

DESCRIPTION

TITLE OF THE INVENTION

FOOD PRODUCT FOR INDIVIDUALS WITH DIFFICULTY IN CHEWING
WHICH IS TOLERANT TO REFRIGERATION AND FREEZING AND WHICH
CAN BE COOKED

Technical Field

[0001]

The present invention relates to a food product for an individual with difficulty in chewing. In particular, it relates to a gel-form food product for an individual with difficulty in chewing, which is tolerant to refrigeration and freezing, which can be cooked, and with which syneresis is prevented.

Background Art

[0002]

As foods for use in medical and nursing care are known food products for an individual with difficulty in chewing. These foods are characteristic in that they can be easily mashed in the oral cavity, they are not too hard, and they can be easily swallowed. Individuals who eat such food products are mostly elderly people who have in many cases a reduced swallowing capability due to aging, pre-existing diseases and symptoms resulting therefrom. Those who have a decreased swallowing capability are at high risk of aspiration, and if water separates from a food product, the risk of aspiration becomes higher at the time of

swallowing. It is therefore necessary to prevent the syneresis of such food products.

[0003]

Food products for an individual with difficulty in chewing have hitherto been prepared upon each meal at hospitals, nursing-care facilities or the like where nursing care is provided for. In recent years, however, hospitals/facilities have come to purchase convenient pre-cooked food products for an individual with difficulty in chewing, because of such reasons as the number of individuals to be cared is small and it is desired to make the time for cooking shorter. Pre-cooked food products for an individual with difficulty in chewing are often delivered in a refrigerated or frozen state. They suffer from the problem that water separates therefrom, in particular, after thawing when delivered frozen. They are also required to be tolerant to heat since they are heated before being served.

[0004]

Heretofore, curdlan has been used to impart to foods with tolerance to heat. There is known a solid-form, cooked food product which contains curdlan and starch as binders and which is free from aging and gelatinization even when refrigerated after being heated (see patent document 1).

[0005]

With regard to syneresis of food products, there is also known that it can be reduced by using a thickening agent such as raw starch and dextrin, together with curdlan (see patent documents 2 and 3). In addition,

there have been proposed viscous food products containing curdlan, pre-gelatinized starch and the like (see patent document 4). However, curdlan is poor in its dispersibility upon dissolution, and hence it is difficult to disperse it uniformly. There exists a problem in this respect (see non-patent document 1).

Prior Art Documents

Patent Documents

[0006]

Patent document 1: Japanese Unexamined Patent Application Publication No. 02-261364

Patent document 2: Japanese Unexamined Patent Application Publication No. 2003-259820

Patent document 3: Japanese Unexamined Patent Application Publication No. 02-411

Patent document 4: Japanese Unexamined Patent Application Publication No. 05-308913

Non-Patent Documents

[0007]

Non-patent document 1: "Shokuhin Tatorui Nyuka, Zonen, Geruka no Chishiki ("Knowledge on Emulsification, Thickening and Gelatinization"), (Saiwaishobo, 2001) pp.168-175

Summary of the Invention

Problem to be solved by the Invention

[0008]

It is an object of the present invention to provide a food product for an individual with difficulty in chewing, having refrigeration tolerance and freezing tolerance, which can be cooked with heat, and with which syneresis is prevented.

Means to Solve the Problem

[0009]

As a result of intensive studies for solving the above problems, the present inventors have found that the problems can be solved through blending, in combination with curdlan, of a modified starch subjected to a specific treatment, and have completed the present invention. More specifically, it has been found that optimal properties as a food product for an individual with difficulty in chewing can be obtained by using curdlan together with a modified starch, and by specifying the amount to be blended, thus rendering the dispersion of curdlan easier and making it possible to effectively incorporate curdlan. It has been confirmed that the thus obtained food product for an individual with difficulty in chewing can be advantageous in that it can be thermally defrosted after being preserved in frozen state since it is tolerant to heat owing to curdlan, and that syneresis, or oozing of water from the interior of the food product, can be prevented owing to a modified starch.

[0010]

Thus, the present invention is as follows.

(1) A food product for an individual with difficulty in chewing, comprising a curdlan, a modified starch and a

food paste-containing food raw material for an individual with difficulty in chewing.

(2) The food product for an individual with difficulty in chewing according to (1), wherein the modified starch is a cross-linked starch.

(3) The food product for an individual with difficulty in chewing according to (2), wherein the cross-linked starch is one or more cross-linked starches selected from the group consisting of hydroxypropyl distarch phosphate and acetylated distarch phosphate.

(4) The food product for an individual with difficulty in chewing according to any one of (1) to (3), wherein an amount to be blended of the modified starch is 2.0 to 6.0% by mass.

(5) The food product for an individual with difficulty in chewing according to any one of (1) to (4), wherein an amount to be blended of the curdlan is 1.5 to 5.0% by mass.

(6) The food product for an individual with difficulty in chewing according to any one of (1) to (5), wherein a hardness of the product at 20°C is 3,000 to 20,000 N/m².

(7) The food product for an individual with difficulty in chewing according to any one of (1) to (6), wherein the curdlan and the modified starch are contained at a ratio of from 1:0.4 to 1:2.

(8) A method for producing a food product for an individual with difficulty in chewing, comprising mixing and heating a curdlan, a modified starch and a food paste-containing food raw material for an individual with difficulty in chewing, followed by the heating to a temperature of 80°C or higher.

(9) A syneresis-preventing agent for use in a food product for an individual with difficulty in chewing, comprising a curdlan and a modified starch.

(10) The syneresis-preventing agent for a food product for an individual with difficulty in chewing according to (9), wherein the modified starch is a cross-linked starch.

(11) The syneresis-preventing agent for a food product for an individual with difficulty in chewing according to (10), wherein the modified starch is one or more cross-linked starches selected from the group consisting of hydroxypropyl distarch phosphate and acetylated distarch phosphate.

[0011]

As other embodiments of the invention of (9) above, which relates to a syneresis-preventing agent for use in a food product for an individual with difficulty in chewing and which comprises a curdlan and a modified starch, mention may be made of use of curdlan and modified starch in the production of a syneresis-preventing agent for food products for an individual with difficulty in chewing; a curdlan and a modified starch for use in the production of a syneresis-preventing agent for a food product for an individual with difficulty in chewing; and a method for preventing syneresis of a food product for an individual with difficulty in chewing, which method comprises mixing a curdlan and a modified starch with a food paste-containing food raw material for an individual with difficulty in chewing.

Effect of the Invention

[0012]

The present invention makes it possible to provide a food product for an individual with difficulty in chewing, which is tolerant to refrigeration and freezing, and has heat tolerance, which can be cooked with heat, and with which syneresis is prevented.

Mode of Carrying Out the Invention

[0013]

The term curdlan in the present invention is a generic term for thermally coagulable polysaccharides mainly composed of β -1,3-glucoside bonds. Such curdlan is produced by microorganisms of the genus *Alcaligenes* or *Acrobacterium*. Commercially available products can be suitably used. The amount of curdlan to be blended therein is 1 to 6% by mass, preferably 1.5 to 5.0% by mass based on the food product for an individual with difficulty in chewing. An amount of 1.5 to 3.5% by mass can be more preferable with regard, in particular, to hardness.

[0014]

The modified starch in the present invention is a starch prepared by chemically modifying a starch from potato, corn, tapioca or the like. As specific examples of modified starches, mention may be made of starch acetate, oxidized starch, hydroxypropyl starch, hydroxypropyl distarch phosphate, distarch phosphate, starch phosphate, phosphated distarch phosphate, acetylated distarch phosphate, acetylated distarch adipate, acetylated oxidized-cross-linked starch, starch sodium octenyl succinate, and the like. A cross-linked starch prepared

by treating a raw starch preferably with a crosslinking agent can be suited and preferred for use in the food product for an individual with difficulty in chewing. A cross-linked starch having substituents subjected to such treatment as esterification or etherification can be more suited and preferred. To be specific, the use of hydroxypropyl distarch phosphate, acetylated distarch phosphate, etc. can be particularly preferred. The amount of modified starch to be blended is 1 to 10% by mass, preferably 2 to 6% by mass, based on the food product for an individual with difficulty in chewing.

[0015]

The above-mentioned food paste is a pasty food processed into a soft and palatable state by micronizing vegetables, fruits, seafood, meat, eggs, dairy products, or processed products thereof, either raw or after heating, by means of a hitherto known method, such as crushing, grinding, pureeing or the like, so that there are no large chunks.

[0016]

In order to improve its taste, texture, shelf life, etc., the food product for an individual with difficulty in chewing of the present invention may contain such ingredients as seasonings, spices and sweeteners; thickening polysaccharides and dextrin; oils and fats; food additives; and the like, to the extent that the effect of the present invention is not impaired. That is to say, the food raw material for an individual with difficulty in chewing may contain, in addition to a food paste, such ingredients as animal/vegetable oils and fats;

thickening polysaccharides other than curdlan and a modified starch; water-soluble dietary fiber; saccharides, such as starch syrup and dextrin; preservatives; spices; coloring agents; or the like. Thus, it can be said that the present invention relates to a food product for an individual with difficulty in chewing which comprises curdlan, a modified starch and a food paste, or to a food product for an individual with difficulty in chewing which comprises curdlan, a modified starch, a food paste, and one or more members selected from the group consisting of animal/vegetable oils and fats; saccharides other than curdlan and modified starch; preservatives; spices; coloring agents; or the like. As examples of the above-described animal/vegetable oils and fats, mention may be made of vegetable oils, e.g., olive oil, palm oil, palm kernel oil, rape seed oil, coconut oil, peanut oil, safflower oil, sunflower oil, cottonseed oil, corn oil, sesame oil, soybean oil and rice oil, and vegetable fats, e.g., cacao butter and the like, as well as animal oils and fats such as beef tallow, lard, fish oil, whale oil, milk fat and the like. As examples of preservatives, mention may be made of organic acids having bacteriostatic activities and salts thereof; amino acids such as glycine and the like; proteins such as lysozyme, protamine and the like; and antioxidants such as L-ascorbic acid, tocopherol and the like.

[0017]

Upon production of the food product for an individual with difficulty in chewing, the curdlan and the modified starch are mixed with a food paste-containing

food raw material for an individual with difficulty in chewing. In the case, however, where the amount to be blended of curdlan and the modified starch increases excessively, there may be resulted a food product which is too hard for an individual with difficulty in chewing. In addition, when the amount to be blended of curdlan is decreased, sufficiently high tolerance to heating may not be attained. When the amount to be blended of the modified starch is decreased, there may be resulted syneresis of the resultant food product. And, the dispersibility of curdlan may be deteriorated.

[0018]

The food product for an individual with difficulty in chewing of the present invention may have a hardness at 20°C of 50,000 N/m² or less, preferably 30,000 N/m² or less, more preferably 20,000 N/m² or less. A hardness of 3,000 N/m² or above is preferred. The hardness of the food product for an individual with difficulty in chewing is herein shown based on the results of measurement obtained by using an equipment, e.g., a texture analyzer or a creep meter which is capable of measuring the compressive stress of a material by a cylindrical plunger having a diameter of 20 mm at a speed of 10 mm/sec.

[0019]

The food product for an individual with difficulty in chewing of the present invention may be produced by; mixing, in a suitable manner, a food paste-containing food raw material for an individual with difficulty in chewing, which food raw material is desired to be used as a base for the food product, together with curdlan, a modified

starch and water; and filling the resultant mixture into a food cup or a food shaping mold; followed by heating thereof to a temperature of 80°C or higher. The gelling of curdlan takes place by the heating of the raw materials filled in the food cup or food shaping mold to 80°C or higher, thereby making it possible to obtain a gel-like food product for an individual with difficulty in chewing in which the food paste is solidified. The thus obtained food product can be refrigerated or frozen. Further, the food products can be cooked since they are also tolerant to heat.

[0020]

The extent of syneresis of the food product for an individual with difficulty in chewing can be detected as follows. The food product is heated and shaped in a food cup or food shaping mold and then refrigerated or frozen as it is. Thereafter, the food product is allowed to return to ambient temperature, and placed onto a plate, etc. If syneresis takes place, water separated from the food product spreads on the plate.

[0021]

The syneresis-preventing agent of the present invention which contains curdlan and a modified starch can be used in a food paste-containing food raw material for an individual with difficulty in chewing. The ratio of curdlan to a modified starch in the syneresis-preventing agent can be 1:0.2 to 1:3, preferably 1:0.4 to 1:2, and more preferably 1:1 to 1:2. It may be possible to attach thereto a written instruction to the effect that the

syneresis-preventing agent is usually for use in a food for an individual with difficulty in chewing.

[0022]

The present invention will be specifically described hereinbelow with reference to examples, but the technical scope of the present invention is not limited by the examples.

[0023]

<EXAMPLES 1 to 15>

There were prepared a food paste, curdlan, a modified starch, water, etc. in accordance with the formulations in Tables 1 and 2. Of these, the food paste, curdlan, modified starch, water, etc. were stirred with a mixer, and food cups were filled with 60 g each of the resulting mixture. Upon stirring with the mixer, the stirring operation was carried out intermittently while maintaining its temperature below 40°C. The cups were heat-sealed with a film and then heated in a steam convection oven at 90°C for 30 minutes to obtain a food product for an individual with difficulty in chewing.

[0024]

With regard to curdlan, there was used a commercially available curdlan marketed by MC Food Specialties Inc. In Examples 1 to 6 and Examples 12 to 15, there was used, as a modified starch, hydroxypropyl distarch phosphate (sedimentation product: 4.0 ml) derived from tapioca. In Examples 7 and 11, there was used acetylated distarch phosphate (sedimentation product: 7.9 ml) derived from tapioca. In Example 8, there was used hydroxypropyl distarch phosphate (sedimentation product:

2.5 ml) derived from corn. In Example 9, there was used hydroxypropyl distarch phosphate (sedimentation product: 9.2 ml) derived from tapioca. In Example 10, there was used starch acetate derived from tapioca.

[0025]

The sedimentation product, which indicates the degree of cross-linking of the cross-linked starch, was measured as follows.

A sample of exactly 150 mg (converted to dry weight) of cross-linked starch is weighed and placed in a test tube. A solution of exactly 15 ml of a reagent solution described hereinbelow is added thereto and shaken so as to disperse it well, and it is heated immediately for 5 minutes by dipping it in a boiling water bath. Thereafter, it is cooled rapidly to room temperature and shaken again to homogenize, and 10 ml of the resulting mixture is placed in a 10 ml of graduated cylinder. After it is allowed to stand at 20 °C for 18 hours, the scale of the precipitate is read, and this value is set as sedimentation product.

A reagent solution is prepared by dissolving, with warming and adjustment, 10% by mass of zinc chloride and 26% by mass of ammonium chloride into 64% by mass of ion-exchanged water. To 10 ml of the resulting solution is added bromophenol blue solution, and titration is carried out with endpoint where its color changes from violet to yellow, and degree of hydrochloric acid (degree of hydrochloric acid = factor of HCl × number of ml required for titration) is determined. The degree of hydrochloric acid is adjusted to 3.9 ± 0.1 by using aqueous ammonia and

hydrochloric acid. After the adjustment, the degree of hydrochloric acid is confirmed once again, and the resulting solution, after being filtered, is used for the test.

[0026]

With regard to food paste, there were used carrot paste in Examples 1 to 10, squash paste in 11, spinach paste in Example 12, cabbage paste in Example 13, chicken paste in Example 14 and salmon paste in Example 15, respectively.

[0027]

In addition, dextrin and/or commercially available home-use salad oil as an ingredient corresponding to oils and fats were used as ingredients in Examples 8 to 15.

[0028]

[Table 1]

	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7
Curdlan (% by mass)	1.5	1.5	3.0	4.0	5.0	5.0	2.0
Modified starch (% by mass)	2.5	2.5	5.0	5.0	4.0	2.0	4.0
Food paste (% by mass)	20.0	40.0	20.0	40.0	40.0	40.0	50.5
Water (% by mass)	76.0	56.0	72.0	51.0	51.0	53.0	43.5
Hardness (N/m ²)	7433	7464	49052	48701	48479	45343	12032
Syneresis	Δ	Δ	○	○	○	○	○
Heat resistance	○	○	○	○	○	○	○
Dispersibility	○	○	○	○	○	○	○

[0029]

[Table 2]

	Example 8	Example 9	Example 10	Example 11	Example 12	Example 13	Example 14	Example 15
Curdlan (% by mass)	2.0	2.0	2.0	1.5	2.0	2.6	2.0	2.0
Modified starch (% by mass)	4.0	4.0	4.0	2.9	4.0	5.1	4.0	4.0
Food paste (% by mass)	50.0	50.0	50.0	50.0	40.0	40.0	20.0	20.0
Dextrin (% by mass)	1.0	1.0	1.0	1.1	1.0	1.3	1.0	1.0
Oils and fats (% by mass)	0	0	0	0	0	0	5.0	5.0
Water (% by mass)	43.0	43.0	43.0	45.7	53.0	51.0	74.0	74.0
Hardness (N/m ²)	11873	19035	16138	14451	8976	12812	25544	11618
Syneresis	○	Δ	Δ	○	○	○	○	○
Heat resistance	○	○	○	○	○	○	○	○
Dispersibility	○	○	○	○	Δ	○	○	○

[0030]

<COMPARATIVE EXAMPLES 1 to 4>

Food products for an individual with difficulty in chewing were prepared in the same manner as in the Examples, except that raw starches not subjected to chemical modification were used. With regard to raw starches, there was used corn starch in Comparative Example 3, and potato starch in Comparative Example 4. Regarding food pastes, there were used carrot in Comparative Examples 1, 3 and 4, and spinach in Comparative Example 2. The formulations are as shown in Table 3.

[0031]

[Table 3]

	Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4
Curdlan (% by mass)	3.0	3.0	2.0	2.0
Modified starch (% by mass)	0	0	0	0
Raw starch (% by mass)	0	0	4.0	4.0
Food paste (% by mass)	40.0	40.0	40.0	40.0
Water (% by mass)	57.0	57.0	54.0	54.0
Hardness (N/m ²)	Upper part 14149 Lower part 19035	26929	26308	24048
Syneresis	×	×	×	×
Heat resistance	○	○	○	○
Dispersibility	×	Δ	○	○

[0032]

<Results>

The food products for an individual with difficulty in chewing prepared in Examples 1 to 15 and Comparative Examples 1 to 4 were evaluated with regard to hardness, syneresis and dispersibility. Results obtained are shown in Tables 1 to 3. Syneresis was checked at the time when a frozen product is returned to ambient temperature, i.e., under the condition where syneresis is most likely to occur. Hardness was measured thereafter. Syneresis was evaluated by placing a frozen product on a plate. It was rated 0 in cases where almost no water spread on the plate, Δ in cases where water was slightly discharged but within an allowable extent, and $\times$ in cases where a large quantity of water spread on the plate. Hardness is shown by values (N/m^2) measured with a cylindrical plunger having a diameter of 20 mm at a speed of 10 mm/sec.

[0033]

In order to confirm tolerance to heat, frozen food products for an individual with difficulty in chewing were heated for 1 minute in a home use microwave oven (set at 600 W), and the products were checked whether or not their shape could be maintained after the heating. The products were rated 0 in cases where the shape of the gel was maintained with no collapsing after the heating, Δ in cases where the shape of the gel collapsed to a certain extent but it remained self-sustaining, and $\times$ in cases where its shape was collapsed.

[0034]

With regard to the dispersibility of curdlan, it was rated ○ in cases where curdlan could be uniformly dispersed with a food paste and the gel maintained its uniformity after the heating, Δ in cases where curdlan could be dispersed uniformly but there was a slight unevenness in the gel after the heating, and × in cases where curdlan did not disperse uniformly and there was observed unevenness in the concentration of curdlan and the gel had areas with different harness.

[0035]

It can be seen from the results shown in Tables 1 to 3 that the food products which comprise curdlan and a modified starch can be dispersed uniformly upon their production, and that the resultant food products can be tolerant to heat and their syneresis can be prevented. In cases, however, where no modified starch is used or where a raw starch is used in place of a modified starch, the dispersion of curdlan may not proceed well, and syneresis is observed in all cases. They are therefore not suited for as a food product for an individual with difficulty in chewing.

Industrial Applicability

[0036]

The food product for an individual with difficulty in chewing of the present invention has industrial applicability in the fields of medical and nursing care.

CLAIMS

1. A food product for an individual with difficulty in chewing, comprising a curdlan, a modified starch and a food paste-containing food raw material for an individual with difficulty in chewing.

2. The food product for an individual with difficulty in chewing according to claim 1, wherein the modified starch is a cross-linked starch.

3. The food product for an individual with difficulty in chewing according to claim 2, wherein the cross-linked starch is one or more cross-linked starches selected from the group consisting of hydroxypropyl distarch phosphate and acetylated distarch phosphate.

4. The food product for an individual with difficulty in chewing according to any one of claims 1 to 3, wherein the modified starch is contained in an amount of 2.0 to 6.0% by mass.

5. The food product for an individual with difficulty in chewing according to any one of claims 1 to 4, wherein the curdlan is contained in an amount of 1.5 to 5.0% by mass.

6. The food product for an individual with difficulty in chewing according to any one of claims 1 to 5, wherein a hardness of the food product at 20°C is 3,000 to 20,000 N/m².

7. The food product for an individual with difficulty in chewing according to any one of claims 1 to 6, wherein the curdlan and the modified starch are contained at a ratio of 1:0.4 to 1:2.

8. A method for producing a food product for an individual with difficulty in chewing, comprising mixing and heating a curdlan, a modified starch and a food paste-containing food raw material for an individual with difficulty in chewing, to a temperature of 80°C or higher.

9. A syneresis-preventing agent for use in a food product for an individual with difficulty in chewing, comprising a curdlan and a modified starch.

10. The syneresis-preventing agent for a food product for an individual with difficulty in chewing according to claim 9, wherein the modified starch is a cross-linked starch.

11. The syneresis-preventing agent for a food product for an individual with difficulty in chewing according to claim 10, wherein the modified starch is one or more cross-linked starches selected from the group consisting of hydroxypropyl distarch phosphate and acetylated distarch phosphate.