DESCRIPTION

SOLID PASTE COMPOSITION FOR COOKING AND METHOD FOR PRODUCING SAME

TECHNICAL FIELD

[0001]

The present invention relates to a solid paste composition for heat cooking and a method of producing the composition.

BACKGROUND ART

[0002]

There are a wide variety of solid paste compositions for cooking all over the world, which are made from various raw materials such as cereal flour and starch, by kneading the material with water and salts into a dough, which is then made into various shapes. They are commonly in elongated shapes (e.g., pasta- and noodle-like foods), but some are there are also made into other shapes such as strips, plates, reeds, tubes, dumplings, grains, etc.

[0003]

Such solid paste compositions for cooking, whether in raw or dried form, are eaten after heat cooking. It is known that the texture derived from the composition structure plays an important role in preference. Conventional solid paste compositions for heat cooking are known to have a unique texture due to their protein network structure such as gluten, as explained in Patent Literature 1.

LIST OF CITATIONS

Patent Literature

[0004]

[Patent Literature 1] JP 2017-055672 A

SUMMARY

[0004a]

In one aspect, provided herein is a solid paste composition for heat cooking containing at least pulse as a raw material, ~~and satisfying the requirements (1) to (4), (7), and (12) below.~~

(1) ~~The~~ wherein the composition has an insoluble dietary fiber content of 2.0 mass % or more in terms of dry mass basis~~.~~,

(2) ~~The~~ wherein the composition has a starch content of 15 mass % or more in terms of dry mass basis~~.~~,

(3) ~~The~~ wherein the composition has a protein content of 5.5 mass % or more in terms of dry mass basis~~.~~,

(4) ~~When~~ wherein when at least one frozen section A of the composition prepared under [Condition A] below is subjected to CBB (Coomassie Brilliant Blue) staining and observed, ~~at least either (4a) or (4b) is satisfied.~~

(4a) ~~The~~ the ratio of [the number of CBB-stained sites having areas of 200μm^2 or more and degree of roundness of 0.3 or more] to [the number of CBB-stained sites having areas of 30μm^2 or more] is 3% or more~~.~~, and/or

(4b) ~~The~~ the ratio of [the total area of CBB-stained sites having areas of 200μm^2 or more and degrees of roundness of 0.3 or more] to [the total section area of the composition] is 0.3% or more.

provided that [Condition A] ~~The~~ is a condition where the composition is heated in water at 90ºC for 6 minutes and then frozen at -25ºC, and the frozen composition is cut along a certain cut plane A into a section having a thickness of 30 μm, which section is used as a frozen composition section A~~.~~,

(7) ~~The composition satisfies at least either (7a) or (7b).~~wherein

(7a) ~~When~~ when one mass part of the composition is immersed in 9 mass parts of iodine solution (0.25 mM) at 20°C for 3 minutes and filtered through a 0.20 μm filter, the difference in absorbance (500 nm) of the iodine solution is 0.65 or less~~.~~, and/or

(7b) ~~When~~ when one mass part of the composition is immersed in 9 mass parts of iodine solution (0.25 mM) at 20°C for 3 minutes and filtered through a 0.20 μm filter and the filtrate stained with iodine (final concentration 0.25 mM), the difference in absorbance (500 nm) of the iodine solution is 1.2 or less~~.~~, and

(12) ~~When~~ wherein when a 6% suspension of a crushed product of the composition is observed, the number of starch grain structures observed is 300/mm^2 or less.

[0004b]

In another aspect, provided herein is a crushed composition prepared by crushing a composition as described herein.

[0004c]

In another aspect, provide herein is a crushed composition agglomerate prepared by agglomerating a crushed composition as described herein.

[0004d]

In another aspect, provided herein is a process of producing a solid paste composition for heat cooking as described herein, comprising the steps of:

(i) preparing a paste dough composition containing at least pulse as a raw material and having an insoluble dietary fiber content of 1.5 mass % or more in terms of wet basis, a starch content of 5.0 mass % or more in terms of wet basis, a protein content of 3.0 mass % or more in terms of wet basis, and a dry mass basis moisture content of 25 mass % or more;

(ii) kneading the composition prepared in step (i) at a temperature of from 100ºC to 200ºC with a specific mechanical energy (SME) of 350kJ/kg or more; and

(iii) cooling the composition kneaded in step (ii) to a temperature at which ~~a temperature at which~~ the composition does not swell.

PROBLEM TO BE SOLVED BY THE DISCLOSURE

[0005]

However, the composition described in Patent Document 1 is difficult to adjust the fine texture, since its gluten network structure is uniformly formed throughout the

CLAIMS

[Claim 1]

A solid paste composition for heat cooking containing at least pulse as a raw material, ~~and satisfying the requirements (1) to (4), (7), and (12) below.~~

(1) ~~The~~ wherein the composition has an insoluble dietary fiber content of 2.0 mass % or more in terms of dry mass basis~~.~~,

(2) ~~The~~ wherein the composition has a starch content of 15 mass % or more in terms of dry mass basis~~.~~,

(3) ~~The~~ wherein the composition has a protein content of 5.5 mass % or more in terms of dry mass basis~~.~~,

(4) ~~When~~ wherein when at least one frozen section A of the composition prepared under [Condition A] below is subjected to CBB (Coomassie Brilliant Blue) staining and observed, ~~at least either (4a) or (4b) is satisfied.~~

(4a) ~~The~~ the ratio of [the number of CBB-stained sites having areas of 200μm^2 or more and degree of roundness of 0.3 or more] to [the number of CBB-stained sites having areas of 30μm^2 or more] is 3% or more~~.~~, and/or

(4b) ~~The~~ the ratio of [the total area of CBB-stained sites having areas of 200μm^2 or more and degrees of roundness of 0.3 or more] to [the total section area of the composition] is 0.3% or more~~.~~,

provided that [Condition A] ~~The~~ is a condition where the composition is heated in water at 90ºC for 6 minutes and then frozen at -25ºC, and the frozen composition is cut along a certain cut plane A into a section having a thickness of 30 μm, which section is used as a frozen composition section A~~.~~,

(7) wherein ~~The composition satisfies at least either (7a) or (7b).~~

(7a) ~~When~~ when one mass part of the composition is immersed in 9 mass parts of iodine solution (0.25 mM) at 20°C for 3 minutes and filtered through a 0.20 μm filter, the difference in absorbance (500 nm) of the iodine solution is 0.65 or less~~.~~, and/or

(7b) ~~When~~ when one mass part of the composition is immersed in 9 mass parts of iodine solution (0.25 mM) at 20°C for 3 minutes and filtered through a 0.20 μm filter and the filtrate stained with iodine (final concentration 0.25 mM), the difference in absorbance (500 nm) of the iodine solution is 1.2 or less~~.~~, and

(12) ~~When~~ wherein when a 6% suspension of a crushed product of the composition is observed, the number of starch grain structures observed is 300/mm^2 or less.

[Claim 2]

The composition according to claim 1, wherein when the frozen composition section A is subjected to CBB staining and observed, ~~the section further satisfies the at least either (4c) or (4d):~~

(4c) ~~The~~ the area corresponding to the 90th percentile score in the CBB-stained sites

having areas of 30μm^2 or more is 3500μm^2 or less~~.~~, and/or

(4d) ~~The~~ the number of CBB-stained sites having longest diameters of 200 μm or more is 40 or less.

[Claim 3]

The composition according to claim 1 or 2, wherein when the frozen composition section A is subjected to CFW (Calcofluor-white) staining and observed, ~~the section further satisfies the at least either (5a) or (5b):~~

(5a) ~~The~~ the average of the longest diameters of CFW-stained sites is 450 μm or less~~.~~, and/or

(5b) ~~The~~ the average of the aspect ratios of CFW-stained sites is 5.0 or less.

[Claim 4]

The composition according to any one of claims 1 to 3, wherein the frozen composition section A is a frozen composition section A1, which is obtained along a cut plane A1 orthogonal to the longitudinal axis of the composition, or

wherein the frozen composition section A comprises a frozen composition section A1, which is obtained along a cut plane A1 orthogonal to the longitudinal axis of the composition, and a frozen composition section A2, which is obtained along a cut plane A2 parallel to the longitudinal axis of the composition.

[Claim 5]

The composition according to any one of claims 1 to 4, wherein when at least one frozen composition section B prepared under [Condition B] below is measured by the X-ray diffraction method, the average crystallinity at the center of the composition section is higher than the average crystallinity at the periphery of the composition section, or

wherein when at least one frozen composition section B prepared under [Condition B] below is subjected to CBB staining and observed, a smooth tissue part with an average thickness of 20 μm or more is found along 30% or more of the perimeter of the composition section on the cut plain B~~.~~,

provided that [Condition B] ~~The~~ is a condition where the composition is frozen at -25°C, and the frozen composition is cut along a certain cut plane B into a section having a thickness of 30 μm, which section is observed as a frozen composition section B.

[Claim 6]

The composition according to claim 5, wherein when the frozen composition section B is subjected to CBB staining and observed, the ratio of [the number of CBB-stained sites area 200μm^2 or more and degrees of roundness of 0.3 or more in the smooth tissue part on the cut plane B] to [the number of CBB-stained sites having areas of 30μm^2 or more in the smooth tissue part on the cut plane B] is 3% or more.

[Claim 7]

The composition according to claim 5 or 6, wherein when the frozen composition section B is measured by the X-ray diffraction method, the average crystallinity in the non-smooth tissue part, which exists inside of the smooth tissue part of the composition, is higher than the average crystallinity in the smooth tissue part.

[Claim 8]

The composition according to any one of claims 5 to 7, wherein the frozen composition section B is a frozen composition section B1, which is obtained along a cut plane B1 orthogonal to the longitudinal axis of the composition, or

wherein the frozen composition section B comprises a frozen composition section B1, which is obtained along a cut plane B1 orthogonal to the longitudinal axis of the composition, and a frozen composition section B2, which is obtained along a cut plane B2 parallel to the longitudinal axis of the composition.

[Claim 9]

The composition according to any one of claims 1 to 8, ~~further satisfying one or more of (6a) to (6d).~~wherein

(6a) ~~The~~ the content of soluble γ-amino butyric acid in the composition is 25mg % or less~~.~~, and/or

(6b) ~~The~~ the ratio of the soluble γ-amino butyric acid content to the total content of soluble proteinogenic amino acids in the composition is 1.5 mass % or less~~.~~ , and/or

(6c) ~~The~~ the content of soluble leucine in the composition is 10mg ~~mass~~ % or less~~.~~ , and/or

(6d) ~~The~~ the ratio of the soluble leucine content to the total content of soluble proteinogenic amino acids in the composition is 1.0 mass % or less.

[Claim 10]

The composition according to any one of claims 1 to 9, ~~further satisfying at least either (8a) or (8b).~~wherein

(8a) ~~When~~ when one mass part of the composition is treated in 9 mass parts of 1% glucoamylase aqueous solution at 20℃ for 2 hours, the glucose content in the resulting reaction solution is less than 2.40 mass %~~.~~, and/or

(8b) ~~When~~ when one mass part of the composition is treated in 9 mass parts of 1% glucoamylase aqueous solution at 20℃ for 2 hours, the glucose content in the resulting reaction solution is 50% or less of a glucose content in a reaction solution prepared by treating one mass part of a crushed product of the composition in 9 mass parts of 1% glucoamylase aqueous solution at 20℃ for 2 hours.

[Claim 11]

The composition according to any one of claims 1 to 10, ~~further satisfying at least either (9a) or (9b).~~wherein

(9a) ~~When~~ when the composition is subjected to [Treatment C] below and then to ultrasonic treatment, the particle size distribution d_{50} of the resulting product is 450 μm or less~~.~~, and/or

(9b) ~~When~~ when the composition is subjected to [Treatment C] below and then to CFW (Calcofluor-white) staining and observed under fluorescence microscope, the average of the longest diameters of CFW-stained sites is 450 μm or less~~.~~,

provided that [Treatment C] is a condition where 6 mass % water suspension of the composition is treated with 0.4 volume % of protease and 0.02 mass % of α-amylase at 20ºC for 3 days.

[Claim 12]

The composition according to any one of claims 1 to 11, ~~further satisfying at least either (10a) or (10b).~~ wherein

(10a) ~~The~~ the ratio of the starch content derived from the pulse to the total starch content in the composition is 50 mass % or more in terms of dry mass basis~~.~~, and/or

(10b) ~~The~~ the ratio of the protein content derived from the pulse to the total protein content in the composition is 50 mass % or more in terms of dry mass basis.

[Claim 13]

The composition according to claim 12, wherein the pulse is a dried pulse with a dry mass basis moisture content of less than 25 mass%.

[Claim 14]

The composition according to any one of claims 1 to 13, wherein the pulse is one or more species of pulse selected from Pisum, Phaseolus, Cajanus, Vigna, Vicia, Cicer, Glycine and Lens species, and/or

wherein the pulse is in the form of pulse flour with a particle size d_{90} of 500 μm or less after subjected to ultrasonic treatment, and/or

wherein the ratio of the starch content derived from pulse to the total starch content in the composition is 50 mass% or more in terms of dry mass basis.

[Claim 15]

The composition according to any one of claims 1 to 14, which is not in the form of a swollen product, and/or

which has a total oil and fat content of less than 17 mass % in terms of dry mass basis, and/or

which has a dry mass basis moisture content of 60 mass % or less.

[Claim 16]

A crushed composition prepared by crushing a composition according to any one of claims 1 to 15.

[Claim 17]

A crushed composition agglomerate prepared by agglomerating a crushed composition according to claim 16.

[Claim 18]

A process of producing a solid paste composition for heat cooking according to any one of claims 1 to 15, comprising the steps of:

(i) preparing a paste dough composition containing at least pulse as a raw material and having an insoluble dietary fiber content of 1.5 mass % or more in terms of wet basis, a starch content of 5.0 mass % or more in terms of wet basis, a protein content of 3.0 mass % or more in terms of wet basis, and a dry mass basis moisture content of 25 mass % or more;

(ii) kneading the composition prepared in step (i) at a temperature of from 100ºC to 200ºC with a specific mechanical energy (SME) of 350kJ/kg or more; and

(iii) cooling the composition kneaded in step (ii) to a temperature at which ~~a temperature at which~~ the composition does not swell.

[Claim 19]

The process according to claim 18, wherein the paste dough composition in step (i) has a dry mass basis moisture content of 40 mass % or more, and/or

wherein the ratio of the content of starch derived from pulse to the total starch content in the dough composition prepared in step (i) is 50 mass % or more in terms of dry mass basis, and/or

wherein the pulse used in step (i) is in the form of pulse flour with a particle size d_{90} of 500 μm or less after subjected to ultrasonic treatment.

[Claim 20]

The process according toclaim 18 or 19, wherein the pulse used in step (i) is pulse flour ~~which satisfies at least either (11a) or (11b).~~, wherein

(11a) ~~When~~ when the pulse flour is subjected to [Treatment D] below and then to ultrasonic treatment, the particle size distribution d_{50} of the resulting flour is 450 μm or less~~.~~, and/or

(11b) ~~When~~ when the pulse flour is subjected to [Treatment D] below and then to CFW (Calcofluor-white) staining and observed under fluorescence microscope, the average of the longest diameters of CFW-stained sites of the resulting flour is 450 μm or less~~.~~, and/or

provided that [Treatment D] is a condition where 6 mass % water suspension of the pulse flour is treated with 0.4 volume % of protease and 0.02 mass % of α-amylase at 20ºC for 3 days.

[Claim 21]

The process according to any one of claims 18 to 20, wherein the kneading in step (ii) is carried out under a pressurized condition of 0.1MPa or more, and/or

until the soluble γ-amino butyric acid content in the composition decreases to 50 mass % or less of the soluble γ-amino butyric acid content in the composition before step (ii), and/or

until the soluble leucine content in the composition decreases to 50 mass % or less of the soluble leucine content in the composition before step (ii), and/or
for a period of from 0.1 to 60 minutes.

[Claim 22]

The process according to any one of claims 18 to 21, wherein the composition in step (iii) is cooled to 95ºC or less, and/or,
the kneading in step (ii) and/or the cooling in step (iii) are/is carried out using an extruder.

[Claim 23]

The process according to claim 22, wherein the extruder is a uniaxial extruder or a biaxial extruder, and/or

wherein the ratio of the length of a flight screw part to the total length of a barrel of the extruder is 95% or less.

[Claim 24]

The process according to any one of claims 18 to 23, further comprising, after step (iii):

(iv) maintaining the composition after the cooling in step (iii) at a temperature at which the composition does not swell in an atmosphere with a dry mass basis moisture content of 25 mass % or more for 0.02 hours or more, and/or

(v) crushing the composition to produce a crushed composition.

[Claim 25]

The process according to claim 24, further comprising, after step (v):

(vi) agglomerating the crushed composition to prepare a crushed composition agglomerate.