the composition has a ratio of a pulse-derived starch content to a total starch content in the composition of 10 % by mass or higher on a dry mass basis.

[Aspect 8]

The composition as defined in any one of Aspects 1 to 7, wherein:

the pulse comprises one or more species of pulse selected from Pisum, Phaseolus, Cajanus, Vigna, Vicia, Cicer, and Lens species.

[Aspect 9]

A crushed composition prepared by crushing a composition as defined in any one of Aspects 1 to 8.

[Aspect 10]

A crushed composition agglomerate prepared by agglomerating a crushed composition as defined in Aspect 9.

[Aspect 11]

A method of producing a solid paste composition for heat cooking containing pulse, comprising the steps of:

(i) preparing a paste dough composition containing pulverized pulse so as to have an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher, a starch content on a dry mass basis of 10 % by mass or higher, and a protein content on a dry mass basis of 4 % by mass or higher;

(ii) kneading the composition from step (i) at a temperature of within a range of from 100 °C to 200 °C ; and

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

[Aspect 11a]

A method of producing a solid paste composition for heat cooking containing pulse, comprising the steps of:

(i) preparing a paste dough composition containing pulverized pulse so as to have an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher, a starch content on a dry mass basis of 10 % by mass or higher, and a protein content on a dry mass basis of 4 % by mass or higher;

(ii) kneading the composition from step (i) at a temperature of within a range of from 100 °C to 200 °C and under a condition with a specific mechanical energy (SME) of 350 kJ/kg or higher; and

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

[Aspect 12]

The method as defined in Aspect 11, further comprising, after step (iii), the step of:

(iv) subjecting the composition from step (iii) to a moist treatment in an environment where the relative humidity (RH%) of the atmosphere is over 50 RH%.

[Aspect 13]

The method as defined in Aspect 12, wherein:

(i) preparing a paste dough composition containing pulverized pulse so as to have an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher, a starch content on a dry mass basis of 10 % by mass or higher, and a protein content on a dry mass basis of 4 % by mass or higher;
(ii) kneading the composition from step (i) at a temperature of within a range of from 100 °C to 200 °C ; and
(iii) cooling the composition from step (ii) to a temperature at which the composition does not swell.

[Aspect 26]

A method of improving a quality of a solid paste composition for heat cooking containing pulse, comprising the steps of:
(i) preparing a paste dough composition containing pulverized pulse so as to have an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher, a starch content on a dry mass basis of 10 % by mass or higher, and a protein content on a dry mass basis of 4 % by mass or higher;
(ii) kneading the composition from step (i) at a temperature of within a range of from 100 °C to 200 °C and under a condition with a specific mechanical energy (SME) of 350 kJ/kg or higher; and
(iii) cooling the composition from step (ii) to a temperature at which the composition does not swell.

[Aspect 27]

The method as defined in Aspect 26, further comprising, after step (iii), the step of:
(iv) subjecting the composition from step (iii) to a moist treatment in an environment where the relative humidity (RH%) of the atmosphere is over 50 RH%.

[Aspect 28]

The method as defined in Aspect 27, wherein:

the moist treatment in step (iv) is carried out under a condition which satisfies Formula 1 below:

$$A \times T \geqq 40 \quad \text{(Formula 1)}$$

where A represents a relative humidity (RH%) of the atmosphere, and T represents the treating time of the moist treatment (hr), provided that A > 50RH%.

[Aspect 29]

The method as defined in any one of Aspects 26 to 28, wherein:

step (ii) and/or step (iii) is carried out under a pressurized condition.

[Aspect 30]

The method as defined in Aspect 29, wherein:

the pressurized condition is a condition where a pressure of 0.1 MPa or higher is applied.

[Aspect 31]

The method as defined in any one of Aspects 26 to 30, wherein:

when the pulverized pulse used in step (i) is subjected to Treatment A below and

[Table 3-2]

	Raw materials		
	Pulverized pulse	d_{50} after ultrasonication (μm)	d_{90} after amylase/protease treatment and ultrasonication (μm)
Comparative Example 5	Dried chick peas 100%	26	16
Example 28			
Example 29			
Example 30	Dried kidney beans 100%	36	11
Example 31			
Example 32			
Comparative Example 6	Dried lentils 100%	12	5
Example 33			
Example 34			
Example 35			
Comparative Example 7	Dried scarlet runner beans 100%	52	27
Example 36			
Example 37			
Comparative Example 8	Yellow peas (seed coat removed) 100%	50	26
Example 38		20	16
Comparative Example 9		480	767

[Table 3-4]

	Processing conditions						
	Flight Screw Ratio (%)	Highest temp. (℃)	Discharge pressure (MPa)	SME for keading (kJ/kg)	Water added (% relative to powder)	Outlet temp. (℃)	Composition shape
Comparative Example 5	90	80℃	2.0	665	50	70	Noodles (Ø: 1mm)
Example 28	90	120℃	3.5	665	50	70	Noodles (Ø: 1mm)
Example 29	90	170℃	3.2	665	50	70	Noodles (Ø: 1mm)
Example 30	95	100℃	3.3	406	50	70	Noodles (Ø: 5mm)
Example 31	95	120℃	4.9	406	50	70	Noodles (Ø: 5mm)
Example 32	95	170℃	3.2	406	50	70	Noodles (Ø: 5mm)
Comparative Example 6	70	80℃	5.9	1236	50	70	Noodles (Ø: 10mm)
Example 33	70	100℃	5.9	1236	50	70	Noodles (Ø: 10mm)
Example 34	70	120℃	5.3	1236	50	70	Noodles (Ø: 10mm)
Example 35	70	180℃	7.8	1236	50	70	Noodles (Ø: 10mm)
Comparative Example 7	50	80℃	5.8	2495	50	70	Noodles (Ø: 15mm)
Example 36	50	120℃	3.6	2495	50	70	Noodles (Ø: 15mm)
Example 37	50	170℃	2.1	2495	50	70	Noodles (Ø: 15mm)
Comparative Example 8	100	120℃	4.2	299	50	100	Noodles (Ø: 2mm)
Example 38	90	120℃	4.2	1283	50	40	Noodles (Ø: 2mm)
Comparative Example 9	97	120℃	4.2	328	50	90	Noodles (Ø: 2mm)

[Table 3-6]

	Post-treatment				
	Composition cut (in 5mm length) ?	Refregerated drying?	Moisture treatment? (conditions?)	Room-temperature drying?	40ºC drying?
Comparative Example 5	-	-	-	Yes	Yes
Example 28	-	-	-	Yes	Yes
Example 29	-	-	-	Yes	Yes
Example 30	-	-	-	Yes	-
Example 31	-	-	-	Yes	-
Example 32	-	-	-	Yes	-
Comparative Example 6	-	-	-	Yes	-
Example 33	-	-	-	Yes	-
Example 34	-	-	-	Yes	-
Example 35	-	-	-	Yes	-
Comparative Example 7	-	-	-	Yes	-
Example 36	-	-	-	Yes	-
Example 37	-	-	-	Yes	-
Comparative Example 8	-	-	-	Yes	-
Example 38	-	-	-	Yes	-
Comparative Example 9	-	-	-	-	Yes

[0126]

The solid paste compositions for heat cooking Examples 13 to 37 and Comparative Examples 4 to 7 were subjected to the analysis and the sensory evaluation as explained in Section I above, the results of which are shown in Tables 4-1 to 4-4 below.

[0127]

[Table 4-2]

	Raw materials	Measurements of Composition				
	Pulverized pulse	Insoluble dietary fiber (% by mass)	d_{90} after amylase/protease treatment and ultrasonication (μm)	Pulverized pulse	Insoluble dietary fiber (% by mass)	Protein (% by mass)
Comparative Example 5	Dried chick peas 100%	16	7	35	100	16
Example 28		16	7	35	100	16
Example 29		16	7	35	100	16
Example 30	Dried kidney beans 100%	19	9	35	100	22
Example 31		19	9	35	100	22
Example 32		19	9	35	100	22
Comparative Example 6	Dried lentils 100%	17	4	40	100	23
Example 33		17	4	40	100	23
Example 34		17	4	40	100	23
Example 35		17	4	40	100	23
Comparative Example 7	Dried scarlet runner beans 100%	27	21	29	100	14
Example 36		27	21	29	100	14
Example 37		27	21	29	100	14
Comparative Example 8	Yellow peas (seed coat removed) 100%	6	19	60	100	15
Example 38		6	15	60	100	15
Comparative Example 9		6	594	60	100	15

[Table 4-4]

	Measurements of Composition			Elution of insoluble components	
	Total fat and oil (% by mass)	Salt equivalent (% by mass)	Water content (% by mass)	Total fat and oil (% by mass)	Salt equivalent (% by mass)
Comparative Example 5	5	0	6	Turbidity observed	25.8
Example 28	5	0	6	–	4.5
Example 29	5	0	6	–	8.0
Example 30	2	0	7	Slight turbidity observed	21.9
Example 31	2	0	7	–	9.7
Example 32	2	0	7	–	5.7
Comparative Example 6	2	0	8	Turbidity observed	85.4
Example 33	2	0	8	–	13.2
Example 34	2	0	8	–	10.5
Example 35	2	0	8	–	4.5
Comparative Example 7	2	0	9	Turbidity observed	25.6
Example 36	2	0	9	–	8.5
Example 37	2	0	9	–	4.8
Comparative Example 8	3	0	5	Turbidity observed	38.0
Example 38	3	0	5	–	1.6
Comparative Example 9	3	0	5	Turbidity observed	27.0

s [Table 4-6]

	Sensory evaluation			Elution of soluble components		Sensory evaluation
	Adhesivity		Evaluation by eating	Appearance	Difference in absorbance	Decrease in elasticity after storage
Comparative Example 5	2	Easy to break during evaluation	3	−	0.04	5
Example 28	5		5	−	0.24	5
Example 29	5		4	Slight elution observed	0.30	4
Example 30	4		4	−	0.01	4
Example 31	5		4	−	0.01	5
Example 32	5		5	−	0.03	5
Comparative Example 6	1	Easy to break during evaluation	1	−	0.03	5
Example 33	5		4	−	0.03	5
Example 34	5		4	Slight elution observed	0.34	4
Example 35	5		4	Elution observed	0.60	1
Comparative Example 7	2	Easy to break during evaluation	3	−	0.02	5
Example 36	5		5	−	0.02	5
Example 37	5		5	−	0.04	5
Comparative Example 8	1	Easy to break during evaluation	1	Slight elution observed	0.35	3
Example 38	5		5	−	0.01	5
Comparative Example 9	2	Easy to break during evaluation	3	−	0.35	3

[0128]

It can be deduced from Tables 2-1 and 2-2 and Tables 4-1 to 4-4 that a solid paste composition for heat cooking being less prone to become adhesive and maintaining its smoothness over time can be obtained by controlling each of the insoluble dietary fiber, starch, and protein contents to a specific value or higher, and by controlling the degree of

CLAIMS

[Claim 1]

A solid paste composition for heat cooking comprising pulse, wherein:

(1) the composition has an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher;

(2) the composition has a starch content on a dry mass basis of 10 % by mass or higher;

(3) the composition has a protein content on a dry mass basis of 4 % by mass or higher; and

(4) when of the composition is isothermally treated in a 40-fold volume of water at 90 °C for 5 minutes, the resultant water has a haze value of 25 % or lower.

[Claim 2]

The composition as defined in claim 1, wherein:

(5) when the composition is treated in a 10-fold volume of iodine solution (0.25 mM) for 5 minutes at 20 °C and then filtered through a 0.20 μm filter to obtain a filtrate, the difference between the absorbance (500 nm) of the filtrate and the absorbance (500 nm) of iodine solution (0.25 mM) is 0.35 or lower.

[Claim 3]

The composition as defined in claim 1 or 2, wherein:

(6) the composition has a total oil and fat content on a dry mass basis of lower than 17 % by mass.

[Claim 4]

The composition as defined in any one of claims 1 to 3, wherein:

(7) the composition has a moisture content on a dry mass basis of 50 % by mass or lower.

[Claim 5]

The composition as defined in any one of claims 1 to 4, wherein:

the composition does not contain native gluten.

[Claim 6]

The composition as defined in any one of claims 1 to 5, wherein:

when the composition is subjected to Treatment A below and then to ultrasonication, the resultant composition has a particle size distribution represented by a d_{90} value of 1000 μm or smaller.

[Treatment A] A suspension of 6 % by mass of the composition in water is treated with 0.4 % by volume of protease and 0.02 % by mass of α-amylase at 20 °C for 3 days.

[Claim 7]

The composition as defined in any one of claims 1 to 6, wherein:

the composition has a ratio of a pulse-derived starch content to a total starch content in the composition of 10 % by mass or higher on a dry mass basis.

[Claim 8]

The composition as defined in any one of claims 1 to 7, wherein:

the pulse comprises one or more species of pulse selected from Pisum, Phaseolus, Cajanus, Vigna, Vicia, Cicer, and Lens species.

[Claim 9]

A crushed composition prepared by crushing a composition as defined in any one of claims 1 to 8.

[Claim 10]

A crushed composition agglomerate prepared by agglomerating a crushed composition as defined in claim 9.

[Claim 11]

A method of producing a solid paste composition for heat cooking containing pulse, comprising the steps of:

(i) preparing a paste dough composition containing pulverized pulse so as to have an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher, a starch content on a dry mass basis of 10 % by mass or higher, and a protein content on a dry mass basis of 4 % by mass or higher;

(ii) kneading the composition from step (i) at a temperature of within a range of from 100 °C to 200 °C and under a condition with a specific mechanical energy (SME) of 350 kJ/kg or higher; and

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

[Claim 12]

The method as defined in claim 11, further comprising, after step (iii), the step of:

(iv) subjecting the composition from step (iii) to a moist treatment in an environment where the relative humidity (RH%) of the atmosphere is over 50 RH%.

[Claim 13]

The method as defined in claim 12, wherein:

the moist treatment in step (iv) is carried out under a condition which satisfies

Formula 1 below:

$$A \times T \geqq 40 \quad \text{(Formula 1)}$$

where A represents a relative humidity (RH%) of the atmosphere, and T represents the treating time of the moist treatment (hr), provided that A > 50RH%.

[Claim 14]

The method as defined in any one of claims 11 to 13, wherein:

step (ii) and/or step (iii) is carried out under a pressurized condition.

[Claim 15]

The method as defined in claim 14, wherein:

the pressurized condition is a condition where a pressure of 0.1 MPa or higher is applied.

[Claim 16]

The method as defined in any one of claims 11 to 15, wherein:

when the pulverized pulse used in step (i) is subjected to Treatment A below and then to ultrasonication, the resultant composition has a particle size distribution represented by a d_{90} value of 1000 μm or smaller.

[Treatment A] A suspension of 6 % by mass of the pulverized pulse in water is treated with 0.4 % by volume of protease and 0.02 % by mass of α-amylase at 20 °C for 3 days.

[Claim 17]

The method as defined in any one of claims 11 to 16, wherein:

step (ii) and/or step (iii) are/is carried out using an extruder.

[Claim 18]

The method as defined in claim 17, wherein:

the extruder is a uniaxial extruder or a biaxial extruder.

[Claim 19]

The method as defined in claim 17 or 18, wherein:

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

[Claim 20]

The method as defined in any one of claims 11 to 19, wherein:

the kneading time in step (ii) is within a range of from 0.1 to 60 minutes.

[Claim 21]

The method as defined in any one of claims 11 to 20, wherein:
the cooling temperature in step (iii) is 95 °C or lower.

[Claim 22]
The method as defined in any one of claims 11 to 21, wherein:
the method further comprises, after step (iii), the step of:
(v) crushing the composition to produce a crushed composition step.

[Claim 23]
The method as defined in claim 22, wherein:
the method further comprises, after step (v), the step of:
(vi) agglomerating the crushed composition to produce a crushed composition agglomerate.

[Claim 24]
A method of improving a quality of a solid paste composition for heat cooking containing pulse, comprising the steps of:
(i) preparing a paste dough composition containing pulverized pulse so as to have an insoluble dietary fiber content on a dry mass basis of 3 % by mass or higher, a starch content on a dry mass basis of 10 % by mass or higher, and a protein content on a dry mass basis of 4 % by mass or higher;
(ii) kneading the composition from step (i) at a temperature of within a range of from 100 °C to 200 °C and under a condition with a specific mechanical energy (SME) of 350 kJ/kg or higher; and
(iii) cooling the composition from step (ii) to a temperature at which the composition does not swell.

[Claim 25]
The method as defined in claim 24, further comprising, after step (iii), the step of:
(iv) subjecting the composition from step (iii) to a moist treatment in an environment where the relative humidity (RH%) of the atmosphere is over 50 RH%.

[Claim 26]
The method as defined in claim 25, wherein:
the moist treatment in step (iv) is carried out under a condition which satisfies Formula 1 below:

$$A \times T \geqq 40 \quad \text{(Formula 1)}$$

where A represents a relative humidity (RH%) of the atmosphere, and T represents the treating time of the moist treatment (hr), provided that A > 50RH%.

[Claim 27]

The method as defined in any one of claims 24 to 26, wherein:

step (ii) and/or step (iii) is carried out under a pressurized condition.

[Claim 28]

The method as defined in claim 27, wherein:

the pressurized condition is a condition where a pressure of 0.1 MPa or higher is applied.

[Claim 29]

The method as defined in any one of claims 24 to 28, wherein:

when the pulverized pulse used in step (i) is subjected to Treatment A below and then to ultrasonication, the resultant composition has a particle size distribution represented by a d_{90} value of 1000 μm or smaller.

[Treatment A] A suspension of 6 % by mass of the pulverized pulse in water is treated with 0.4 % by volume of protease and 0.02 % by mass of α-amylase at 20 °C for 3 days.

[Claim 30]

The method as defined in any one of claims 24 to 29, wherein:

step (ii) and/or step (iii) are/is carried out using an extruder.

[Claim 31]

The method as defined in claim 30, wherein:

the extruder is a uniaxial extruder or a biaxial extruder.

[Claim 32]

The method as defined in claim 30 or 31, wherein:

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

[Claim 33]

The method as defined in any one of claims 24 to 32, wherein:

the kneading time in step (ii) is within a range of from 0.1 to 60 minutes.

[Claim 34]

The method as defined in any one of claims 24 to 33, wherein:

the cooling temperature in step (iii) is 95 °C or lower.

[Claim 35]

The method as defined in any one of claims 24 to 34, wherein:

the improvement of the quality comprises suppressing adhesivity of the composition and/or a decline in elasticity of the composition after heat cooking.