent. Examples of the emulsifying agent that can be used include lecithin, monoglycerin fatty acid ester, organic acid monofatty acid glyceride, polyglycerin fatty acid ester, polyglycerin condensed ricinoleic acid ester, propylene glycol fatty acid ester, sorbitan fatty acid ester, sucrose fatty acid ester, polyoxyethylene sorbitan fatty acid ester, and starch sodium octenylsuccinate. In the present embodiment, it is preferable to use starch sodium octenylsuccinate as the emulsifying agent. For example, the proportion of starch sodium octenylsuccinate included in cheese-like foods can be 1% by mass or more and 5% by mass or less.

[0038]

Herein, starch sodium octenylsuccinate is treated as an emulsifying agent instead of a starch. That is, herein, the total amount of the starch does not include starch sodium octenylsuccinate.

[0039]

(Another component)

The cheese-like food according to the present embodiment may include a component other than the above components (another component) as long as the advantageous effects of the present invention are not impaired. Examples of the another component that can be used include L-ascorbic acid, an L-ascorbic acid derivative; an antioxidant such as tocopherol, tocotrienol, lignan, a ubiquinone, a xanthin, oryzanol, a catechin, a polyphenol, or a tea extract; a colorant such as carotene; a flavoring; a seasoning such as salt, sugar, or an amino acid; a polysaccharide such as a starch other than the above, xanthan gum, guar gum, Arabic gum, pectin, locust bean gum, carrageenan, alginic acid, dextrin, gellan gum, or cellulose; a milk component such as casein sodium or powdered skim milk; a cheese such as natural cheese or processed cheese; a pH adjuster such as acetic acid, phosphoric acid, citric acid, lactic acid, and sodium salts thereof; a shelf life enhancer such as sodium acetate, glycine, or egg white lysozyme.

[0040]

As described above, in the cheese-like food according to the present embodiment, the mass ratio of the starch to the moisture is 0.55 or more and 0.92 or less. When the mass ratio of the starch to the moisture is set in the above

range, the hardening rate can be increased when the emulsified raw material is cooled for solidification in the production step of the cheese-like food.

Therefore, the production step can be shortened, and thus the productivity of the cheese-like food can be improved. Further, the hardness of the cheese-like food after production can be set in an appropriate range by setting the mass ratio of the starch to the moisture in the above range. Therefore, the texture of the cheese-like food can be brought close to that of cheese, and thus a cheese-like food having an appropriate texture can be provided.

[0041]

That is, in the cheese-like food, when the amount of the starch is increased relative to that of the moisture, the hardening rate when the emulsified raw material is cooled for solidification can be increased. On the other hand, when the amount of the starch is large relative to that of the moisture, the hardness of the cheese-like food after production becomes high, and the texture becomes poor. On the contrary, when the amount of the starch is small relative to that of the moisture, the hardness of the cheese-like food after production decreases, but the hardening rate when the emulsified raw material is cooled for solidification becomes slow. Accordingly, in the cheese-like food according to the present embodiment, the mass ratio of the starch to the moisture is 0.55 or more and 0.92 or less in consideration of the balance between the hardening rate of the raw material during the production and the hardness of the cheese-like food after production. By setting the mass ratio of the starch to the moisture in such a range, it is possible to provide a cheese-like food having an appropriate texture while improving the productivity of the cheese-like food.

[0042]

<Method for producing cheese-like food>

Next, the method for producing a cheese-like food according to the present embodiment will be described.

When producing the cheese-like food according to the present embodiment, first, a mixture (raw material) including a starch including at least an acid-treated starch, moisture, and an oil or fat is provided (provision step). At this time, the mass ratio of the starch to the moisture included in the mixture provided is 0.55 or more and 0.92 or less, and the mass ratio of the oil or fat to the starch is 0.25 or more and 1.80 or less. In addition, in the present embodiment, the mass ratio

of the starch to the moisture included in the mixture provided is preferably 0.60 or more and 0.86 or less, more preferably 0.62 or more and 0.80 or less, and further preferably 0.65 or more and 0.77 or less. The above raw materials for the cheese-like food can be used for the mixture. When providing the mixture, water, a starch, and an oil or fat may be mixed together, or any two components may be mixed in advance and then the remaining component may be added and mixed.

[0043]

Next, the provided mixture is stirred while being heated to emulsify the mixture (stirring step). For example, the provided mixture is stirred for a few minutes without being heated, then heating is started, and the mixture is stirred until the starch is gelatinized and the whole is emulsified. The temperature at which the mixture is stirred while being heated is preferably such that the temperature of the mixture is 80°C or more and less than 120°C. To give a specific example of the step of emulsifying, the mixture is stirred for 1 minute under a condition of 1200 rpm using a propeller stirrer in a state in which the mixture is not heated. After that, the mixture can be stirred for 6 minutes under a condition of 1000 rpm while being heated in a hot water bath at 90°C to emulsify the mixture. In the stirring step, live steam may be injected as heating means. At that time, the injected live steam is calculated as the moisture.

[0044]

An apparatus other than the propeller type stirrer may be used in the stirring step. For example, after emulsifying the mixture using an emulsifier such as a kettle type emulsifier, a Stefan type emulsifier, or a surface scraping type emulsifier, or a homomixer or a propeller type stirrer, the mixture may be heated using a surface scraping type heat exchanger or the like. By including a heating step as described above, the mixed liquid becomes a paste liquid, and a cheese-like texture can be imparted to the cheese-like food.

[0045]

After that, the emulsified mixture is cooled for solidification (cooling step). The cooling temperature at this time can be, for example, cooled in an atmosphere of more than 0°C and 10°C or less. Cooling at this temperature can impart an appropriate hardness to the emulsified mixture. After that, the solidified mixture (cheese-like food) may be cut and packed into a packaging container or the like.

[0046]

In the method for producing a cheese-like food according to the present embodiment, the cooling step may be carried out after the emulsified mixture (emulsion) is packed into a packaging container or the like. For example, when
5 producing an individually packaged sliced cheese-like food, an emulsion is packed inside a band-shaped packaging film having a cavity, and the packaging film into which the emulsion is packed is cooled to solidify the emulsion to produce a cheese-like food. At this time, the packaging film into which the
10 emulsion is packed is pressed in the upward and downward directions to flatten the film (for example, the film is passed between two rollers to flatten the film), the flattened film is cooled and then cut into pieces, making it possible to produce a sliced cheese-like food packaged in the packaging film.

[0047]

In the method for producing a cheese-like food according to the present
15 embodiment, the thickness of cheese-like food is not limited, and can be 3 cm or less, 2 cm or less, or 1.5 cm or less. From the viewpoint of strength, the thickness is preferably 0.2 mm or more, more preferably 0.5 mm or more, and more preferably 1 mm or more. For example, when the packaging film into
20 which the emulsion is packed is flattened, the thickness can be 0.2 mm or more and 3.0 mm or less, and preferably 0.8 mm or more and 2.0 mm or less. According to the present invention, the hardening of the emulsion is promoted, and thus the productivity of cheese-like food having a small thickness can be improved.

[0048]

25 That is, in the method for producing a cheese-like food by packing an emulsion inside a packaging film and cooling the packaging film into which the emulsion is packed, the packing of the emulsion and the cooling of the emulsion are continuously carried out. Because of this, when producing a cheese-like food using this method, it is important for the emulsion to be quickly solidified in the
30 cooling step.

[0049]

As described above, in the present embodiment, the mass ratio of the starch to the moisture is 0.55 or more and 0.92 or less, and thus the hardening rate when the emulsion is solidified in the cooling step can be increased. From this, the

method for producing a cheese-like food according to the present embodiment can be particularly suitably used for a method for producing a cheese-like food by packing an emulsion inside a packaging film and cooling the packaging film into which the emulsion is packed. For example, the method for producing a cheese-like food according to the present embodiment can be suitably used for a production step using an IWS (Individual wrapping slice) type packing apparatus. [0050]

According to the invention according to the present embodiment described above, it is possible to improve the productivity of a cheese-like food and to provide a cheese-like food having an appropriate texture and a method for producing a cheese-like food.

Examples

[0051]

Next, Examples of the present invention will be described.

[0052]

<Experiment 1>

As Experiment 1, cheese-like foods according to Examples 1-1 to 1-7 and Comparative Examples 1-1 and 1-2 were created using the following method.

[0053]

(Creation of samples)

First, the following raw materials were provided (see Table 1).

Acid-treated acetylated potato starch (Lyckeby 11200: manufactured by Lyckeby) and hydroxypropylated tapioca starch (Gelcol (registered trade mark) POT-05: manufactured by J-Oil Mills, Inc.) were provided as starches. Starch sodium octenylsuccinate (N-CREAMER (registered trade mark) 46: manufactured by Ingredion Incorporated) was provided as an emulsifying agent. Palm oil (manufactured by J-Oil Mills, Inc.) was provided as an oil or fat. Then, these raw materials were placed in a container together with salt, water, and a flavoring. The proportion (% by mass) of each raw material placed in the container is as shown in Table 1.

[0054]

For example, in the case of Example 1-1, each raw material was weighed and placed in a container such that the proportion of acid-treated acetylated

potato starch was 22.5%, the proportion of hydroxypropylated tapioca starch was 2.6%, and the proportion of starch sodium octenylsuccinate was 2.0%, the proportion of salt was 1.8%, the proportion of water was 42.0%, the proportion of palm oil was 29.0%, and the proportion of the flavoring was 0.1%, based on the total weight.

[0055]

Then, the mixture (raw materials) in the container was stirred for 1 minute under a condition of 1200 rpm using a propeller stirrer in a state in which the mixture was not heated. After that, the mixture was stirred for 6 minutes under a condition of 1000 rpm while being heated in a hot water bath at 90°C to emulsify the mixture. That is, the mixture was stirred while being heated to gelatinize the starch to thereby emulsify the mixture.

[0056]

After that, a cylindrical stainless steel container having a diameter of 5 cm and a depth of 1.3 cm was filled to the full with the emulsified mixed liquid, the top of this container was covered with a wrap, and rubber was wound to seal the container. Then, the whole container was immersed in ice water and cooled for 1 hour. Using the above method, cheese-like foods according to Examples 1-1 to 1-7 and Comparative Examples 1-1 and 1-2, which were different from each other in the proportions of the raw materials, were created.

[0057]

(Evaluations)

The following four items were evaluated for each sample.

[0058]

1. Production suitability (during heating and stirring)

The state of the mixture when the mixture was stirred while being heated was visually observed, and the production suitability during the heating and stirring was evaluated. Specifically, the mixture was rated as having no production suitability when the viscosity increased too much during the heating and stirring to make the stirring impossible or when emulsification was not possible. In addition, when the mixture has a low viscosity during the heating and stirring and has a good state of emulsification, the mixture was rated as excellent. The evaluation criteria for the production suitability (during the heating and stirring) are as follows. A to C were considered to be accepted.

[0059]

A: Has a low viscosity and a good state of emulsification

B: Has a slightly high viscosity but is emulsified

C: Has a high viscosity but is emulsified

5 D: Has a high viscosity and a low fluidity; a poor state of emulsification

[0060]

2. Hardening rate

The hardness of the sample after cooling with ice water for 5 minutes was evaluated. Specifically, the hardness of the sample was measured using the
10 following method.

[0061]

In the above production step, the emulsified mixed liquid was placed in a stainless steel container, the whole container was immersed in ice water and cooled for 5 minutes, and then the hardness of the sample was measured using a
15 texture analyzer (TA-XT2i: manufactured by EKO Instruments Co., Ltd.). Specifically, the yield point was measured using the texture analyzer, and this value was used as a value representing the hardness of the sample. The measurement conditions at this time are as follows.

[0062]

20 Plunger: Cylindrical shape having a diameter of 5 mm

Stage entry speed: 6 cm/min

Measurement time: 10 seconds after the plunger comes into contact with the sample

[0063]

25 The specific evaluation criteria are as follows. A to C were considered to be accepted.

A: 100 g or more

B: 75 g or more and 99 g or less

C: 50 g or more and 74 g or less

30 D: 49 g or less

[0064]

3. Product hardness

The hardness of the sample after cooling with ice water for 1 hour was evaluated. Specifically, the hardness of the sample was measured using the following method.

[0065]

5 In the above production step, the emulsified mixed liquid was placed in a stainless steel container, the whole container was immersed in ice water and cooled for 1 hour, and then the hardness of the sample was measured. The hardness of the sample after cooling with ice water for 1 hour was also measured using the same method as for the sample after cooling with ice water for 5
10 minutes.

[0066]

In addition, the hardness of a commercially available cheese was measured using the same method as above. That is, the commercially available cheese was stirred for 6 minutes while being heated in a hot water bath at 90°C to melt the
15 cheese. After that, the melted cheese was placed in a stainless steel container, the top thereof was covered with a wrap, and rubber was wound to seal the container. The whole container was immersed in ice water and cooled for 1 hour, and then the hardness of the sample was measured using a texture analyzer. The hardness of each commercially available cheese is as follows.

20 [0067]

Commercially available cheese 1: Manufactured by Megmilk Snow Brand Co., Ltd. Sliced Cheese Hardness: 816 g

Commercially available cheese 2: Manufactured by Rokko Butter Co., Ltd. QBB Baby Cheese Hardness: 511 g

25 [0068]

The hardness of the samples (Examples 1-1 to 1-7 and Comparative Examples 1-1 and 1-2) after cooling with ice water for 1 hour was evaluated based on the hardness of the above commercially available cheeses 1 and 2. Specifically, a sample having a measured hardness close to the hardness of one of
30 the commercially available cheeses was considered to be good. The specific evaluation criteria are as follows. A to C were considered to be accepted.

[0069]

A: 500 g to 800 g

B: 400 g or more and 499 g or less or 801 g or more and 900 g or less

C: 300 g or more and 399 g or less or 901 g or more and 1000 g or less

D: 299 g or less or 1001 g or more

[0070]

4. Product texture

5 Each sample after trial production was stored at 5°C for several days and tasted without being heated to evaluate the texture thereof. A sample having a texture that was not too hard, supple, and not too elastic was rated as excellent. The specific evaluation criteria are as follows. A to C were considered to be accepted.

10 [0071]

A: Cheese-like

B: Slightly cheese-like

C: Slightly lacking in cheesiness but not unacceptable

D: Not cheese-like

15 [0072]

(Results of Experiment 1)

In Experiment 1, a suitable range of the mass ratio of the starch and water was studied by changing the mass ratio of the starch and water (moisture).

Specifically, the suitable range of the mass ratio of the starch to water was

20 investigated by changing the mass ratio of the starch to water (starch/water) in the range of 0.53 to 0.94. In Experiment 1, the proportions of the emulsifying agent, salt, palm oil (oil or fat), and the flavoring of each sample were almost the same.

[0073]

25 Focusing on the evaluation results of the production suitability (during the heating and stirring), Comparative Example 1-1 and Example 1-1, which had a low mass ratio of the starch to water (starch/water), received the highest rating (A). On the other hand, Comparative Example 1-2, which had a high mass ratio of the starch to water (starch/water), received a low rating (D). It is considered that this is because when the mass ratio of the starch to water is high (the amount

30 of the starch is large), the viscosity during the heating and stirring increases and the fluidity of the mixture decreases.

[0074]

In addition, focusing on the evaluation results of the hardening rate, Example 1-7 and Comparative Example 1-2, which had a high mass ratio of the

starch to water (starch/water), received the highest rating (A). On the other hand, Comparative Example 1-1, which had a low mass ratio of the starch to water (starch/water), received a low rating (D).

[0075]

5 In addition, focusing on the evaluation result of the product hardness, Examples 1-3 to 1-6 received the highest rating (A). On the other hand, Comparative Example 1-2, which had a high mass ratio of the starch to water (starch/water), received a low rating (D).

[0076]

10 As described above, there is a trade-off relationship between the hardening rate and the product hardness. That is, when the mass ratio of the starch to water is high (the amount of the starch is large), the hardening rate increases, but the product hardness increases. On the contrary, when the mass ratio of the starch to water is low (the amount of the starch is small), the product hardness becomes
15 good, but the hardening rate decreases. Therefore, when producing a cheese-like food, the balance of the proportion of the starch to water is important, and from the results of Experiment 1, the mass ratio of the starch to water (starch/water) is preferably 0.60 or more and 0.86 or less, and further preferably 0.60 or more and 0.77 or less. By setting the mass ratio of the starch to water (starch/water) in
20 this range, both the hardening rate and the product hardness can be made good.

[0077]

In addition, from the results of Experiment 1, the proportion of acid-treated acetylated potato starch in the cheese-like food is preferably 22.5% or more and 28.5% or less, and more preferably 22.5% or more and 26.5% or less.

25 [0078]

The difference between Example 1-3 and Example 1-4 is the presence or absence of hydroxypropylated tapioca starch, and looking at the evaluation results of Examples 1-3 and 1-4, there was no great difference between both the evaluation results. On the other hand, when the cheese-like foods according to
30 Examples 1-3 and 1-4 were heated, tasted, and compared, Example 1-3, which included hydroxypropylated tapioca starch, had a better texture than Example 1-4.

[0079]

[Table 1]

Table 1

Raw material		Comparative Example 1-1	Example 1-1	Example 1-2	Example 1-3	Example 1-4	Example 1-5	Example 1-6	Example 1-7	Comparative Example 1-2
Starches	Acid-treated acetylated potato starch (%)	20.5	22.5	24.1	24.5	27.0	24.7	26.5	28.5	31.7
	Hydroxypropylated tapioca starch (%)	2.6	2.6	2.6	2.6	—	2.6	2.6	2.6	2.4
Emulsifying agent (starch Na octenylsuccinate) (%)		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	1.8
Salt (%)		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.6
Water (%)		44.0	42.0	40.9	40.0	40.1	39.4	38.0	36.0	36.2
Palm oil (%)		29.0	29.0	28.5	29.0	29.0	29.4	29.0	29.0	26.2
Flavoring (%)		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total (%)		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Starch total (%)		23.1	25.1	26.7	27.1	27.0	27.3	29.1	31.1	34.1
Starch/water		0.53	0.60	0.65	0.68	0.67	0.69	0.77	0.86	0.94
Evaluations	Hardness after cooling in ice water for 5 minutes (g)	47	63	68	88	90	90	113	123	174
	Hardness after cooling in ice water for 1 hour (g)	252	304	487	518	611	610	676	876	1148
	Production suitability (during heating and stirring)	A	A	B	B	B	B	C	C	D
	Hardening rate	D	C	C	B	B	B	A	A	A
	Product hardness	D	C	B	A	A	A	A	B	D
Texture evaluation		A	B	B	C	C	C	C	C	D

[0080]

<Experiment 2>

As Experiment 2, cheese-like foods according to Examples 2-1 to 2-6 and Comparative Examples 2-1 and 2-2 were created. The method for creating the cheese-like foods and the methods for evaluating the cheese-like foods are the same as in Experiment 1. The proportions (% by mass) of the raw materials of each Example and each Comparative Example of Experiment 2 are as shown in Table 2.

[0081]

In Experiment 2, the ratio of the starch to palm oil (oil or fat) was changed in a state in which the mass ratio of the starch to water (moisture) (starch/water) was almost fixed. Specifically, in Experiment 2, a suitable range of the mass ratio of palm oil to the starch (palm oil/starch) was investigated by changing the mass ratio of palm oil to the starch (palm oil/starch) in the range of 0.19 to 2.21. At this time, the proportion of the starch was changed in the range of 18.4% to 32.2%. In addition, the proportion of palm oil was changed in the range of 6.7% to 45.0%.

[0082]

Focusing on the evaluation results of the production suitability (during the heating and stirring), in Comparative Example 2-2, the proportion of palm oil was large, and thus the state of emulsification was weak, and the oil or fat was slightly separated, resulting in a low rating (D). In the other samples, the production suitability (during heating and stirring) satisfied the minimum criterion (C).

[0083]

In addition, focusing on the texture evaluation, Comparative Example 2-1 received a low rating (D). It is considered that this is because the mass ratio of palm oil to the starch (palm oil/starch) was low (in other words, the proportion of the starch was large), and thus the sample was hardened. The other samples satisfied the minimum criterion (C) of the texture evaluation.

[0084]

As described above, when producing a cheese-like food, the balance between the proportions of the starch and palm oil (oil or fat) is also important, and from the results of Experiment 2, it was found that the mass ratio of palm oil

to the starch (palm oil/starch) is preferably 0.28 or more and 1.67 or less. From this result, it was considered that the mass ratio is preferably 0.25 or more and 1.80 or less. In addition, it was considered that the mass ratio is more preferably 0.30 or more and 1.50 or less and further preferably 0.49 or more and 1.48 or less.

5 [0085]

At this time, the total amount of the starch is preferably 21.0% or more and 35.3% or less, more preferably 23.3% or more and 34.0% or less, and further preferably 24.0% or more and 32.5% or less. In addition, the proportion of palm oil is preferably 8.0% or more and 40.0% or less, more preferably 10.0% or more and 38.8% or less, and further preferably 16.0% or more and 36.1% or less.

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[0086]

In addition, from the results of Experiment 2, the proportion of acid-treated acetylated potato starch in the cheese-like food is preferably 21.0% or more and 32.0% or less, more preferably 21.1% or more and 31.9% or less, and further preferably 22.1% or more and 30.0% or less.

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[0087]

[Table 2]

Table 2

Raw material		Comparative Example 2-1	Example 2-1	Example 2-2	Example 2-3	Example 2-4	Example 2-5	Example 2-6	Comparative Example 2-2
Starches	Acid-treated acetylated potato starch (%)	32.2	31.9	29.4	27.0	23.1	22.1	21.1	18.4
	Hydroxypropylated tapioca starch (%)	3.4	3.4	3.1	2.9	2.5	2.3	2.2	2.0
Emulsifying agent (starch Na octenylsuccinate) (%)		2.6	2.0	2.0	2.0	1.9	1.8	1.7	2.0
	Salt (%)	2.4	1.8	1.8	1.8	1.7	1.6	1.6	1.8
	Water (%)	52.6	50.8	47.6	44.2	37.7	36.0	34.5	30.7
	Palm oil (%)	6.7	10.0	16.0	22.0	33.0	36.1	38.8	45.0
	Flavoring (%)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
	Total (%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Evaluations	Starch total (%)	35.6	35.3	32.5	29.9	25.6	24.4	23.3	20.4
	Starch/water	0.68	0.69	0.68	0.68	0.68	0.68	0.68	0.66
	Palm oil /Starches	0.19	0.28	0.49	0.74	1.29	1.48	1.67	2.21
	Hardness after cooling in ice water for 5 minutes (g)	Unmeasurable	150	112	84	73	59	58	72
	Hardness after cooling in ice water for 1 hour (g)	510	578	610	604	528	513	536	542
	Production suitability (during heating and stirring)	B	C	B	B	B	B	B	D
Evaluations	Hardening rate	-	A	A	B	C	C	C	C
	Product hardness	A	A	A	A	A	A	A	A
	Texture evaluation	D	C	C	C	B	A	B	B

[0088]

<Experiment 3>

As Experiment 3, cheese-like foods according to Example 3-1 and Comparative Examples 3-1 to 3-4 were created. In Experiment 3, cheese-like foods were created by also using a starch other than acid-treated acetylated potato starch. Specifically, the following starches were used as the starch.

[0089]

- Example 3-1: Acid-treated acetylated potato starch (Lyckeby 11200: manufactured by Lyckeby)
- Comparative Example 3-1: Acetylated tapioca starch (Actbody (registered trade mark) N-5: manufactured by J-Oil Mills, Inc.)
- Comparative Example 3-2: Potato starch (Gelcol (registered trade mark) BP-200: manufactured by J-Oil Mills, Inc.)
- Comparative Example 3-3: Phosphate crosslinked potato starch (Gelcol (registered trade mark) KPS-200: manufactured by J-Oil Mills, Inc.)
- Comparative Example 3-4: Hydroxypropylated phosphate crosslinked potato starch (Gelcol (registered trade mark) EG-500: manufactured by J-Oil Mills, Inc.)

[0090]

The method for creating the cheese-like foods except for the above and the methods for evaluating the cheese-like foods are the same as in Experiment 1. The proportions (% by mass) of the raw materials of the Example and each Comparative Example of Experiment 3 are as shown in Table 3. Experiment 3 was intended to investigate the relationship between the type of a starch and the state of a cheese-like food, and thus the proportion of each raw material in each sample was the same (that is, only the type of the starch was different).

[0091]

As shown in Table 3, in Experiment 3, the samples other than Example 3-1 (Comparative Example 3-1 to Comparative Example 3-4) received a low rating (D) for the production suitability (during the heating and stirring). Because of this, it was not possible to create a cheese-like food satisfying the appropriate conditions. Therefore, from the results of Experiment 3, it can be deemed that in the present invention, a cheese-like food satisfying the object of the present invention can be created by using acid-treated acetylated potato starch.

[0092]

[Table 3]

Table 3

Raw material		Example 3-1	Comparative Example 3-1	Comparative Example 3-2	Comparative Example 3-3	Comparative Example 3-4
Starches	Acid-treated acetylated potato starch (%)	24.5	-	-	-	-
	Acetylated tapioca starch (%)	-	24.5	-	-	-
	Potato starch (%)	-	-	24.5	-	-
	Phosphate crosslinked potato starch (%)	-	-	-	24.5	-
	Hydroxypropylated phosphate crosslinked potato starch (%)	-	-	-	-	24.5
	Hydroxypropylated tapioca starch (%)	2.6	2.6	2.6	2.6	2.6
Emulsifying agent (starch Na octenylsuccinate) (%)		2.0	2.0	2.0	2.0	2.0
	Salt (%)	1.8	1.8	1.8	1.8	1.8
	Water (%)	40.0	40.0	40.0	40.0	40.0
	Palm oil (%)	29.0	29.0	29.0	29.0	29.0
	Flavoring (%)	0.1	0.1	0.1	0.1	0.1
	Total (%)	100.0	100.0	100.0	100.0	100.0
Evaluations	Starch total (%)	27.1	27.1	27.1	27.1	27.1
	Starch/water	0.68	0.68	0.68	0.68	0.68
	Hardness after cooling in ice water for 5 minutes (g)	88	-	-	-	-
	Hardness after cooling in ice water for 1 hour (g)	518	-	-	-	-
	Production suitability (during heating and stirring)	B	D	D	D	D
	Hardening rate	B	-	-	-	-
Evaluations	Product hardness	A	-	-	-	-
	Texture evaluation	C	-	-	-	-

<Experiment 4>

As Experiment 4, cheese-like foods according to Examples 4-1 to 4-4 were created. The method for creating the cheese-like foods and the methods for evaluating the cheese-like foods are the same as in Experiment 1. The proportions (% by mass) of the raw materials of each Example of Experiment 4 are as shown in Table 4.

[0094]

As described in Experiment 1, when hydroxypropylated tapioca starch was included in the starch, the cheese-like food had a good texture. Because of this, in Experiment 4, the upper limit value of the amount of hydroxypropylated tapioca starch added was studied. Specifically, in Experiment 4, samples in which the proportion of hydroxypropylated tapioca starch was changed in the range of 0% to 4.6% were created. In Experiment 4, the mass ratio of the starch to water (starch/water) was set to 0.67 or 0.68.

[0095]

As shown in Table 4, Examples 4-1 to 4-4 received a rating equal to or higher than the criterion value (C) for each evaluation item. From this result, it was found that any proportion of hydroxypropylated tapioca starch is suitable as long as the proportion is about 5.5% or less.

[0096]

[Table 4]

Table 4

Raw material		Example 4-1	Example 4-2	Example 4-3	Example 4-4
Starches	Acid-treated acetylated potato starch (%)	27.0	24.5	29.4	22.5
	Hydroxypropylated tapioca starch (%)	-	2.6	3.1	4.6
Emulsifying agent (starch Na octenylsuccinate) (%)		2.0	2.0	2.0	2.0
Salt (%)		1.8	1.8	1.8	1.8
Water (%)		40.1	40.0	47.6	40.0
Palm oil (%)		29.0	29.0	16.0	29.0
Flavoring (%)		0.1	0.1	0.1	0.1
Total (%)		100.0	100.0	100.0	100.0
Starch total (%)		27.0	27.1	32.5	27.1
Starch/water		0.67	0.68	0.68	0.68
Evaluations	Hardness after cooling in ice water for 5 minutes (g)	90	88	112	76
	Hardness after cooling in ice water for 1 hour (g)	611	518	610	499
	Production suitability (during heating and stirring)	B	B	B	C
	Hardening rate	B	B	A	B
	Product hardness	A	A	A	B
Texture evaluation		C	C	C	C

[0097]

<Experiment 5>

As Experiment 5, cheese-like foods according to Examples 5-1 and 5-2 were created. In Experiment 5, a cheese-like food was created by also using a liquid other than water as the moisture. Specifically, in Example 5-2, soymilk (Oishii Muchosei Tonyu, water content of 90% by mass, manufactured by Kikkoman Corporation) was used as the moisture. The method for creating the cheese-like foods except the above and the methods for evaluating the cheese-like foods are the same as in Experiment 1. The proportions (% by mass) of the raw materials of each Example of Experiment 5 are as shown in Table 5.

[0098]

As shown in Table 5, in Experiment 5, the samples of Example 5-1 and Example 5-2 received a rating equal to or higher than the criterion value (C) for each evaluation item. Therefore, even if soymilk was used as the moisture, it was possible to create a cheese-like food satisfying the criterion value. As described above, by using a component other than water as the moisture, a flavor can be added to the cheese-like food. For example, a component other than water may be used as the moisture, or water and a component other than water may be mixed and used as the moisture.

[0099]

[Table 5]

Table 5

Raw material		Example 5-1	Example 5-2
Starches	Acid-treated acetylated potato starch (%)	24.1	24.0
	Hydroxypropylated tapioca starch (%)	2.6	2.5
Emulsifying agent (starch Na octenylsuccinate) (%)		2.0	2.0
Salt (%)		1.8	1.8
Water (%)		40.9	-
Soymilk (%)		-	44.0
Palm oil (%)		28.5	25.6
Coconut oil (%)		-	-
Flavoring (%)		0.1	0.1
Total (%)		100.0	100.0
Starch total (%)		26.7	26.5
Starch/moisture (water, soymilk)		0.65	0.60
Evaluations	Hardness after cooling in ice water for 5 minutes (g)	68	50
	Hardness after cooling in ice water for 1 hour (g)	487	494
	Production suitability (during heating and stirring)	B	B
	Hardening rate	C	C
	Product hardness	B	B
	Texture evaluation	B	C

[0100]

<Experiment 6>

As Experiment 6, cheese-like foods according to Examples 6-1 to 6-4 were created. In Experiment 6, the cheese-like foods were created by using acid-treated acetylated potato starch (not acetylated). The proportions (% by mass) of the raw materials of each Example of Experiment 6 are as shown in Table 6. Also in Experiment 6, the proportion of acid-treated potato starch to water (starch/water) was within the range of the present invention (0.55 or more and 0.92 or less).

[0101]

In Experiment 6, acid-treated potato starch was used. In addition, as xanthan gum, Vistop (registered trade mark) D-3000-S manufactured by San-Ei Gen F.F.I., Inc. was used. In addition, rapeseed oil (manufactured by J-Oil Mills, Inc.) was used. The raw materials of the cheese-like foods except the above are the same as in Experiment 1. In addition, the method for creating the cheese-like foods according to Experiment 6 and the methods for evaluating the cheese-like foods are also the same as in Experiment 1.

[0102]

As shown in Table 6, each evaluation result satisfied the criterion (C) in all of Examples 6-1 to 6-4. Therefore, even if acid-treated potato starch was used instead of acid-treated acetylated potato starch, it was possible to create a cheese-like food satisfying the object of the present invention.

[0103]

In Example 6-2, xanthan gum was used instead of hydroxypropylated tapioca starch, and even in Example 6-2, each evaluation result satisfied the criterion (C). Therefore, even if xanthan gum was used instead of hydroxypropylated tapioca starch, it was possible to create a cheese-like food satisfying the object of the present invention.

[0104]

In Example 6-3, rapeseed oil was used instead of palm oil, and even in Example 6-3, each evaluation result satisfied the criterion (C). Therefore, even if rapeseed oil was used instead of palm oil, it was possible to create a cheese-like food satisfying the object of the present invention.

[0105]

In Example 6-4, acid-treated potato starch and hydroxypropylated tapioca starch were used as the starch. In Example 6-4, the evaluation result of the texture was particularly good as compared with the other Examples of Experiment 6. In addition, in Examples 6-1 to 6-4, the evaluation result (A) of the hardening rate was good as a whole.

[0106]

[Table 6]

Table 6

Raw material		Example 6-1	Example 6-2	Example 6-3	Example 6-4
Starches	Acid-treated potato starch (%)	27.0	27.0	27.0	24.5
	Hydroxypropylated tapioca starch (%)				2.6
	Xanthan gum(%)		0.2		
	Emulsifying agent (starch Na octenylsuccinate) (%)	2.0	2.0	2.0	2.0
	Salt (%)	1.8	1.8	1.8	1.8
	Water (%)	40.1	39.9	40.1	40.0
	Palm oil (%)	29.0	29.0		29.0
	Rapeseed oil (%)			29.0	
	Flavoring (%)	0.1	0.1	0.1	0.1
Evaluations	Total (%)	100.0	100.0	100.0	100.0
	Starch total (%)	27.0	27.0	27.0	27.1
	Starch/water	0.67	0.68	0.67	0.68
	Hardness after cooling in ice water for 5 minutes (g)	161	160	101	151
	Hardness after cooling in ice water for 1 hour (g)	858	878	313	845
	Production suitability (during heating and stirring)	A	A	A	B
	Hardening rate	A	A	A	A
	Product hardness	B	B	C	B
	Texture evaluation	C	C	C	B

[0107]

This application claims priority based on Japanese Patent Application No. 2020-068441 filed on April 6, 2020, the disclosure of which is incorporated herein by reference in its entirety.

CLAIMS

1. A method for producing a cheese-like food, comprising:
 - a step of providing a mixture comprising at least a starch comprising an
 - 5 acid-treated starch, moisture, and an oil or fat;
 - a step of stirring the mixture while heating to emulsify the mixture; and
 - a step of cooling the emulsified mixture for solidification, wherein
 - a mass ratio of the starch to the moisture included in the mixture is 0.55 or
 - more and 0.92 or less, and
 - 10 a mass ratio of the oil or fat to the starch included in the mixture is 0.25 or
 - more and 1.80 or less.
2. The method for producing a cheese-like food according to Claim 1,
- wherein the mass ratio of the starch to the moisture is 0.60 or more and 0.86 or
- 15 less.
3. The method for producing a cheese-like food according to Claim 1,
- wherein the mass ratio of the starch to the moisture is 0.62 or more and 0.80 or
- less.
- 20 4. The method for producing a cheese-like food according to any one of
- Claims 1 to 3, wherein a proportion of the starch included in the mixture is 21.0%
- by mass or more and 35.3% by mass or less.
- 25 5. The method for producing a cheese-like food according to any one of
- Claims 1 to 4, wherein a proportion of the oil or fat included in the mixture is
- 8.0% by mass or more and 40.0% by mass or less.
6. The method for producing a cheese-like food according to any one of
- 30 Claims 1 to 5, further comprising a hydroxypropylated starch as the starch.
7. The method for producing a cheese-like food according to Claim 6,
- wherein a proportion of the hydroxypropylated starch included in the mixture is
- 5.5% by mass or less.

8. The method for producing a cheese-like food according to Claim 6 or 7, wherein the hydroxypropylated starch is hydroxypropylated tapioca starch.

5 9. The method for producing a cheese-like food according to any one of Claims 1 to 8, wherein the acid-treated starch is acid-treated potato starch.

10 10. The method for producing a cheese-like food according to any one of Claims 1 to 8, wherein the acid-treated starch is acid-treated acetylated potato starch.

11. The method for producing a cheese-like food according to any one of Claims 1 to 10, wherein the mixture further comprises an emulsifying agent.

15 12. The method for producing a cheese-like food according to Claim 11, wherein the emulsifying agent is starch sodium octenylsuccinate.

20 13. The method for producing a cheese-like food according to any one of Claims 1 to 12, wherein the moisture comprises at least one of water, soymilk, and coconut milk.

25 14. A cheese-like food comprising:
a starch comprising at least an acid-treated starch;
moisture; and
an oil or fat, wherein
a mass ratio of the starch to the moisture is 0.55 or more and 0.92 or less,
and
a mass ratio of the oil or fat to the starch is 0.25 or more and 1.80 or less.