

DESCRIPTION

Title of Invention: SHRIMP SUBSTITUTE FOOD

Technical Field

5 [0001]

The present invention relates to a shrimp substitute food product.

Background Art

10 [0002]

Shrimp is popular for its unique, firm-but-tender texture (*puri puri* texture in Japanese), and is widely eaten in Japan.

Japan imports a vast quantity of farmed shrimp from Southeast Asia to meet its demand. However, the recent rapid increase in demand for shrimp has driven the price up.

[0003]

Konjac is popular for its unique texture and is widely eaten in Japan. There are patent applications for novel food materials using konjac, for example, Patent Literature 1 and 2. There are also patent applications for use of konjac in fishery products, for example, Patent Literature 3.

Additionally, Patent Literature 4, for example, relates to a method for producing a shrimp- or crab-flavored *kamaboko*-like food product (fish cake) using konjac.

Citation List

Patent Literature

[0004]

30 Patent Literature 1: JPH01-256366A

Patent Literature 2: JPH05-192106A

Patent Literature 3: JP2005-229973A

Patent Literature 4: WO2012/081734 pamphlet

35 Summary of Invention

Technical Problem

[0005]

An object of the present invention is to provide a food product having a shrimp-like texture that can be used as an
5 alternative to shrimp.

Solution to Problem

[0006]

The present inventors conducted extensive research to
10 achieve the object.

Patent Literature 1 discloses that a mixture containing konjac is gelatinized, then frozen, and allowed to thaw. However, regarding what texture the obtained food material has, Patent Literature 1 describes "novel texture," "excellent texture," and
15 the like; and regarding the advantageous effects of the invention, Patent Literature 1 states that the food material is also useful as a material for delicacies.

From these descriptions, however, this patent application was not a useful reference in developing a food
20 product having a shrimp-like texture.

[0007]

Patent Literature 2 discloses a novel konjac obtained by heating konjac paste and starch (starting materials) to gelatinize the mixture, and freezing the heated product.

25 The obtained product is a novel konjac that can be kept in a freezer and that is juicy with a tender texture when chewed, like radish cooked for *oden* (Japanese one-pot dish), *nimono* (Japanese simmered dish), etc., and the flavor of broth penetrates the konjac well. However, the konjac is not at all
30 intended for use as a shrimp substitute food product.

[0008]

Patent Literature 3 discloses as its feature that proteins or saccharides that irreversibly denature when frozen, heated, or dried are injected into the muscles or organs of
35 fishery products (paragraph [0013]).

Specifically, Patent Literature 3 states that tofu and konjac that have denatured when frozen or dried, starch paste that has denatured when frozen, minced fish and egg whites for which a denaturation inhibitor is not used, etc. have been
5 considered to become reduced in quality and called "denaturation" but that these products are useful in this invention.

However, regarding materials to be injected into shrimp, Patent Literature 3 only discloses tofu (claim 11) and minced fish (claim 14), and only tofu appears to be usable in achieving
10 the object of the present invention.
[0009]

Patent Literature 4 relates to a method for producing a shrimp- or crab-flavored *kamaboko*-like food product; however, shrimp *kamaboko* and crab *kamaboko* have textures that are
15 inherently substantially different from each other. From the disclosure of Patent Literature 3, it is only expected that a food product having a *kamaboko*-like texture can be obtained, and it was not a useful reference for completing the present invention.

20 The present inventors conducted further research to achieve the object, and found that a shrimp-like texture is achieved by mixing starch, konjac flour, cellulose, an alkaline agent, and water, heating the mixture, and then freezing the heated product, and that in particular, the use of wheat starch
25 and/or high-amylose cornstarch as the starch provides a more preferable shrimp-like texture. The inventors then completed the invention.

[0010]

Specifically, the present invention relates to the
30 following subject matter.

(1) A method for producing a shrimp substitute food product,
the method comprising
mixing starch, konjac flour, cellulose, an
35 alkaline agent, and water,

heating the mixture, and
freezing the heated product.

(2) The method for producing a shrimp substitute food product
5 according to (1), wherein the starch is wheat starch and/or high-
amylose cornstarch.

(3) The production method according to (1) or (2), wherein the
amount of the starch is 1 to 10 wt%.
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(4) The production method according to any one of (1) to (3),
wherein the amount of the konjac flour is 0.5 to 8 wt%.

(5) The production method according to any one of (1) to (4),
15 wherein the amount of the cellulose is 1 to 7 wt%.

(6) The production method according to any one of (1) to (5),
wherein the amount of the alkaline agent is 0.01 to 0.4 wt%.

20 More specifically, the present invention relates to the
following subject matter.

(7) A method for producing a shrimp substitute food product,
the method comprising
25 mixing 1 to 10 wt% of starch, 0.5 to 8 wt% of
konjac flour, 1 to 7 wt% of cellulose, 0.01 to 0.4 wt% of an
alkaline agent, and water,
heating the mixture, and
freezing the heated product.

30

(8) The method for producing a shrimp substitute food product
according to (7), wherein the starch is wheat starch and/or high-
amylose cornstarch.

35 (9) The method for producing a shrimp substitute food product

according to (7), wherein the amount of the starch is 3 to 7 wt%.

(10) The method for producing a shrimp substitute food product according to (8), wherein the amount of the starch is 3 to 7 wt%.

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(11) The method for producing a shrimp substitute food product according to (7), wherein the amount of the konjac flour is 1.5 to 4 wt%.

10 (12) The method for producing a shrimp substitute food product according to (8), wherein the amount of the konjac flour is 1.5 to 4 wt%.

(13) The method for producing a shrimp substitute food product according to (9), wherein the amount of the konjac flour is 1.5 to 4 wt%.

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(14) The method for producing a shrimp substitute food product according to (10), wherein the amount of the konjac flour is 1.5 to 4 wt%.

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(15) The method for producing a shrimp substitute food product according to (7), wherein the cellulose is a crystalline cellulose preparation.

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(16) The method for producing a shrimp substitute food product according to (8), wherein the cellulose is a crystalline cellulose preparation.

30 (17) The method for producing a shrimp substitute food product according to (14), wherein the cellulose is a crystalline cellulose preparation.

(18) The method for producing a shrimp substitute food product according to (7), wherein the alkaline agent is sodium carbonate.

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(19) The method for producing a shrimp substitute food product according to (8), wherein the alkaline agent is sodium carbonate.

5 (20) The method for producing a shrimp substitute food product according to (14), wherein the alkaline agent is sodium carbonate.

(21) The method for producing a shrimp substitute food product according to (17), wherein the alkaline agent is sodium carbonate.

10

(22) The production method according to (7), wherein the amount of the cellulose is 1.5 to 4 wt%.

(23) The production method according to (8), wherein the amount
15 of the cellulose is 1.5 to 4 wt%.

(24) The production method according to (14), wherein the amount of the cellulose is 1.5 to 4 wt%.

20 (25) The production method according to (17), wherein the amount of the cellulose is 1.5 to 4 wt%.

(26) The production method according to (21), wherein the amount of the cellulose is 1.5 to 4 wt%.

25

Advantageous Effects of Invention

[0011]

The present invention provides an inexpensive food product that can be used as an alternative to shrimp by a simple
30 method.

Description of Embodiments

[0012]

The shrimp substitute food product as used in the
35 present invention refers to a food product that can be used as an

alternative to some or all of the shrimp in food products for which shrimp is used as a starting material. Specifically, the shrimp substitute food product gives a shrimp-like texture when the product alone is eaten. The Examples below describe a more detailed evaluation method.

[0013]

The konjac flour as used in the present invention refers to powdery konjac potato (*arako*) or purified mannan (*seiko*). However, the use of simply powdered konjac potato may result in a strong astringent taste, which may require a boiling step or other like steps. Thus, from the standpoint of flavor and work efficiency, the use of konjac flour purified by alcohol treatment or the like is preferable.

The amount of the konjac flour is preferably 0.5 to 8 wt%, more preferably 1 to 6 wt%, and still more preferably 1.5 to 4 wt%, which is the amount of konjac flour added in the production of the shrimp substitute food product. The use of a suitable amount of konjac flour provides a preferable shrimp-like texture.

[0014]

A feature of the present invention is the use of starch. The use of starch can develop a preferable shrimp-like texture. The starch used is preferably wheat starch and/or high-amylose cornstarch, and more preferably high-amylose cornstarch. High-amylose cornstarch is a cornstarch with a particularly high amylose content ranging from 60 to 80 wt%.

The amount of the starch for use is preferably 1 to 10 wt%, more preferably 2 to 8 wt%, and still more preferably 3 to 7 wt%. The use of a suitable amount of starch provides a preferable shrimp-like texture.

[0015]

The present invention uses cellulose as a starting material. This develops a preferable shrimp-like texture.

The amount of the cellulose is preferably 1 to 7 wt%, more preferably 1 to 5 wt%, and still more preferably 1.5 to 4

wt%. The use of a suitable amount of cellulose develops a preferable shrimp-like texture. Specifically, the cellulose for use is preferably a crystalline cellulose preparation.

[0016]

5 The present invention uses an alkaline agent. The alkaline agent is for gelatinizing mannan derived from konjac flour. Specifically, the alkaline agent includes sodium hydroxide, sodium carbonate, and calcium hydroxide; the alkaline agent is more preferably calcium hydroxide and sodium carbonate, and still
10 more preferably sodium carbonate. The use of an alkaline agent enables mannan to form a gel.

 The amount of the alkaline agent varies depending on the type of the alkaline agent and other components added; when sodium carbonate is used as an alkaline agent, the amount is
15 preferably 0.01 to 0.4 wt%, more preferably 0.05 to 0.3 wt%, and still more preferably 0.08 to 0.2 wt%. The use of a suitable amount of an alkaline agent provides a preferable shrimp-like texture.

[0017]

20 In the present invention, a shrimp flavoring agent can suitably be used. The shrimp flavoring agent refers to a variety of materials having a shrimp flavor; specifically, the agent includes shrimp extracts, shrimp flavorings, and shrimp powder.

 In addition to the starting materials described above,
25 components typically used, such as various flavorings and color additives, can suitably be used to the degree that the effect of the present invention is not hindered.

[0018]

 The following describes the method for producing a
30 shrimp substitute food product according to the present invention.

 For the shrimp substitute food product according to the present invention, starch, konjac flour, cellulose, an alkaline agent, and water are mixed, and heated to form a gel. The heating conditions may be heating by hot water immersion or heating by
35 steaming. When *arako* is used, heating by hot water immersion may

be necessary to remove the astringent taste.

However, a simpler production method to achieve a texture much closer to shrimp is to use *seiko* konjac flour and to heat it by steaming. This more easily provides a food product
5 having a more preferable shrimp-like texture.
[0019]

The food product with a shrimp-like texture according to the present invention can be obtained by freezing the gel resulting from heating and allowing the frozen gel to thaw. The
10 freezing conditions are preferably -3 to -25°C, and more preferably -3 to -18°C. The freezing time period is not particularly limited. However, insufficient freezing may make it less likely to achieve a preferable shrimp-like texture.
[0020]

15 A feature of the shrimp substitute food product obtained by the method according to the present invention is that the product undergoes a freezing step in the production steps as described above, and it is possible to distribute the product in a frozen state. Distributing the product in a frozen state makes
20 it possible to set a longer best-before date. Because only a necessary amount of the product can be thawed, the product provides a high degree of convenience.

The present invention relates to a method for producing a shrimp substitute food product a feature of which is that
25 konjac gel is denatured by freezing, thereby achieving a shrimp-like texture. As described above, the product is often distributed in its frozen state and is generally thawed before it is eaten.

Thus, the production method for producing a shrimp
30 substitute food product according to the present invention is considered to have been complete after the freezing step has been performed.
[0021]

The conditions under which the product after freezing
35 is allowed to thaw are not particularly determined. However,

leaving the product to naturally thaw at 0 to 20°C or allowing the product to thaw under running water at 0 to 20°C is preferable. If the product is thawed at an overly high temperature, the product may denature, and the texture may be affected.

The following Examples describe embodiments of the present invention in more detail.

Examples

[0022]

Study 1: Preparation of Shrimp Substitute Food Product

Samples of formulations shown in Table 1 were prepared in accordance with the method for producing a shrimp substitute food product.

The obtained samples were evaluated by a method for evaluating a shrimp substitute food product. Table 2 shows the results.

[0023]

Table 1: Formulations

	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5	Comparative Example 6	Comparative Example 7
Konjac Flour	2.50	3.00	2.50	3.00	3.00	2.50	2.50
Cellulose Preparation	2.50	5.00	2.50	5.00	5.00	2.50	2.50
Crystalline Cellulose							
Curdlan							
Glutinous Rice Flour	5.00	10.00	5.00	10.00	10.00		
Waxy Starch						5.00	
Cornstarch							5.00
Alkaline Agent	0.06	0.03	0.09	0.02	0.06	0.06	0.06
α Starch							
Shrimp Extract							
Water	89.94	81.97	89.91	81.98	81.94	89.94	89.94
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Production Method: Denaturing by Freezing	Not Performed	Not Performed	Not Performed	Not Performed	Not Performed	Not Performed	Not Performed

(Formulations indicated by wt%)

Table 1 (Continued)

	Comparative Example 8	Comparative Example 9	Comparative Example 10	Comparative Example 11	Comparative Example 12	Comparative Example 13	Comparative Example 14	Comparative Example 15
Konjac Flour	2.50	2.50	2.50	2.50	2.50	2.50		2.50
Cellulose Preparation	2.50	2.50						2.50
Crystalline Cellulose			2.50					
Curdlan							4.00	
Glutinous Rice Flour			5.00	5.00				5.00
Waxy Starch	2.50	8.00				5.00	4.00	
Cornstarch								
Alkaline Agent	0.06	0.06	0.06	0.06	0.06	0.06		0.06
α Starch						2.50		
Shrimp Extract								1.00
Water	92.44	86.94	89.94	92.44	97.44	89.94	92.00	88.94
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Production Method: Denaturing by Freezing	Not Performed	Not Performed	Not Performed	Not Performed	Performed	Not Performed	Performed	Not Performed

(Formulations indicated by wt%)

For konjac flour, Rheolex RS produced by Shimizu Chemical Corporation was used.

- 5 For curdlan, Curdlan produced by Kirin Kyowa Foods Company, Limited, was used.

For glutinous rice powder, Riz Farine Légerère produced by GunmaSeifun Co., Ltd., was used. Its starch content was 80 wt%.

- 10 For waxy starch, Waxy Starch Y produced by Sanwa Starch Co., Ltd., was used.

For the cellulose preparation, Cellulose Neo C-91 produced by Kirin Kyowa Foods Company, Limited, was used.

For the crystalline cellulose, KC Flock produced by Nippon Paper Chemicals Co., Ltd., was used.

- 15 For α starch, Matsunorin XA80M produced by Matsutani Chemical Industry Co., Ltd., was used. Its amylopectin content was 75 wt%.
For the alkaline agent, calcium hydroxide was used.

For the shrimp extract, Shrimp Extract N produced by Fuji Foods Corporation was used.

- 20 [0024]

Method for Producing a Shrimp Substitute Food Product (50 g Scale)

1. All the starting materials except for the alkaline agent were mixed with a cutter mixer for 10 seconds.
25 2. The alkaline agent was added.

Table 2 (Continued)

	Comparative Example 8	Comparative Example 9	Comparative Example 10	Comparative Example 11	Comparative Example 12	Comparative Example 13	Comparative Example 14	Comparative Example 15
Texture Evaluation	2	2	2	2	1	2	1	2
Result	Fail	Fail	Fail	Fail	Fail	Fail	Fail	Fail

[0027]

5 Discussion

When the sample was not denatured by freezing, the shrimp substitute food product according to the present invention was not obtained even with formulation adjustment.

10 In Comparative Example 14, the sample was denatured by freezing, but konjac flour was not included in the formulation; as a result, a shrimp substitute food product according to the present invention was not obtained.

[0028]

Study 2: Preparation 2 of Shrimp Substitute Food Product

15 Samples of formulations shown in Table 3 were prepared in accordance with the method for producing a shrimp substitute food product.

20 The obtained samples were evaluated by the method for evaluating a shrimp substitute food product. Table 4 shows the results.

[0029]

Table 3: Formulations

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Konjac Flour	2.78	2.78	2.78	2.62	2.69	2.62	2.62
Cellulose	2.78	2.78	2.78	2.62	2.69	2.62	2.62
Wheat Starch	5.55						2.62
Cornstarch					2.69		
High-amylose Cornstarch		5.55					
Pea Starch						5.24	
Potato Starch			5.55	5.24			
Oat Fiber				0.94	0.96	0.94	2.25
Alkaline Agent	0.13	0.13	0.13	0.13	0.13	0.13	0.14
Modified Starch	0.99	0.99	0.99	0.94	0.96	0.94	
Water	87.77	87.77	87.77	87.51	89.88	87.51	89.75
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Production Method: Denaturing by Freezing	Performed	Performed	Performed	Performed	Performed	Performed	Performed

(Formulations indicated by wt%)

For konjac flour, Rheolex RS produced by Shimizu Chemical Corporation was used.

- 5 For wheat starch, wheat starch *ukiko* (purified starch) produced by Sanwa Starch Co., Ltd., was used.

For cornstarch, Cornstarch Y produced by J-Oil Mills, Inc., was used.

- 10 For high-amylose cornstarch, High-Amylose Cornstarch (HS-7) produced by J-Oil Mills, Inc., was used.

For pea starch, Starch EH produced by Nippon Starch Chemical Co., Ltd., was used.

For potato starch, Ginrei produced by Nihon Shokuhin Kako Co., Ltd., was used.

- 15 For oat fiber, VITACEL HF200 produced by J. Rettenmaier & Söhne GmbH + Co. KG was used.

For the alkaline agent, sodium carbonate was used.

For the cellulose preparation, Crystalline Cellulose Preparation Neocel C91 produced by MC Food Specialties, Inc., was used.

- 20 For modified starch, Neotrust W-300 produced by J-Oil Mills, Inc., was used.

[0030]

Table 4: Results

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Texture Evaluation	4	5	3	3	3	3	3
Result	Pass	Pass	Pass	Pass	Pass	Pass	Pass

[0031]

5 Discussion

As shown in Table 4, the predetermined formulations and denaturing by freezing resulted in a shrimp substitute food product with an excellent texture. In particular, the use of high-amylose cornstarch or wheat starch for starch resulted in excellent texture, and the use of high-amylose cornstarch led to the most preferable shrimp-like texture.

CLAIMS

1. A method for producing a shrimp substitute food product, the method comprising
5 mixing 1 to 10 wt% of wheat starch and/or high-amylose cornstarch, 1.5 to 8 wt% of konjac flour, 1 to 7 wt% of cellulose, an alkaline agent, and water,
heating the mixture, and
freezing the heated product.

2. The method for producing a shrimp substitute food product according to claim 1, wherein the amount of the alkaline agent is 0.05 to 0.4 wt%.

3. The method for producing a shrimp substitute food product according to claim 1 or 2, wherein the amount of the starch is 3 to 7 wt%.

4. The method for producing a shrimp substitute food product according to any one of claims 1 to 3, wherein the amount of the konjac flour is 1.5 to 4 wt%.

5. The method for producing a shrimp substitute food product according to any one of claims 1 to 4, wherein the cellulose is a crystalline cellulose preparation.

6. The method for producing a shrimp substitute food product according any one of claims 1 to 5, wherein the alkaline agent is sodium carbonate.

7. The production method according to any one of claims 1 to 6, wherein the amount of the cellulose is 1.5 to 4 wt%.