

SPECIFICATION

TITLE OF INVENTION:

METHOD FOR REDUCING DETERIORATION OF TEXTURE OF BAKERY FOOD

5

TECHNICAL FIELD

[0001]

The present invention relates to a method for reducing a deterioration of texture when reheating bakery food.

10

BACKGROUND ART

[0002]

Bakery foods, especially dressed breads having cooked-goods dressed thereon or sandwiched therebetween, are often reheated after storage and eaten. It is known that, in a case where bakery food is heated in a microwave oven at the time of reheating, a deterioration of the texture such as poor crispness is shown.

[0003]

Patent Document 1 discloses a frozen bread suitable for microwave oven heating, which is obtained by blending 1% to 6% by weight of an emulsifier in a bread dough mainly composed of wheat flour, and baking.

RELATED DOCUMENT

25

PATENT DOCUMENT

[0004]

[Patent Document 1] Japanese Unexamined Patent Publication No.

H02-222639

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

5 [0005]

However, although an effect of reducing a deterioration of the texture due to heating in a microwave oven was obtained to some extent in the bread disclosed in Patent Document 1, the flavor and texture as bread was not good in some cases due to the influence and the like
10 of the emulsifier itself because a large amount of the emulsifier was contained.

SOLUTION TO PROBLEM

[0006]

When the inventor of the present invention and the like conducted
15 diligent studies, it was found that, in bakery food obtained from a dough containing an ingredient (A) containing specific starch, texture when reheating is good.

[0007]

That is, the present invention is
20 a method for reducing a deterioration of texture when reheating bakery food in which a dough contains a powder raw material containing an ingredient (A) satisfying the following conditions (1) to (4), in which a blending amount of the ingredient (A) with respect to the powder raw material is 2% by mass or more and 30% by mass or less.

25 The ingredient (A): a powdery granular material satisfying the following conditions (1) to (4).

(1) A starch content is 75% by mass or more.

(2) 3% by mass or more and 45% by mass or less of low-molecular-weight starch of starch in which an amylose content is 5% by mass or more is contained, and a peak molecular weight of the low-molecular-weight starch is 3×10^3 or more and 5×10^4 or less.

5 (3) A cold water swelling degree at 25°C is 5 or more and 20 or less.

(4) A content under a sieve with an aperture of 0.5 mm and on a sieve with an aperture of 0.038 mm is 30% by mass or more and 100% by mass or less.

10 [0008]

A content of the ingredient (A) under the sieve with the aperture of 0.5 mm and on the sieve with the aperture of 0.038 mm is preferably 65% by mass or more and 100% by mass or less.

[0009]

15 The above-mentioned food is preferably dressed bread.

[0010]

Any combination of each of these configurations, and an aspect in which the expression of the present invention is converted between methods, devices, and the like are also effective as the aspects of
20 the present invention.

ADVANTAGEOUS EFFECTS OF INVENTION

[0011]

According to the present invention, a method for reducing a
25 deterioration of texture when reheating bakery food can be provided.

DESCRIPTION OF EMBODIMENTS

[0012]

In the present specification, "to" representing a numerical value range means "equal to or more than" and "equal to or less than", and includes both a lower limit value and an upper limit value.

5 A method for reducing a deterioration of texture when reheating bakery food of the present embodiment is

 a method for reducing a deterioration of texture when reheating bakery food in which a dough contains a powder raw material containing an ingredient (A) satisfying the following conditions (1) to (4),
10 in which a blending amount of the ingredient (A) with respect to the powder raw material is 2% by mass or more and 30% by mass or less.

 The ingredient (A): a powdery granular material satisfying the following conditions (1) to (4).

 (1) A starch content is 75% by mass or more.

15 (2) 3% by mass or more and 45% by mass or less of low-molecular-weight starch of starch in which an amylose content is 5% by mass or more is contained, and a peak molecular weight of the low-molecular-weight starch is 3×10^3 or more and 5×10^4 or less.

 (3) A cold water swelling degree at 25°C is 5 or more and 20
20 or less.

 (4) A content under a sieve with an aperture of 0.5 mm and on a sieve with an aperture of 0.038 mm is 30% by mass or more and 100% by mass or less.

 Reducing a deterioration of texture referred to herein means
25 that a degradation of the texture of bakery food after reheating can be reduced as compared to bakery food before reheating, and more specifically means reducing a degradation of crispness and reducing

an increase of remains in mouth when chewing.

In addition, the content on the sieve and the content under the sieve are specifically the content of the fraction on the sieve and the content of the fraction under the sieve, respectively.

5 [0013]

(Ingredient (A))

The ingredient (A) is a powdery granular material containing 75% by mass or more of starch. Here, the powdery granular material includes at least one of a powdery material and a granular material,
10 and may include both the powdery material and the granular material.

In addition, the ingredient (A) contains, in the powdery granular material, 3% by mass or more and 45% by mass or less of the low-molecular-weight starch of the starch in which the amylose content is 5% by mass or more as starch, in which a peak molecular
15 weight of the low-molecular-weight starch is 3×10^3 or more and 5×10^4 or less, and the cold water swelling degree of the powdery granular material at 25°C is 5 or more and 20 or less.

[0014]

The starch content in the ingredient (A) is 75% by mass or more,
20 preferably 80% by mass or more, and more preferably 85% by mass or more.

In addition, the upper limit of the starch content in the ingredient (A) is not limited and is 100% by mass or less, but it may be 99.5% by mass or less, for example, or 99% by mass or less,
25 for example, depending on the properties and the like of the bakery food.

[0015]

In addition, the ingredient (A) contains, as the starch, the low-molecular-weight starch made of the starch in which an amylose content is 5% by mass or more as a raw material in a specific proportion, and the low-molecular-weight starch having a specific peak molecular weight is used. That is, the starch in the ingredient (A) contains, in the ingredient (A), 3% by mass or more and 45% by mass or less of the low-molecular-weight starch made of the starch in which an amylose content is 5% by mass or more as a raw material, and the peak molecular weight of the low-molecular-weight starch is 3×10^3 or more and 5×10^4 or less.

[0016]

The peak molecular weight of the low-molecular-weight starch is 3×10^3 or more and is preferably 8×10^3 or more from the viewpoint of improving crispness and absence of remains in mouth. In addition, from the same viewpoint, the peak molecular weight of the low-molecular-weight starch is 5×10^4 or less, preferably 3×10^4 or less, and more preferably 1.5×10^4 or less. A measurement method of the peak molecular weight of the low-molecular-weight starch (for example, starch after decomposition) will be described in the section of Examples.

[0017]

From the viewpoint of excellent production stability, the low-molecular-weight starch is preferably one or two or more kinds selected from the group consisting of acid-treated starch, oxidation-treated starch, or enzyme-treated starch, and more preferably acid-treated starch.

[0018]

The conditions of the acid treatment are not limited, but the treatment can be performed as follows, for example.

After injecting starch in which an amylose content is 5% by mass or more and water to a reaction device, acid is further injected.

5 Alternatively, acid water in which acid is previously dissolved in water, and the raw material starch are injected to the reaction device. From the viewpoint of more stably performing the acid treatment, a state in which the total amount of the starch in the reaction is uniformly dispersed in the aqueous phase, or a slurry state of the
10 total amount of the starch in the reaction is desirable. For that purpose, the concentration of the starch slurry when performing the acid treatment is adjusted to be in the range of 10% by mass or more and 50% by mass or less, preferably 20% by mass or more and 40% by mass or less, for example. When the concentration of the slurry is
15 too high, the viscosity of the slurry may increase, which may make it difficult to uniformly stir the slurry.

[0019]

Specific examples of the acid used for the acid treatment include inorganic acids such as hydrochloric acid, sulfuric acid, and nitric
20 acid, which can be used regardless of the type and purity.

[0020]

In the acid treatment reaction, the acid concentration during the acid treatment is preferably 0.05 normality (N) or more and 4 N or less, more preferably 0.1 N or more and 4 N or less, and further
25 preferably 0.2 N or more and 3 N or less, for example. In addition, the reaction temperature is preferably 30°C or higher and 70°C or lower, more preferably 35°C or higher and 70°C or lower, and further

preferably 35°C or higher and 65°C or lower. The reaction time is preferably 0.5 hours or longer and 120 hours or shorter, more preferably 1 hour or longer and 72 hours or shorter, and further preferably 1 hour or longer and 48 hours or shorter.

5 [0021]

From the viewpoint of improving crispness and absence of remains in mouth, the content of the low-molecular-weight starch in the ingredient (A) is 3% by mass or more, preferably 8% by mass or more, and more preferably 13% by mass or more with respect to the entire
10 ingredient (A).

Meanwhile, from the same viewpoint, the content of the low-molecular-weight starch in the ingredient (A) is 45% by mass or less, preferably 35% by mass or less, and more preferably 25% by mass with respect to the entire ingredient (A).

15 [0022]

In addition, the amylose content in the raw material starch of the low-molecular-weight starch is 5% by mass or more, preferably 12% by mass or more, more preferably 22% by mass or more, further preferably 45% by mass or more, further more preferably 55% by mass
20 or more, and even further preferably 65% by mass or more. The upper limit of the amylose content in the raw material starch of the low-molecular-weight starch is not limited, and it is 100% by mass or less, preferably 90% by mass or less, and more preferably 80% by mass or less.

25 [0023]

As the starch in which the amylose content is 5% by mass or more, which is a raw material of the low-molecular-weight starch, it is

possible to use one or two or more kinds selected from the group consisting of high amylose corn starch, corn starch, tapioca starch, sweet potato starch, potato starch, wheat starch, high amylose wheat starch, rice starch, and processed starch in which these raw materials have been chemically, physically, or enzymatically processed. From the viewpoint of improving crispness and absence of remains in mouth, it is preferable to use one or two or more kinds selected from high amylose corn starch, corn starch, and tapioca starch, and it is more preferable to use high amylose corn starch. High amylose corn starch in which the amylose content is 40% by mass or more is available. Starch in which the amylose content is 5% by mass or more is more preferably corn starch in which the amylose content is 40% by mass or more.

[0024]

The cold water swelling degree of the ingredient (A) at 25°C is 5 or more, preferably 5.5 or more, and more preferably 6 or more from the viewpoint of improving crispness and absence of remains in mouth.

In addition, from the same viewpoint, the cold water swelling degree of the ingredient (A) at 25°C is 20 or less, preferably 17 or less, and more preferably 15 or less.

Here, the cold water swelling degree of the ingredient (A) at 25°C is measured by the following method.

(1) A sample is heated and dried at 125°C to measure the water content using a moisture analyzer (manufactured by KENSEI KOGYO Co., Ltd., model number MX-50), and the mass of dry matter is calculated from the obtained water content value.

(2) In a state where 1 g of the sample in terms of the mass of dry matter is dispersed in 50 mL of water at 25°C, stirring is gently performed in a constant-temperature incubator at 25°C for 30 minutes, and thereafter centrifugation is performed at 3000 rpm for 10 minutes
5 (centrifuge: manufactured by Hitachi Koki Co., Ltd., Hitachi table-top centrifuge CT6E type; rotor: T4SS type swing rotor; adapter: 50TC × 2S adapter) to separate into a precipitated layer and a supernatant layer.

(3) The supernatant layer is removed to measure the mass of the
10 precipitated layer, which is defined as B (g).

(4) The mass when dryness of the precipitated layer is caused (105°C, constant mass) is defined as C (g).

(5) The value obtained by dividing B by C is defined as the cold water swelling degree.

15 [0025]

The content of the ingredient (A) under the sieve with an aperture of 0.5 mm and on the sieve with an aperture of 0.038 mm according to the JIS-Z8801-1 standard is 30% by mass or more and 100% by mass or less. From the viewpoint of improving crispness, it is preferably
20 50% by mass or more mass and 100% by mass or less, more preferably 65% by mass or more and 100% by mass or less, further preferably 65% by mass or more and 97% by mass or less, further more preferably 70% by mass or more and 94% by mass or less, and yet more preferably 70% by mass or more and 90% by mass or less.

25 From the same viewpoint, the content of the ingredient (A) under the sieve with an aperture of 0.5 mm and on the sieve with an aperture of 0.038 mm according to the JIS-Z8801-1 standard is 30% by mass or

more, preferably 50% by mass or more, more preferably 65% by mass or more, and further preferably 70% by mass or more, and it is 100% by mass or less, preferably 97% by mass or less, more preferably 94% by mass or less, and further preferably 90% by mass or less.

5 In addition, from the viewpoint of improving absence of remains in mouth, the content of the ingredient (A) under the sieve with an aperture of 0.5 mm and on the sieve with an aperture of 0.038 mm according to the JIS-Z8801-1 standard is preferably 50% by mass or more and 100% by mass or less, more preferably 65% by mass or more and 100% by mass or less, further preferably 65% by mass or more and 98% by mass or less, further more preferably 65% by mass or more and 92% by mass or less, and yet more preferably 70% by mass or more and 88% by mass or less.

15 From the same viewpoint, the content of the ingredient (A) under the sieve with an aperture of 0.5 mm and on the sieve with an aperture of 0.038 mm according to the JIS-Z8801-1 standard is 30% by mass or more, preferably 50% by mass or more, more preferably 65% by mass or more, and further preferably 70% by mass or more, and it is 100% by mass or less, preferably 98% by mass or less, more preferably 92% by mass or less, and further preferably 88% by mass or less.

[0026]

25 In addition, from the viewpoint of improving crispness, the content of the ingredient (A) under a sieve of 0.25 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z8801-1 standard is preferably 20% by mass or more and 100% by mass or less, more preferably 25% by mass or more and 97% by mass or less, further preferably 28% by mass or more and 94% by mass or

less, and further more preferably 30% by mass or more and 90% by mass or less.

From the same viewpoint, the content of the ingredient (A) under the sieve of 0.25 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z8801-1 standard is preferably 20% by mass or more, more preferably 25% by mass or more, further preferably 28% by mass or more, and further more preferably 30% by mass or more, and it is preferably 100% by mass or less, more preferably 97% by mass or less, further preferably 94% by mass or less, and further more preferably 90% by mass or less.

In addition, from the viewpoint of improving absence of remains in mouth, the content of the ingredient (A) under the sieve of 0.25 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z8801-1 standard is preferably 20% by mass or more and 100% by mass or less, more preferably 25% by mass or more and 100% by mass or less, further preferably 28% by mass or more and 98% by mass or less, further more preferably 30% by mass or more and 92% by mass or less, and yet more preferably 30% by mass or more and 88% by mass or less.

From the same viewpoint, the content of the ingredient (A) under the sieve of 0.25 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z 8801-1 standard is,
[0027]

In addition, from the viewpoint of improving crispness, the content of the ingredient (A) under a sieve of 0.15 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z 8801-1 standard is preferably 10% by mass or more and 100% by mass

or less, more preferably 12% by mass or more and 97% by mass or less, further preferably 15% by mass or more and 58% by mass or less, and further more preferably 17% by mass or more and 58% by mass or less.

From the same viewpoint, the content of the ingredient (A) under the sieve of 0.15 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z 8801-1 standard is preferably 10% by mass or more, more preferably 12% by mass or more, further preferably 15% by mass or more, and further more preferably 17% by mass or more, and it is preferably 100% by mass or less, preferably 97% by mass or less, and further preferably 58% by mass or less.

In addition, from the viewpoint of improving absence of remains in mouth, the content of the ingredient (A) under the sieve of 0.15 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z8801-1 standard is preferably 10% by mass or more and 100% by mass or less, more preferably 12% by mass or more and 97% by mass or less, further preferably 15% by mass or more and 90% by mass or less, further more preferably 15% by mass or more and 70% by mass or less, and yet more preferably 17% by mass or more and 50% by mass or less.

From the same viewpoint, the content of the ingredient (A) under the sieve of 0.15 mm and on the sieve with an aperture of 0.038 mm according to the sieve of the JIS-Z 8801-1 standard is preferably 10% by mass or more, more preferably 12% by mass or more, further preferably 15% by mass or more, and further more preferably 17% by mass or more, and it is preferably 100% by mass or less, more preferably 97% by mass or less, further preferably 90% by mass or less, further more preferably 70% by mass or less, and even further preferably 50%

by mass or less.

[0028]

In the present embodiment, various starches can be used as the starch ingredient other than the low-molecular-weight starch in the ingredient (A). Specifically, the type is not limited as long as starches are starches that are generally commercially available depending on usage applications, for example, starches for foods, but one or more kinds can be appropriately selected from starches such as corn starch, potato starch, tapioca starch, and wheat starch, and processed starch in which these starches have been chemically, physically, or enzymatically processed. It is preferable to contain one or two or more kinds of starches selected from the group consisting of corn starch, wheat starch, potato starch, tapioca starch, and cross-linked starch thereof, and it is more preferable to contain corn starch.

[0029]

In addition, an ingredient other than starch can be blended in the ingredient (A) in the present embodiment.

Specific examples of the ingredient other than starch include insoluble salts such as calcium carbonate and calcium sulfate, and colorants. It is preferable to blend an insoluble salt, and it is more preferable that the blending amount of the insoluble salt in the ingredient (A) be 0.1% by mass or more and 2% by mass or less.

[0030]

Next, a production method of the ingredient (A) will be described. The production method of the ingredient (A) includes the following steps, for example.

(Step of preparing low-molecular-weight starch) A step of reducing the molecular weight of raw material starch in which the amylose content is 5% by mass or more to obtain low-molecular-weight starch in which the peak molecular weight is 3×10^3 or more and 5×10^4 or less.

(Granulation step) A step of performing heat gelatinization on a raw material, which contains 3% by mass or more and 45% by mass or less of the low-molecular-weight starch and in which the total of the low-molecular-weight starch and starch other than the low-molecular-weight starch is 75% by mass or more, to perform granulation.

[0031]

The step of preparing the low-molecular-weight starch is a step of decomposing starch in which the amylose content is 5% by mass or more into low-molecular-weight starch. The decomposition referred to herein refers to decomposition accompanied by a reduction in the molecular weight of starch. Examples of typical decomposition methods include decomposition by acid treatment, oxidation treatment, and enzyme treatment. Among these, acid treatment is preferable from the viewpoint of decomposition rate, cost, and reproducibility of decomposition reaction.

[0032]

In addition, in the granulation step, a general method used for granulating starch can be used, but it is preferable to use a general method used for heat gelatinization of starch from the viewpoint of setting a predetermined cold water swelling degree. Specifically, a method using a machine such as a drum dryer, a jet cooker, an extruder,

or a spray dryer is known, but in the present embodiment, from the viewpoint of more reliably obtaining the ingredient (A) in which the cold water swelling degree satisfies the above-mentioned specific condition, heat gelatinization with an extruder or a drum dryer is preferable, and an extruder is more preferable.

In the case of treatment with an extruder, usually, after adding water to a raw material containing starch to adjust the water content to about 10% to 60% by mass, heat swelling is performed under the condition in which a barrel temperature is 30°C to 200°C, an outlet temperature is 80°C to 180°C, a screw rotation speed is 100 to 1000 rpm, and a heat treatment time is 5 to 60 seconds, for example.

[0033]

In the present embodiment, by the step of performing heat gelatinization on the above-mentioned specific raw material, for example, the ingredient (A) in which the cold water swelling degree satisfies a specific condition can be obtained. In addition, the ingredient (A) may be obtained by pulverizing and sieving the granulated product obtained by the heat gelatinization as necessary to appropriately adjust the size thereof.

[0034]

From the viewpoint of improving the effect of reducing a deterioration of texture, the blending amount of the ingredient (A) in the dough in the present embodiment is 2% by mass or more and 30% by mass or less, preferably 4% by mass or more and 28% by mass or less, and more preferably 7% by mass or more and 19% by mass or less with respect to the powder raw material.

From the same viewpoint, the blending amount of the ingredient

(A) in the dough with respect to the powder raw material is 2% by mass or more, preferably 4% by mass or more, and more preferably 7% by mass or more, and it is 30% by mass or less, preferably 28% by mass or less, and more preferably 19% by mass or less.

5 Here, the blending amount of the ingredient (A) with respect to the powder raw material is specifically the blending amount of the ingredient (A) with respect to the entire powder raw material when the entire powder raw material contained in the dough is 100% by mass.

10 [0035]

From the viewpoint of the quality of crispness and absence of remains in mouth, the blending amount of the ingredient (A) is preferably 1% or more, more preferably 3% by mass or more, and further preferably 4% by mass or more with respect to the total amount of
15 the dough.

In addition, from the viewpoint of the quality of crispness and absence of remains in mouth, the blending amount of the ingredient (A) is preferably 15% by mass or less and more preferably 10% by mass or less with respect to the total amount of the dough.

20 [0036]

(Powder raw material)

The powder raw material in the present embodiment is a raw material that is blended in a powdery form in the dough (dough for bakery food).

25 The powder raw material contains at least the ingredient (A), and it is preferable to contain the ingredient (A) and the powder raw material other than the ingredient (A).

Specific examples of the powder raw material other than the ingredient (A) for the dough for bakery food include cereal flour such as wheat flour, rice flour, rye flour, and soybean flour; proteins such as gluten and soy protein; polysaccharides such as tapioca starch, corn starch, potato starch, wheat starch, rice starch, sago starch, sweet potato starch, mung bean starch, pea starch, and processed starch in which these starches have been subjected to single or combined processes of acetylation, etherification, cross-linking, gelatinization, oil and fat processing, and the like, resistant starch, and dextrin (excluding the ingredient (A)); saccharides such as sugar, fructose, glucose, high-fructose corn syrup, invert sugar, oligosaccharides, trehalose, and sugar alcohols; powdered sweeteners such as aspartame and acesulfame potassium; milk such as skimmed milk powder, whole milk powder, and cheese powder; salts; dietary fibers such as bran, cellulose, and indigestible dextrin; eggs such as egg white powder and whole egg powder; thickening polysaccharides such as guar gum and alginic acid esters; emulsifiers; flavored powders such as cocoa powder and green tea powder; improvers; and leavening agents such as baking powder.

In addition, the dough for bakery food preferably contains cereal flour as the powder raw material, more preferably contains one or two or more kinds selected from wheat flour and rice flour, and further preferably contains wheat flour. In addition, in a case where the dough for bakery food of the present embodiment contains wheat flour, it preferably includes strong flour.

[0037]

(Oil and fat composition)

The dough used in the present embodiment may further contain an oil and fat composition. The oil and fat composition is not limited as long as it contains edible oils and fats. The content of the edible oils and fats contained in the oil and fat composition is preferably 70% by mass or more and 100% by mass or less, and more preferably 80% by mass or more and 100% by mass.

[0038]

The edible oils and fats as a raw material oil and fat used in the oil and fat composition are not limited. Examples thereof include vegetable oils and fats such as rapeseed oil, soybean oil, corn oil, coconut oil, palm oil, palm kernel oil, sal butter, cacao butter, shea butter, rice oil, cottonseed oil, safflower oil, sunflower oil, olive oil, linseed oil, and peanut oil; animal oils and fats such as beef fat, lard, chicken fat, milk fat, and fish oil; and synthetic oils and fats such as medium-chain fatty acids triglycerides. In addition, examples thereof include processed oils and fats in which the above-mentioned vegetable oils and fats, animal oils and fats, and synthetic oils and fats are treated by one or two or more kinds of curing, fractionation, and transesterification.

[0039]

In addition, as the oil and fat composition, it is possible to use one in any state of a liquid at room temperature (20°C) such as rapeseed oil, soybean oil, and olive oil, and a solid at room temperature such as margarine, shortening, and butter.

[0040]

In addition, the oil and fat composition can further contain an oil-soluble ingredient together with the edible oils and fats.

Examples of the oil-soluble ingredient include tocopherols, coloring agents, fragrances, emulsifiers, and the like.

[0041]

When the dough contains the oil and fat composition, from the
5 viewpoint of the quality of crispness and absence of remains in mouth,
the blending amount of the oil and fat composition is preferably 1%
by mass or more and more preferably 3% by mass or more with respect
to the total amount of the dough.

In addition, from the viewpoint of the quality of crispness and
10 absence of remains in mouth, the blending amount of the oil and fat
composition is preferably 40% by mass or less, more preferably 20%
by mass or less, and further preferably 10 % by mass or less with
respect to the total amount of the dough.

[0042]

15 (Other ingredients)

In the present embodiment, the dough can contain ingredients
other than the above-mentioned ingredients as raw materials. As the
ingredients other than the above-mentioned ingredients, for example,
liquid ingredients such as water, milk, soy milk, fruit juice,
20 vegetable juice, honey, black sugar syrup, liquid sugar, and malt
syrup; eggs such as whole eggs, egg yolks, and egg whites; various
flavor materials such as nuts, dried fruits, and chocolate chips;
sesame; brown rice; mixed grains such as millet and foxtail millet;
and baker's yeast such as compressed yeast and instant dry yeast can
25 also be blended.

[0043]

(Bakery food)

In the present embodiment, the bakery food contains the powder raw material containing the ingredient (A) in the dough thereof. Since the powder raw material in the dough contains the ingredient (A), a deterioration of the texture due to reheating of the bakery food can be reduced.

Specific examples of the bakery food obtained in the present embodiment include yeast-fermented foods such as breads, pizzas, yeast doughnuts, Chinese dumplings, naans, and Danish pastries; and yeast-free foods such as steamed bread, cake doughnuts, scones, pound cakes, sponge cakes, chiffon cakes, rolled cakes, butter cakes, muffins, cupcakes, hotcakes, financiers, bouchées, waffles, madeleines, and pies. The bakery food is preferably one selected from the group consisting of yeast-fermented foods and cake doughnuts, more preferably one selected from breads, pizza, yeast doughnuts, and cake doughnuts, and further preferably breads.

Among the breads, in a case of breads, such as baguettes, which do not contain auxiliary raw materials such as sugar and oils and fats or in which a small amount thereof is blended, the effect of the present embodiment is more exhibited.

[0044]

In addition, among the breads, dressed breads having cooked-goods dressed thereon or sandwiched therebetween are preferable. Examples of the dressed breads include sandwiches, yakisoba (Japanese stir-fried noodles) breads, croquette breads, hamburgers, hot dogs, croque monsieur, curry breads, corn breads, onion breads, garlic toast, and cheese breads.

[0045]

Next, a production method of bakery food will be described.

The bakery food can be obtained by a production method including a step of preparing a dough and a step of heating the dough, for example. In addition, the obtained bakery food is specifically eaten after
5 a reheating step, and more specifically, is eaten after a storage step and a reheating step.

Specifically, the step of preparing the dough includes a step of kneading the powder raw material containing the ingredient (A), and other ingredients as appropriate.

10 The dough for bakery food obtained by the production method of a dough for bakery food in the present embodiment may be stored frozen as a frozen dough.

[0046]

The bakery food can be obtained through a step of heating the
15 obtained dough for bakery food. Specific examples of a method of heating include baking, steaming, frying with oil, and the like. One or two kinds of cooking selected from baking and frying with oil are preferable, where baking is more preferable.

Specific examples of the baking include baking with a frying
20 pan or a hot plate, baking with an oven, convection heating, steam convection heating, and the like. One or two kinds selected from hot plate baking, baking with an oven, and convection heating are preferable, convection heating and baking with an oven are more preferable, and baking with an oven is further preferable.

25 The cooking temperature is preferably 150°C to 260°C, and more preferably 160°C to 250°C. The time is preferably 4 to 60 minutes, and more preferably 6 to 50 minutes.

[0047]

In the present embodiment, the bakery food specifically undergoes the storage step and thereafter the reheating step.

Examples of the storage step include freezing storage,
5 refrigerated storage, room temperature storage, and warm storage. One or two or more kinds selected from the group consisting of freezing storage, refrigerated storage, and room temperature storage are preferable, and one or two kinds selected from the group consisting of refrigerated storage and room temperature storage are more
10 preferable.

In addition, the lower limit of the storage temperature is specifically preferably -50°C or higher, more preferably -20°C or higher, further preferably higher than 0°C , and further more preferably 3°C or higher.

15 The upper limit of the storage temperature is preferably 35°C or lower, more preferably 30°C or lower, further preferably 25°C or lower, and further more preferably 20°C or lower.

[0048]

In the present embodiment, the bakery food undergoes the
20 reheating step after the above-mentioned storage step.

Examples of a reheating method include baking, microwave heating, frying with oil, and steaming. One or two or more consisting of baking, microwave heating, and steaming are preferable, one or two selected from baking and microwave heating are more preferable, and microwave
25 heating is further preferable.

Examples of equipment used for reheating include ovens, toaster ovens, microwave ovens, fryers, steamers, and steam convection ovens.

One or two or more kinds selected from ovens, toaster ovens, microwave ovens, steamers, and steam convection ovens are preferable, one or two or more kinds selected from ovens, toaster ovens, microwave ovens, and steam convection ovens are more preferable, one or two or more
5 kinds selected from ovens, toaster ovens, and microwave ovens are further preferable, one or two kinds selected from toaster ovens and microwave ovens are further more preferable, and microwave ovens are even further preferable.

[0049]

10 In addition, in a case where the reheating method is microwave oven heating, there is a method of heating for, for example, 5 to 10 seconds at 1000 W, 10 to 30 seconds at 600 W, or 10 to 45 seconds at 500 W in a case of only bakery food with no cooked-goods, and, for example, for 5 to 20 seconds at 1000 W, 10 to 60 seconds at 600
15 W, or 10 seconds to 80 seconds at 500 W in a state where cooked-goods are dressed thereon or sandwiched therebetween.

[Examples]

[0050]

Examples of the present invention will be described below, but
20 the present invention is not limited thereto.

[0051]

(Raw materials)

In the following examples, the following materials were mainly used as raw materials.

25 (Starch)

Low-molecular-weight starch: Acid-treated high amylose corn starch produced in Production Example 1 described later

Corn starch: Corn starch Y, manufactured by J-Oil Mills, INC.

Powdery granular materials 1 to 3: Powdery granular materials produced by a method of Production Example 2 described later

(Oil and fat composition)

5 Oil and fat composition 1: Atlanta SS, manufactured by J-Oil Mills, INC.

Oil and fat composition 2: Meister MY BROT EZ200, manufactured by J-Oil Mills, INC.

(Powder raw material other than ingredient (A))

10 Strong flour 1: LYS D'OR, manufactured by Nippon Flour Mills Co., Ltd.

Strong flour 2: EAGLE, manufactured by Nippon Flour Mills Co., Ltd.

15 Bread quality improver: Max Power, manufactured by J-Oil Mills, INC.

Instant dry yeast: Saf-Instant Dry Yeast RED, manufactured by Lesaffre

Skimmed milk powder: Skimmed milk powder, manufactured by Hokkaido Dairy Products Co., Ltd.

20 Sugar: White Soft Sugar, manufactured by Mitsui Sugar Co., Ltd.

(Raw materials other than powder raw material)

Malt syrup: EUROMALT, manufactured by Diamalteria Italiana Srl

Baker's yeast: Oriental Yeast, manufactured by Oriental Yeast Co., Ltd.

25 [0052]

(Production Example 1) Production of low-molecular-weight starch

Acid-treated high amylose corn starch was produced as low-molecular-weight starch that was a raw material for powdery granular materials 1 to 3.

High amylose corn starch (manufactured by J-Oil Mills, INC.,
5 HS-7, amylose content 70% by mass) was suspended in water to prepare a 35.6% (w/w) slurry, which was heated to 50°C. While stirring, a hydrochloric acid aqueous solution prepared to 4.25 N was added thereto in an amount of 1/9 times the mass ratio of the slurry to start the reaction. After the reaction for 16 hours, neutralization
10 with 3% NaOH, washing with water, dehydration, and drying were performed to obtain acid-treated high amylose corn starch.

When the peak molecular weight of the obtained acid-treated high amylose corn starch was measured by a method described later, the peak molecular weight was 1.2×10^4 .

15 [0053]

(Measurement method of peak molecular weight)

Measurement of the peak molecular weight was performed using an HPLC unit manufactured by TOSOH CORPORATION (pump DP-8020, RI detector RS-8021, deaerator SD-8022).

20 (1) A sample was pulverized to recover the fraction under a sieve with an aperture of 0.15 mm which is a sieve of JIS-Z8801-1 standard. This recovered fraction was suspended so that it was 1 mg/mL in the mobile phase, and the suspension was heated at 100°C for 3 minutes to completely dissolve it. Filtration was performed using a 0.45
25 μm filtration filter (manufactured by ADVANTEC, DISMIC-25HP PTFE 0.45 μm), and the filtrate was used as an analysis sample.

(2) The molecular weight was measured under the following

analytical conditions.

Column: Two pieces of TSKgel α -M (7.8 mm ϕ , 30 cm) (manufactured by TOSOH CORPORATION)

Flow velocity: 0.5 mL/min

5 Mobile phase: 5 mM sodium nitrate-containing 90% (v/v) dimethyl sulfoxide solution

Column temperature: 40°C

Analytical volume: 0.2 mL

(3) The detector data was collected by software (Multistation
10 GPC-8020 model II Data Collection Ver 5.70, manufactured by TOSOH CORPORATION) to calculate the molecular weight peak.

Pullulan (Shodex Standard P-82, manufactured by Showa Denko K.K.) with a known molecular weight was used for a calibration curve.
[0054]

15 (Measurement method of cold water swelling degree)

(1) A sample was heated and dried at 125°C to measure the water content using a moisture analyzer (KENSEI KOGYO Co., Ltd., model number MX-50), and the mass of dry matter was calculated from the obtained water content value.

20 (2) In a state where 1 g of the sample in terms of the mass of dry matter was dispersed in 50 mL of water at 25°C, stirring was gently performed in a constant-temperature tank at 25°C for 30 minutes, and thereafter centrifugation was performed at 3000 rpm for 10 minutes (centrifuge: manufactured by Hitachi Koki Co., Ltd., Hitachi
25 table-top centrifuge CT6E type; rotor: T4SS type swing rotor; adapter: 50TC $\times$ 2S adapter) to separate into a precipitated layer and a supernatant layer.

(3) The supernatant layer was removed to measure the mass of the precipitated layer, which was defined as B (g).

(4) The mass when dryness of the precipitated layer was caused (105°C, constant mass) was defined as C (g).

5 (5) The value obtained by dividing B by C was defined as the cold water swelling degree.

[0055]

(Production Example 2) Production of powdery granular materials
1 to 3

10 79% by mass of corn starch, 20% by mass of acid-treated high amylose corn starch obtained by the above-mentioned method, and 1% by mass of calcium carbonate were mixed in a bag until they became sufficiently uniform. The mixture was treated by pressurization and heating using a twin-screw extruder (KEI-45 manufactured by KOWA
15 KOGYO Inc.). The treatment conditions were as follows.

Raw material supply: 450 g/minutes

Water added: 17% by mass

Barrel temperature: 50°C, 70°C, and 100°C from the raw material inlet to the outlet.

20 Outlet temperature: 100°C to 110°C

Screw rotation speed: 250 rpm

The heat-gelatinized product obtained by the extruder treatment in this manner was dried at 110°C to adjust the water content to 10% by mass.

25 Next, the dried heat-gelatinized product was pulverized with a tabletop cutter pulverizer and thereafter sieved with a sieve of JIS-Z8801-1 standard. The sieved heat-gelatinized product was mixed

at the blending proportions described in Table 1 to prepare the powdery granular materials 1 to 3. Table 1 collectively shows values obtained by measuring the cold water swelling degree of the powdery granular materials 1 to 3 at 25°C by the above-mentioned method.

5 [0056]

[Table 1]

Table 1

Fraction (mass%)	Powdery granular material 1	Powdery granular material 2	Powdery granular material 3
Under 1 mm sieve and on 0.5 mm sieve	18.0		
Under 0.5 mm sieve and on 0.25 mm sieve	42.0		
Under 0.25 mm sieve and on 0.15 mm sieve	15.0	36.4	
Under 0.15 mm sieve and on 0.075 mm sieve	20.0	48.0	75.5
Under 0.075 mm sieve and on 0.038 mm sieve	3.7	11.4	17.9
Under 0.038 mm sieve	1.3	4.2	6.6
Total of fraction (mass%)	100.0	100.0	100.0
Fraction under 0.5 mm sieve and on 0.038 mm sieve (mass%)	80.7	95.8	93.4
Fraction under 0.25 mm sieve and on 0.038 mm sieve (mass%)	38.7	95.8	93.4
Fraction under 0.15 mm sieve and on 0.038 mm sieve (mass%)	23.7	59.4	93.4
Cold water swelling degree	10.5	7.3	9.5

[0057]

Note) For example, "Under 0.15 mm sieve and on 0.075 mm sieve" means "under a sieve with an aperture of 0.15 mm and on a sieve with an aperture of 0.075 mm of JIS-Z8801-1 standard".

[0058]

(Examples 1-1 to 1-6 and Comparative Example 1-1)

Baguette was produced with formulations described in Table 2.

(Production method of Baguette)

15 1. All the materials were put into a mixer bowl and mixed with a mixer for bread (KANTO MIXER HP-20M, manufactured by KANTO KONGOKI INDUSTRIAL Co., Ltd.) under the following conditions.

Mixing conditions: Kneading with a hook in first gear for 5

minutes, second gear for 5 minutes, and third gear for 3 minutes.

2. After mixing, the dough was taken out from the mixer, fermented at 28°C for 60 minutes, and punched.

3. The dough was stored in a refrigerator (4°C) for 8 hours,
5 and thereafter divided into 30 parts by a dough division machine (Paneotrad: manufactured by BONGARD).

4. A coupe (a cut) was made on the surface of the dough with a knife, and baking was performed in an oven under the following condition and time.

10 Baking condition: Upper 240°C/lower 230°C

Baking time: 20 minutes

5. After the baking, the heat just after baking of the bread baked was removed at room temperature (20°C).

[0059]

15 The obtained bread was evaluated by the following evaluation method.

[0060]

(Evaluation method)

The obtained bread was heated in a microwave oven at 600 W for
20 30 seconds, and the texture (quality of crispness and absence of remains in mouth) after being left to stand at room temperature for 5 minutes was evaluated according to the following evaluation criteria. In addition, 1 slice of a commercially available sliced ham (Daily Choice Loin Ham: manufactured by NH Foods Ltd.) and 1 slice
25 of a commercially available sliced cheese (Sliced Cheese: manufactured by MEGMILK SNOW BRAND Co., Ltd.) were sandwiched in the obtained bread. This bread was wrapped in wrap, and the texture after

being stored overnight in a refrigerator (4°C), heated in a microwave oven at 600 W for 1 minute thereafter, and left to stand at room temperature for 5 minutes was also evaluated. The evaluation was determined by the average score of seven panelists. The evaluation
 5 criteria are described below.

[0061]

(Crispness)

5: The bread dough had very good crispness, and was very easy to bite off.

10 4: The bread dough had good crispness, and was very easy to bite off.

3: The bread dough had a little good crispness, and was easy to bite off.

15 2: The bread dough had not very good crispness, and was a little difficult to bite off.

1: The bread dough had very poor crispness, and was very difficult to bite off.

(Absence of remains in mouth)

5: No remains in mouth when chewed

20 4: Almost no remains in mouth when chewed

3: A little bit of remains in mouth when chewed, but not bothered by it

2: Became a little lumpy when chewed, and slight remains in mouth

1: Became lumpy when chewed, and remains in mouth

25 [0062]

The obtained results are described in Table 2.

[0063]

[Table 2]

Table 2

Powder raw material	Raw material (part by mass)	Comparative Example 1-1	Example 1-1	Example 1-2	Example 1-3	Example 1-4	Example 1-5	Example 1-6
O	Strong flour 1	100	88	94	88	82	75	88
O	Ingredient (A) Powdery granular material 1		12					
O	Ingredient (A) Powdery granular material 2			6	12	18	25	
O	Ingredient (A) Powdery granular material 3							12
O	Salt	2	2	2	2	2	2	2
O	Instant dry yeast	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	Malt syrup	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Water	72	88	79	82	87	92	80
Total of powder raw material (part by mass)		102.6	102.6	102.6	102.6	102.6	102.6	102.6
Total of dough (part by mass)		174.9	190.9	181.9	184.9	189.9	194.9	182.9
Ingredient (A)/powder raw material (mass%)*		-	11.7	5.8	11.7	17.5	24.4	11.7
Ingredient (A)/total of dough (mass%)**		-	6.3	3.3	6.5	9.5	12.8	6.6
Evaluation (only bread, 30 seconds at 600 W → left to stand for 5 minutes and eaten)								
Texture	Quality of crispness	1.4	4.1	3.3	3.7	4.0	3.9	4.0
	Absence of remains in mouth	1.6	4.3	3.0	4.0	4.3	3.7	3.7
Evaluation (ham and cheese were sandwiched, wrapped in wrap, 1 minute at 600 W → left to stand for 5 minutes and eaten)								
Texture	Quality of crispness	1.4	4.0	3.6	3.9	4.0	3.7	3.9
	Absence of remains in mouth	1.4	4.0	3.1	4.0	4.0	3.6	3.7

Note)

* Ingredient (A)/powder raw material (mass%) means mass% of ingredient (A) with respect to powder raw material

** Ingredient (A)/total of dough (mass%) means mass% of ingredient (A) with respect to total amount of dough

[0064]

From Table 2, in the baguette containing 5.8% by mass or more and 24.4% by mass or less of the ingredient (A) per powder raw material of the dough, the quality of crispness and the absence of remains in mouth after reheating were excellent, and the bread containing 11.7% by mass or more and 17.5% by mass was further excellent. In addition, even in the baguette that was reheated after sandwiching

of the ham and the cheese therebetween and refrigerated storage, by incorporating 5.8% by mass or more and 24.4% by mass or less of the ingredient (A) per powder raw material of the dough, the quality of crispness and the absence of remains in mouth were excellent.

5 The quality of crispness and the absence of remains in mouth were excellent when the content of the ingredient (A) under the sieve with the aperture of 0.5 mm and on the sieve with the aperture of 0.038 mm was 80.7% by mass or more and 95.8% by mass or less, and the quality of crispness and the absence of remains in mouth were
10 further excellent at 80.7% by mass.

[0065]

(Example 2-1 and Comparative Example 2-1)

Hamburger buns were produced with the formulations described in Table 3.

15 [0066]

(Production method of hamburger buns)

1. All the materials including the oil and fat composition were put into a mixer bowl and mixed with a mixer for bread (KANTO MIXER HP-20M, manufactured by KANTO KONGOKI INDUSTRIAL Co., Ltd.) under
20 the following conditions.

Mixing conditions: Kneading with a hook in first gear for 2 minutes, second gear for 4 minutes, and third gear for 4 minutes.

2. After mixing, the dough was taken out from the mixer and fermented at 26°C for 60 minutes.

25 3. The dough was divided into 55 g, rolled, caused to rest for 15 minutes, and thereafter the dough was rolled again for forming.

4. The formed dough was fermented in a fermenter at 36°C and

80% relative humidity for 55 minutes.

5. After fermentation, baking was performed in an oven under the following condition and time.

Baking condition: Upper 230°C/lower 190°C

5 Baking time: 10 minutes

6. After the baking, the heat just after baking of the bread baked was removed at room temperature (20°C).

[0067]

The obtained bread was evaluated by the following evaluation
10 method.

[0068]

(Evaluation method)

The obtained bread was heated in a microwave oven at 600 W for 30 seconds, and the texture (quality of crispness and absence of
15 remains in mouth) after being left to stand for 5 minutes was evaluated according to the above-mentioned evaluation criteria. In addition, a commercially available chilled hamburger (Marushin Hamburger: manufactured by MARUSHIN FOODS Co., Ltd.) which was heated at 500 W for 1 minute was sandwiched in the obtained bread. This bread was
20 put in a paper box for hamburgers, and the texture after being stored overnight in a refrigerator (4°C), heated in a microwave oven at 600 W for 1 minute thereafter, and left to stand for 5 minutes was also evaluated.

The evaluation was determined by the consensus of three
25 panelists.

[0069]

The obtained results are described in Table 3.

[0070]

Table 3

Powder raw material	Raw material (part by mass)	Comparative Example 2-1	Example 2-1
O	Strong flour 2	100	90
O	Ingredient (A) Powdery granular material 2		10
O	Salt	2	2
O	White soft sugar	10	10
O	Bread quality improver	0.3	0.3
O	Skimmed milk powder	2	2
	Baker's yeast	2.5	2.5
	Oil and fat composition 1	6	6
	Oil and fat composition 2	2	2
	Water	67	78
Total of powder raw material (part by mass)		114.3	114.3
Total of dough (part by mass)		191.8	202.8
Ingredient (A)/powder raw material (mass%)*		-	8.7
Ingredient (A)/total of dough (mass%)**		-	4.9
Evaluation (only bread, 30 seconds at 600 W → left to stand for 5 minutes and eaten)			
Texture	Quality of crispness	2	4
	Absence of remains in mouth	3	5
Evaluation (chilled hamburger was sandwiched, put in box, 1 minute at 600 W → left to stand for 5 minutes and eaten)			
Texture	Quality of crispness	3	5
	Absence of remains in mouth	3	4

Note)

* Ingredient (A)/powder raw material (mass%) means mass% of ingredient (A) with respect to powder raw material

** Ingredient (A)/total of dough (mass%) means mass% of ingredient (A) with respect to total amount of dough

[0071]

From Table 3, even in the hamburger buns, by incorporating the ingredient (A) in the dough, the quality of crispness and the absence of remains in mouth after reheating were excellent.

[0072]

This application claims the priority on the basis of Japanese

Patent Application No. 2020-015835, filed January 31, 2020, the content of which is incorporated herein by reference.

CLAIMS

1. A method for reducing a deterioration of texture when reheating bakery food in which a dough contains a powder raw material containing
5 an ingredient (A) satisfying the following conditions (1) to (4),
wherein a blending amount of the ingredient (A) with respect to the powder raw material is 2% by mass or more and 30% by mass or less,

the ingredient (A): a powdery granular material satisfying the
10 following conditions (1) to (4),

- (1) a starch content is 75% by mass or more,
- (2) 3% by mass or more and 45% by mass or less of low-molecular-weight starch of starch in which an amylose content is 5% by mass or more is contained, and a peak molecular weight of
15 the low-molecular-weight starch is 3×10^3 or more and 5×10^4 or less,
- (3) a cold water swelling degree at 25°C is 5 or more and 20 or less, and
- (4) a content under a sieve with an aperture of 0.5 mm and on a sieve with an aperture of 0.038 mm is 30% by mass or more and 100%
20 by mass or less.

2. The method for reducing a deterioration of texture according to claim 1, wherein a content of the ingredient (A) under the sieve with the aperture of 0.5 mm and on the sieve with the aperture of 0.038
25 mm is 65% by mass or more and 100% by mass or less.

3. The method for reducing a deterioration of texture according to

claim 1 or 2, wherein the bakery food is dressed bread.