

DESCRIPTION

PREDUST AND COMPOSITION FOR BATTER

TECHNICAL FIELD

[0001]

The present invention relates to a predust and a composition for batter of deep-fried foods and deep-fried food-like foods, and more specifically, a predust containing one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches, and a composition for batter containing an acid-treated legume starch.

BACKGROUND ART

[0002]

As a technique of a composition for batter of fried chicken and the like, Patent Document 1 (WO 2020/116299) discloses a batter containing (A) a specific starch powder, (B) one or two selected from the group consisting of oxidized starches and acid-treated starches, and (C) a phosphate cross-linked tapioca starch. By the use of the batter of the invention, deterioration over time of an appearance and a texture of a food obtained by cooking with heat can be suppressed, and a food with preferable fresh feeling for the appearance and the texture of coating can be provided even when the food is heated again after preservation. However, it is neither disclosed nor suggested that the predust containing the acid-treated legume starch or the oxidation-treated legume starch and the batter containing the acid-treated legume starch can reduce stickiness of coating.

[0003]

Patent Document 2 (WO 2015/162972) discloses an enrobing material for fried foods containing one or more selected from the group consisting of acid-treated

acetylated starches and acid-treated hydroxypropylated starches. However, an acid-treated tapioca starch on which only a process of acid treatment is performed is described as comparative example 5 in paragraph 0057, and further, it is neither disclosed nor suggested that the acid-treated legume starch and the oxidation-treated legume starch can reduce the stickiness of the coating.

[0004]

Patent Document 1: WO 2020/116299

Patent Document 2: WO 2015/162972

DISCLOSURE OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005]

As described above, the technique for reducing the stickiness of coating of deep-fried foods and deep-fried food-like foods has not been disclosed.

[0006]

Therefore, the present invention provides a predest and a composition for batter capable of reducing stickiness of coating of a deep-fried food and the like, and a method for reducing the stickiness of coating.

[0007]

Note that the stickiness of coating in the present invention means a sticky feeling with feeling of high moisture between the coating and an ingredient while including one like powder lumps in the coating, and it is different from crispness or easiness to bite.

SOLUTIONS TO THE PROBLEMS

[0008]

The inventors seriously studied to achieve the above-described object, and found that (1) a predest containing one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches, and (2) a composition for batter containing an acid-treated legume starch having an average molecular weight of 15×10^3 or more and 400×10^3 or less was able to reduce the stickiness of coating of a deep-fried food or the like, thus completing the present invention.

[0009]

That is, the present invention is a predest containing one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches.

[0010]

A content of the one or two selected from the group consisting of the acid-treated legume starches and the oxidation-treated legume starches is preferably 10 mass% or more and 100 mass% or less.

[0011]

An average molecular weight of the acid-treated legume starch and/or an average molecular weight of the oxidation-treated legume starch is preferably 15×10^3 or more and 800×10^3 or less.

[0012]

A raw material of the legume starch is preferably one or two or more selected from the group consisting of pea, mung bean, and lentil bean.

[0013]

The present invention is a method for reducing a stickiness of a coating of a

deep-fried food or a deep-fried food-like food, and the method includes a step of coating an outside of an ingredient with the predust.

[0014]

The present invention is a deep-fried food or a deep-fried food-like food that includes the predust.

[0015]

The present invention is a method for manufacturing a deep-fried food or a deep-fried food-like food, and the method includes: a step of coating an outside of an ingredient with the predust; a step of coating the outside of the ingredient that has been coated with the predust with a batter; and a step of cooking the ingredient that has been coated with the batter with heat.

[0016]

The present invention is a composition for batter containing an acid-treated legume starch having an average molecular weight of 15×10^3 or more and 400×10^3 or less.

[0017]

A content of the acid-treated legume starch is preferably 15 mass% or more and 100 mass% or less.

[0018]

A raw material of the legume starch is preferably one or two or more selected from the group consisting of pea, mung bean, and lentil bean.

[0019]

The present invention is a method for reducing a stickiness of a coating of a deep-fried food or a deep-fried food-like food, and the method includes a step of coating an outside of an ingredient with a batter containing the composition for batter.

[0020]

The present invention is a batter containing the composition for batter.

[0021]

The present invention is a batter containing an acid-treated legume starch by 5 mass% or more and 50 mass% or less, and the acid-treated legume starch has an average molecular weight of 15×10^3 or more 400×10^3 or less.

[0022]

The present invention is a deep-fried food or a deep-fried food-like food that includes the batter.

[0023]

The present invention is a method for manufacturing a deep-fried food or a deep-fried food-like food, and the method includes: a step of coating an outside of an ingredient with the batter; and a step of cooking the ingredient that has been coated with the batter with heat.

EFFECTS OF THE INVENTION

[0024]

The present invention can reduce the stickiness of coating of a deep-fried food or the like including a predest that contains one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches. The present invention can reduce the stickiness of coating of a deep-fried food or the like including a composition for batter that contains an acid-treated legume starch having an average molecular weight of 15×10^3 or more and 400×10^3 or less.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0025]

An acid-treated legume starch of the present invention is one obtained by an acid treatment of a legume starch. An oxidation-treated legume starch of the present invention is one obtained by an oxidation treatment of a legume starch. The legume starch is unprocessed starch, and that is, processing, such as acetylation or hydroxypropylation, has not been performed. The legume starch may be processed with oil or fat after the acid treatment or the oxidation treatment (for example, an acid-treated legume starch processed with oil or fat or an oxidation-treated legume starch processed with oil or fat).

[0026]

The acid treatment is usually performed by immersing a raw material starch in an acid aqueous solution containing hydrochloric acid, sulfuric acid, or the like at a gelatinization start temperature or less. The acid of the acid aqueous solution is not specifically limited, but is preferably one or two selected from hydrochloric acid and sulfuric acid. The temperature is preferably 5°C or more and 65°C or less, more preferably 20°C or more and 65°C or less, further preferably 40°C or more and 60°C or less, and further more preferably 50°C or more and 60°C or less. The pH of the acid aqueous solution is preferably 0.1 or more and 3 or less, more preferably 0.15 or more and 2 or less, and further preferably 0.2 or more and 1 or less.

For the immersion period, a period may be appropriately selected depending on the acid concentration, the pH and the temperature of the acid aqueous solution. In the case of the predust of the present invention, the immersion period is preferably 0.5 hours or more and 72 hours or less, more preferably one hour or more and 72 hours or less, further preferably 1.5 hours or more and 48 hours or less, further more preferably 2 hours or more and 40 hours or less, especially preferably 3 hours or more and 30 hours

or less, and most preferably 3 hours or more and 24 hours or less. In the case of the composition for batter of the present invention, the immersion period is preferably more than 2 hours and 72 hours or less, more preferably 2.2 hours or more and 72 hours or less, further preferably 2.2 hours or more and 48 hours or less, further more preferably 2.5 hours or more and 40 hours or less, especially preferably 3 hours or more and 30 hours or less, and most preferably 3 hours or more and 24 hours or less.

After the end of the immersion, neutralization, water cleaning, filtration, and drying are performed, thus obtaining the acid-treated legume starch. From the difference of the ratio of the starch to the aqueous solution, there are a wet acid-treated starch and a dry acid-roasted starch, and both of them can be used in this embodiment.
[0027]

While the viscosity of the acid-treated legume starch is not specifically limited, in the case of the predust of the present invention, the viscosity of a slurry in which a mass concentration (dry matter equivalent) of the acid-treated legume starch is 10 mass% is preferably 0 RVU or more and 100 RVU or less, more preferably 0 RVU or more and 80 RVU or less, further preferably 0 RVU or more and 50 RVU or less, further more preferably 0 RVU or more and 25 RVU or less, especially preferably 0 RVU or more and 15 RVU or less, and most preferably 0 RVU or more and 12 RVU or less. The viscosity of a slurry in which the mass concentration (dry matter equivalent) of the acid-treated legume starch is 15 mass% is preferably 1 RVU or more and 500 RVU or less, more preferably 1 RVU or more and 300 RVU or less, further preferably 4 RVU or more and 200 RVU or less, further more preferably 5 RVU or more and 100 RVU or less, especially preferably 5 RVU or more and 80 RVU or less, and most preferably 6 RVU or more and 60 RVU or less. Furthermore, the viscosity of a slurry in which the mass concentration (dry matter equivalent) of the acid-treated legume starch is 30

mass% is preferably 2 RVU or more and 2000 RVU or less, more preferably 2 RVU or more and 1800 RVU or less, further preferably 5 RVU or more and 1800 RVU or less, further more preferably 10 RVU or more and 1800 RVU or less, especially preferably 15 RVU or more and 1600 RVU or less, and most preferably 20 RVU or more and 1400 RVU or less.

On the other hand, in the case of the composition for batter of the present invention, the viscosity of the slurry in which the mass concentration (dry matter equivalent) of the acid-treated legume starch is 10 mass% is preferably 0 RVU or more and 9.5 RVU or less, more preferably 0 RVU or more and 8 RVU or less, further preferably 0 RVU or more and 6 RVU or less, further more preferably 0 RVU or more and 5 RVU or less, and especially preferably 0 RVU or more and 4 RVU or less. The viscosity of the slurry in which the mass concentration (dry matter equivalent) of the acid-treated legume starch is 15 mass% is preferably 1 RVU or more and 36 RVU or less, more preferably 1 RVU or more and 30 RVU or less, further preferably 4 RVU or more and 30 RVU or less, further more preferably 5 RVU or more and 30 RVU or less, especially preferably 5 RVU or more and 20 RVU or less, and most preferably 6 RVU or more and 15 RVU or less. Furthermore, the viscosity of the slurry in which the mass concentration (dry matter equivalent) of the acid-treated legume starch is 30 mass% is preferably 2 RVU or more and 1100 RVU or less, more preferably 2 RVU or more and 900 RVU or less, further preferably 5 RVU or more and 900 RVU or less, further more preferably 10 RVU or more and 800 RVU or less, especially preferably 15 RVU or more and 600 RVU or less, and most preferably 20 RVU or more and 500 RVU or less.

[0028]

The viscosities described in the present invention are viscosities obtained by a

measuring method described in Examples.

[0029]

When the acid-treated legume starch is used as the predust, the average molecular weight of the acid-treated legume starch is, although not specifically limited, preferably 15×10^3 or more and 800×10^3 or less, more preferably 15×10^3 or more and 500×10^3 or less, further preferably 20×10^3 or more and 400×10^3 or less, further more preferably 25×10^3 or more and 300×10^3 or less, especially preferably 25×10^3 or more and 250×10^3 or less, and most preferably 30×10^3 or more and 200×10^3 or less.

[0030]

When the acid-treated legume starch is used as the composition for batter, the average molecular weight of the acid-treated legume starch is 15×10^3 or more and 400×10^3 or less, preferably 20×10^3 or more and 300×10^3 or less, more preferably 25×10^3 or more and 250×10^3 or less, further preferably 30×10^3 or more and 250×10^3 or less, further more preferably 40×10^3 or more and 250×10^3 or less, and especially preferably 60×10^3 or more and 200×10^3 or less.

[0031]

The average molecular weights described in the present invention are values measured by a method described in Examples.

[0032]

In the oxidation treatment, usually, a raw material starch and sodium hypochlorite are reacted in an alkaline solution. The reaction can be performed under generally known conditions, and specifically, the reaction is performed by dropping sodium hypochlorite having an effective chlorine concentration of about 10% in a raw material starch suspension, which is prepared to have a pH of preferably 8 or more and 11 or less and more preferably the pH of 8 or more and 10 or less and the temperature of

preferably 30°C or more and 60°C or less and more preferably 35°C or more and 55°C or less, for preferably 0.5 hours or more and 24 hours or less, more preferably 2 hours or more and 10 hours or less, and further preferably 2 hours or more and 8 hours or less.
[0033]

The average molecular weight of the oxidation-treated legume starch is, although not specifically limited, preferably 15×10^3 or more and 800×10^3 or less, more preferably 15×10^3 or more and 500×10^3 or less, further preferably 20×10^3 or more and 400×10^3 or less, further more preferably 25×10^3 or more and 300×10^3 or less, especially preferably 25×10^3 or more and 250×10^3 or less, and most preferably 30×10^3 or more and 200×10^3 or less.
[0034]

The viscosity of a slurry in which a mass concentration (dry matter equivalent) of the oxidation-treated legume starch is 10 mass% is, although not specifically limited, preferably 10 RVU or more and 200 RVU or less, more preferably 20 RVU or more and 200 RVU or less, further preferably 20 RVU or more and 150 RVU or less, further more preferably 30 RVU or more and 100 RVU or less, and especially preferably 50 RVU or more and 90 RVU or less.
[0035]

While the raw material of the legume starch is not specifically limited insofar as it is a legume, examples include pea, mung bean, lentil bean (lentil), kidney bean, broad bean, adzuki bean, and black-eyed pea. The legume is preferably one or two or more selected from pea, mung bean, and lentil bean, and is more preferably pea. The amylose content of the legume starch is preferably 28% or more and 55% or less, more preferably 30% or more and 55% or less, further preferably 35% or more and 50% or less, further more preferably 35% or more and 47% or less, and especially preferably

38% or more and 45% or less.

[0036]

The predust of the present invention contains one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches, and preferably contains an acid-treated legume starch. The content of the one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches is preferably 10 mass% or more and 100 mass% or less, more preferably 40 mass% or more and 100 mass% or less, preferably 50 mass% or more and 100 mass% or less, further preferably 55 mass% or more and 100 mass% or less, further more preferably 60 mass% or more and 100 mass% or less, especially preferably 70 mass% or more and 100 mass% or less, and most preferably 75 mass% or more and 100 mass% or less.

[0037]

The composition for batter of the present invention contains an acid-treated legume starch. The content of the acid-treated legume starch is preferably 15 mass% or more and 100 mass% or less, more preferably 15 mass% or more and 92 mass% or less, further preferably 20 mass% or more and 92 mass% or less, further more preferably 22 mass% or more and 90 mass% or less, especially preferably 25 mass% or more and 85 mass% or less, and most preferably 28 mass% or more and 82 mass% or less.

[0038]

The predust is a coating material used together with the batter. For example, the predust is used on an ingredient before coating the ingredient with the batter. Usually, using the predust to an ingredient from which the coating easily peels off allows more effectively suppressing the peeling off of the coating from the ingredient.

[0039]

The batter is a liquid coating material for a deep-fried food and the like, and the batter is directly coated over the ingredient in some cases, or the batter is coated over the ingredient that has been coated with the predust in some cases. The content of the acid-treated legume starch in the batter of the present invention is preferably 5 mass% or more and 50 mass% or less, more preferably 5 mass% or more and 40 mass% or less, further preferably 8 mass% or more and 40 mass% or less, further more preferably 10 mass% or more and 38 mass% or less, especially preferably 10 mass% or more and 35 mass% or less, and most preferably 11 mass% or more and 35 mass% or less.

[0040]

The predust and the batter of the present invention are appropriate for deep-fried foods or deep-fried food-like foods, and are preferably used for deep-fried foods.

[0041]

The deep-fried food of the present invention is not specifically limited. The deep-fried food is usually cooked by frying with a heated oil-and-fat composition. The deep-fried food of the present invention is a food with a coating. Specifically, examples include fried chicken, tempura, fritters, croquettes such as a potato croquette and a cream croquette, pork cutlet, ground meat cutlet, beef cutlet, chicken cutlet, ham cutlet, fried seafoods such as a fried shrimp and a fried squid, and curry bread. One or two or more selected from the fried chicken, the curry bread, the pork cutlet, and the tempura are preferable, and the fried chicken is more preferable.

[0042]

Specific examples of the ingredient of the deep-fried food of the present invention include: meats, such as pork, chicken, and beef, and processed meat products; any seafood including shellfishes, such as shrimp, squid, oyster, and scallop, and fishes

such as horse mackerel, and processed fishery products, such as a fish paste product; and fruit and vegetables, such as vegetables, and bread dough. For the meats, tumbling, injection, or the like may be performed, and preferably, tumbling is performed.

[0043]

The deep-fried food-like food of the present invention is what is called a non-fried food, and specific examples can include foods obtained by being cooked with heat, such as baking in an oven and heating with steam. Specific examples of the ingredient of the deep-fried food-like food of the present invention are same as those described in the deep-fried food.

[0044]

While the deep-fried food or the deep-fried food-like food of the present invention may be in any state of room temperature, refrigerated, and frozen in preservation and distribution after cooking, one or two of refrigerated and frozen are preferable, and frozen is more preferable. Note that a deep-fried food or a deep-fried food-like food finally cooked at a shop of a supermarket or the like or a standard home after the primary cooking is included in the deep-fried food or the deep-fried food-like food of the present invention. The deep-fried food or the deep-fried food-like food of the present invention may be directly eaten after cooking, but may be heated with a microwave oven or the like at the time of eating.

[0045]

A method for manufacturing a deep-fried food or a deep-fried food-like food using the predust of the present invention is a manufacturing method including: a step of coating an outside of an ingredient with the predust of the present invention; a step of coating the outside of the ingredient that has been coated with the predust with a batter,

and a step of cooking the ingredient that has been coated with the batter with heat. However, the coating method and the like are not especially limited, and a method ordinarily performed by those skilled in the art can be employed.

A method of reducing stickiness of a coating of a deep-fried food or a deep-fried food-like food using the predust of the present invention is a method including a step of coating an outside of an ingredient with the predust of the present invention. However, the coating method is not especially limited, and a method ordinarily performed by those skilled in the art can be employed.

[0046]

A method for manufacturing a deep-fried food or a deep-fried food-like food using the batter of the present invention is a manufacturing method including: a step of coating an outside of an ingredient with the batter of the present invention; and a step of cooking the ingredient that has been coated with the batter with heat. However, the coating method and the like are not especially limited, and a method ordinarily performed by those skilled in the art can be employed. The ingredient includes an ingredient that has been coated with the predust.

A method of reducing stickiness of a coating of a deep-fried food or a deep-fried food-like food using the composition for batter of the present invention is a method including a step of coating an outside of an ingredient with a batter containing the composition for batter of the present invention. However, the coating method is not especially limited, and a method ordinarily performed by those skilled in the art can be employed.

[0047]

The predust and the composition for batter of the present invention may contain a component other than the acid-treated legume starch or the oxidation-treated

legume starch of the embodiment of the present invention. Examples of the other component includes: starches other than the acid-treated legume starch or the oxidation-treated legume starch of the embodiment of the present invention, such as a cornstarch and a phosphate cross-linked tapioca starch (preferably containing a phosphate cross-linked tapioca starch); any viscosity modifier including polysaccharide other than above, such as xanthan gum; grain flours, such as flour, rice flour, and cornflour; proteins, such as soy protein, milk protein, egg albumen, and egg yolk; seasonings, such as sweet sake, soy sauce, salt, and spice; fats and oils, such as animal and vegetable fats and oils and powdered fat and oil; emulsifiers, such as lecithin and glycerin fatty acid ester; and swelling agents, such as a baking powder.

[Examples]

[0048]

While the following further specifically describes the present invention with examples, the present invention is not limited these examples. The starch and the like used for tests are as follows.

[0049]

<Legume Starch>

Pea starch (amylose content 41%, manufactured by Puris)

[0050]

<Other Raw Materials>

Acid-treated waxy corn starch (Jelcall [registered trademark] R-100, manufactured by J-OIL MILLS, INC.)

SP-3 (Jelcall [registered trademark] SP-3(oxidized tapioca starch), manufactured by J-OIL MILLS, INC.)

TP-4W (Act Body [registered trademark] TP-4W (phosphate cross-linked

tapioca starch), manufactured by J-OIL MILLS, INC.)

Soft flour (Flour, manufactured by Nisshin Flour Milling Inc.)

NEOTRUST [JP registered trademark] W-600 (manufactured by J-OIL MILLS, INC.)

Cornstarch (manufactured by J-OIL MILLS, INC.)

[0051]

(Acid-Treated Pea Starch Preparation 1)

Hydrochloric Acid of 35 mass% was added to 480 pts.mass of aqueous dispersion of pea starch of 35 mass% by 20 pts.mass (hydrochloric acid concentration 1.4%, pH 0.2). An acid treatment was performed at 53°C for 11 hours while stirring it. After the acid treatment, calcium hydrate was used for neutralization so as to have a pH of 6.5. Then, through water cleaning and drying, an acid-treated pea starch A was obtained.

[0052]

(Acid-Treated Pea Starch Preparation 2)

Hydrochloric acid of 20 mass% was added to 361 pts.mass of aqueous dispersion of pea starch of 40 mass% by 20 pts.mass (hydrochloric acid concentration 1.0%, pH 0.8). An acid treatment was performed at 55°C for 6 hours, 4 hours, and 2 hours while stirring it. After the acid treatment, calcium hydrate was used for neutralization so as to have a pH of 6.5. Then, through water cleaning and drying, acid-treated pea starches B, C, and D were obtained.

[0053]

(Acid-Treated Tapioca Starch Preparation)

Hydrochloric Acid of 15 mass% was added to 114 pts.mass of aqueous dispersion of tapioca starch of 35 mass% by 10 pts.mass (hydrochloric acid

concentration 1.2%, pH 0.3). An acid treatment was performed at 45°C for 8 hours while stirring it. After the acid treatment, sodium hydroxide of 3 mass% was used for neutralization so as to have a pH of 6.5. Then, through water cleaning and drying, an acid-treated tapioca starch was obtained.

[0054]

(Oxidation-Treated Pea Starch Preparation)

A slurry was prepared by adding water to 160 g of a starch, for which a pea starch was used, in a separable flask of 500 mL so that a mass concentration (dry matter equivalent) of starch to a slurry mass becomes 34% (dry starch weight/slurry weight).

After adjusting the temperature of the obtained slurry to 38°C, a sodium hypochlorite aqueous solution was added so as to be 2.0% of the mass concentration (dry matter equivalent) of starch while stirring it at 300 rpm, and a sodium hydroxide aqueous solution of 3 mass% was dropped to obtain the pH of 8.25.

Then, the sodium hydroxide aqueous solution was dropped at an appropriate time to maintain the pH within ± 0.03 of a set value until the end of the reaction, thus obtaining an oxidized starch. The end of the reaction was a time point at which a small amount of the slurry was sampled and dropped to a saturated potassium iodide aqueous solution, and it no longer appears purple (five hours).

After the confirmation of the reaction end, a sodium ascorbate solution of 3 mass% was added to the slurry to neutralize it to a pH of 6, and through water cleaning, dehydration, and then drying, thus an oxidation-treated pea starch was obtained.

[0055]

(Preparation of Acid-Treated Pea Starch A Processed with Oil or Fat)

0.1 pts.mass of a high-linoleic safflower oil (iodine value 150) and 1 part of a defatted soy flour (Nikka Milky [registered trademark] S, manufactured by J-OIL

MILLS, INC.) were mixed in 100 pts.mass of the acid-treated pea starch A at 2000 rpm for three minutes with a mixer (super mixer, manufactured by KAWATA MFG CO., LTD.), thus obtaining a uniform mixture (water content 12.5 mass%). The mixture was heated for 14 days at 70°C by using a tray drier, thus obtaining the acid-treated pea starch A processed with oil or fat.

[0056]

The average molecular weights and the viscosities of the acid-treated starch and oxidation-treated starch prepared as described above, and the starch and the like before the treatment were measured. The results are illustrated in Table 1.

[0057]

(Measuring Method of Average Molecular Weight)

The average molecular weight was measured using HPLC unit manufactured by Tosoh Corporation (pump DP-8020, RI detector RS-8021, degasifier SD-8022).

(1) The sample was pulverized to adjust the size as being equal to or smaller than the 0.15 mm mesh according to JIS-Z8801-1 standard. This sample was suspended in a moving phase so as to achieve 1 mg/mL, and the resultant suspension was heated at 100°C for 3 minutes to be completely dissolved. A filtration was conducted by using a 0.45 µm filtration filter (commercially available from ADVANTEC Co., Ltd., DISMIC-25HP PTFE 0.45 µm), and the resultant filtrate was obtained as an analytical sample.

(2) Molecular weight was measured under the following analytical conditions.

Column: TSK gel α-M (7.8 mm inner diameter, 30 cm) (commercially available from TOSOH CORPORATION), two columns

Flow rate: 0.5 mL/min

Moving phase: 5 mM NaNO₃-containing 90% (v/v) dimethylsulfoxide solution

Column temperature: 40°C

Analytical quantity: 0.2 mL

(3) Detector data were collected by utilizing software (Multistation GPC-8020, Model II, Data acquisition ver. 5.70, commercially available from TOSOH CORPORATION), and an average molecular weight was calculated.

A pullulan (commercially available from Showa Denko Co., Ltd., Shodex Standard P-82), molecular weight of which had been known, was employed for obtaining the calibration curve.

[0058]

(Measuring Method of Starch Viscosity)

(1) A starch whose water content had been measured and water were mixed in a dedicated aluminum container, and a slurry having 10 mass% of a mass concentration (dry matter equivalent) of the starch was prepared thereby. A dedicated puddle was put in the aluminum container, and it was set to a rapid visco analyzer (Rapid Visco Analyzer: RVA: model number RVA-4, manufactured by Perten Instruments).

(2) While the viscosity was measured under stirring at 160 rpm, it was maintained at 40°C for one minute, and then, heated from 40°C to 95°C at a speed of 6 °C/minute.

(3) After maintaining at 95°C for five minutes, it was cooled to 50°C by 6 °C/minute.

(4) A viscosity (RVU) as a maximum viscosity when the heating to 95°C was performed was read, and thus the viscosity was measured.

[0059]

Instead of the slurry having 10 mass% of the mass concentration (dry matter equivalent) of the starch, using slurries having 15 mass% and 30 mass% thereof, the viscosities were measured under the same condition as above.

[0060]

[Table 1]

Starch	Average Molecular Weight ($\times 10^3$)	Viscosity (RVU)		
		10 mass% Slurry	15 mass% Slurry	30 mass% Slurry
Acid-Treated Waxy Corn Starch	296.8	0	7.3	18.9
Acid-Treated Tapioca Starch	982	4.9	14.4	210.2
Pea Starch (Unprocessed)	1909	286.2	1239.1	> 2000
Oxidation-Treated Pea Starch	83.4	78.2	Not Measured	Not Measured
Acid-Treated Pea Starch A	35.3	0	9.4	31.8
Acid-Treated Pea Starch B	85.1	0	9.3	132.8
Acid-Treated Pea Starch C	148	3.6	10.0	408.3
Acid-Treated Pea Starch D	441	10.0	39.7	1267.3

[0061]

[Test Example 1] Evaluation of Acid-Treated Pea Starch and The Like

Fried chicken was manufactured by the following procedure using predust described in Table 2. Three professional panelists ate the obtained fried chicken, and evaluated them according to the following evaluation standards based on consensus. The results are illustrated in Table 2. Note that in Comparative Example 2-1, the predust was not used. For the batter, one having the following composition (batter A) was used.

(Batter A)

NEOTRUST [JP registered trademark] W-600 (20 pts.mass)

TP-4W (30 pts.mass)

SP-3 (20 pts.mass)

Soft flour (30 pts.mass)

Ice-cooled water (160 pts.mass)

[0062]

(Evaluation Standards: Stickiness of Coating)

5: hardly felt, or felt not at all

4: slightly felt

3: felt a little

2: significantly felt

1: strongly felt

[0063]

(Method for Manufacturing Fried Chicken)

1. Chicken thighs were used as the chicken, and cut in about 25 g/piece.
2. The chicken of 1. and a pickle liquid having a composition described later were put in a tumbler (manufactured by VAKONA, ESK-60), and tumbling was performed at 5°C for 90 minutes with a vacuum rate of 80%.
3. The predust was added by 4 mass% relative to the chicken, and the chicken after the tumbling was coated with the predust.
4. The batter was added by 20 mass% relative to the chicken, and battering was performed on the chicken coated with the predust.
5. The chicken after battering was deep fried in a canola oil at 170°C for four minutes.
6. The chicken after deep frying was arranged in a tray, and frozen with the tray at -20°C, and then, the chicken was put in a zipper bag, and kept frozen at -20°C for three days.
7. Four pieces of the fried chicken after 3-day freezing were arranged on a paper tray, and heated to be thawed for two minutes by a microwave oven (600W), and thus the fried chicken was obtained.

[0064]

(Composition of Pickle Liquid)

The pickle liquid was prepared by combining raw materials (combination ratios are indicated in parentheses) as follows.

HITRUST [registered trademark in JP TH] TC-500 (manufactured by J-OIL MILLS, INC.) (10 mass%)

Superfine sugar (4 mass%)

Salt (4 mass%)

Glutamic acid Na (1.4 mass%)

White pepper (0.16 mass%)

Soy sauce (20 mass%)

Ice-cooled water (60.44 mass%)

[0065]

[Table 2]

Predust (mass%)	Comparative Example 2-1	Comparative Example 2-2	Comparative Example 2-3	Comparative Example 2-4	Example 2-1	Example 2-2	Example 2-3	Example 2-4	Example 2-5	Example 2-6
Acid-Treated Waxy Corn Starch		100								
Acid-Treated Tapioca Starch			100							
Pea Starch (Unprocessed)				100						
Acid-Treated Pea Starch A					100					
Acid-Treated Pea Starch B						100				
Acid-Treated Pea Starch C							100			
Acid-Treated Pea Starch D								100		
Oxidation-Treated Pea Starch									100	
Acid-Treated Pea Starch A Processed with Oil or Fat (Evaluation)										100
Coating Stickiness	2	2	2	2	4	4	4	4	4	4

[0066]

As illustrated in Table 2, it was found that the acid-treated pea starches and the oxidation-treated pea starch had the effect of reducing the stickiness of coating of fried chicken. It was also found that the acid-treated pea starch processed with oil or fat also has the effect. On the other hand, in the case of the other acid-treated starches, the stickiness of coating cannot be reduced, and especially surprisingly, the acid-treated waxy corn starch or the acid-treated tapioca starch cannot provide the effect of the present invention even though they were close to the properties of the acid-treated pea starch A and the acid-treated pea starch B in both the average molecular weight and the viscosity. It was also confirmed that the pea starch before the acid treatment did not provide the effect.

Accordingly, it is apparent that the acid-treated starch, such as an acid-treated pea starch, and the oxidation-treated starch, such as an oxidation-treated pea starch, have the operational advantage of reducing the stickiness of coating of a deep-fried

food.

[0067]

[Test Example 2] Evaluation of Combined Amount

The evaluation was performed using predust described in Table 3 by the method same as Test Example 1 excluding that a batter B below was used instead of the batter A. The results are illustrated in Table 3.

(Batter B)

Soft flour (100 pts.mass)

Ice-cooled water (150 pts.mass)

[0068]

[Table 3]

Predust (mass%)	Comparative Example 3-1	Example 3-1	Example 3-2	Example 3-3
Soft Flour	100	40	20	
Acid-Treated Pea Starch C		60	80	100
(Evaluation)				
Coating Stickiness	1	3	4	4

[0069]

As illustrated in Table 3, it was able to be confirmed that the predust containing the acid-treated pea starch by 60 mass% or more and 100 mass% or less had the effect of reducing the stickiness of coating, and it was found that combining the acid-treated pea starch by 80 mass% or more and 100 mass% or less provided the higher effect.

It was also confirmed that the effect of the present invention can be obtained even when the batter composition was different.

[0070]

[Test Example 3] Evaluation with Batter

150 pts.mass of ice-cooled water was mixed with 100 pts.mass of compositions

for batter described in Table 4, and thus batters were prepared. The evaluation was performed by the method same as Test Example 1 excluding that the prepared batters were used instead of the batter A and the predust was not used. The results are illustrated in Table 4.

[0071]

[Table 4]

Composition for Batter (mass%)	Comparative Example 4-1	Example 4-1	Example 4-2	Example 4-3	Comparative Example 4-2	Comparative Example 4-3
Soft Flour	30	30	30	30	30	30
TP-4W	20	20	20	20	20	20
Neo Trust W-600	20	20	20	20	20	20
SP-3 (Oxidized Tapioca Starch)	30					
Acid-Treated Pea Starch A		30				
Acid-Treated Pea Starch B			30			
Acid-Treated Pea Starch C				30		
Acid-Treated Pea Starch D					30	
Oxidation-Treated Pea Starch						30
(Evaluation)						
Coating Stickiness	2	4	5	5	2	2

[0072]

As illustrated in Table 4, it was found that the acid-treated pea starch having the average molecular weight of 35.3×10^3 or more and 148×10^3 or less was able to reduce the stickiness of coating. On the other hand, the oxidation-treated pea starch and the oxidized tapioca starch were low in reduction of the stickiness of coating. Therefore, it was confirmed that a specific treatment of acid treatment was necessary.

Accordingly, it is apparent that the acid-treated starch, such as an acid-treated pea starch, having the average molecular weight of 35.3×10^3 or more and 148×10^3 or less has the operational advantage of reducing the stickiness of coating of a deep-fried food.

[0073]

[Test Example 4] Evaluation of Combined Amount

150 pts.mass of ice-cooled water was mixed with 100 pts.mass of compositions for batter described in Table 5, and thus batters were prepared. The evaluation was

performed using the prepared batters by the method same as Test Example 3. The results are illustrated in Table 5.

[0074]

[Table 5]

Composition for Batter (mass%)	Comparative Example 5-1	Example 5-1	Example 5-2	Example 5-3
Soft Flour	100	80	60	20
Acid-Treated Pea Starch C		20	40	80
(Evaluation)				
Coating Stickiness	2	3	4	4

[0075]

As illustrated in Table 5, the effect of reducing the stickiness of coating was able to be confirmed when the content of the acid-treated pea starch in the composition for batter was 20 mass% or more and 80 mass% or less (the content of the acid-treated pea starch in the batter was 8 mass% or more and 32 mass% or less), and the effect was high at 40 mass% or more and 80 mass% or less (when the content of the acid-treated pea starch in the batter was 16 mass% or more and 32 mass% or less).

[0076]

[Test Example 5] Evaluation 1 with Tempura

Tail-on stretched shrimps (about 13 g/one shrimp) that were thawed were coated with predust described in Table 6 by about 3 pts.mass relative to 100 pts.mass of the shrimps.

The shrimps coated with the predust were put in a batter (liquid obtained by mixing 150 pts.mass of ice-cooled water with 100 pts.mass of soft flour) and deep-fried for 3 minutes in canola oil at 170°C, thereby obtaining shrimp tempuras. After the obtained tempuras were left at room temperature for two hours, three professional panelists ate the obtained tempuras, and evaluated them according to the evaluation

standards same as Test Example 1 based on consensus. The results are illustrated in Table 6.

[0077]

[Table 6]

Predust (mass%)	Comparative Example 6-1	Example 6-1	Example 6-2
Soft Flour	100	60	40
Acid-Treated Pea Starch C		40	60
(Evaluation)			
Coating Stickiness	1	3	3

[0078]

As illustrated in Table 6, it was able to be confirmed that the predust containing the acid-treated pea starch had the effect of reducing the stickiness of coating also in the tempura.

[0079]

[Test Example 6] Evaluation 2 with Tempura

150 pts.mass of ice-cooled water was mixed with 100 pts.mass of compositions for batter described in Table 7, and thus batters were prepared. Tail-on stretched shrimps (about 13 g/one shrimp) that were thawed were coated with the prepared batters, and deep-fried for 3 minutes in canola oil at 170°C, thereby obtaining shrimp tempuras. After the obtained tempuras were left at room temperature for two hours, three professional panelists ate the obtained tempuras, and evaluated them according to the evaluation standards same as Test Example 1 based on consensus. The results are illustrated in Table 7.

[0080]

[Table 7]

Composition for Batter (mass%)	Comparative Example 7-1	Example 7-1	Example 7-2
Soft Flour	100	60	20
Acid-Treated Pea Starch C		40	80
(Evaluation)			
Coating Stickiness	1	4	4

[0081]

As illustrated in Table 7, it was able to be confirmed that the batter containing the acid-treated pea starch had the effect of reducing the stickiness of coating also in the tempura. Specifically, the effect was able to be confirmed when the content of the acid-treated pea starch in the composition for batter was 40 mass% or more and 80 mass% or less (the content of the acid-treated pea starch in the batter was 16 mass% or more and 32 mass% or less).

[0082]

[Test Example 7] Evaluation with Pork Cutlet

90 pts.mass of the acid-treated pea starch A processed with oil or fat, 9.6 pts.mass of cornstarch, and 0.4 pts.mass of a xanthan gum (ECHO GUM F, manufactured by DSP Gokyo Food & Chemical Co., Ltd.) were mixed well, and then, 200 pts.mass of ice-cooled water was added and further mixed, and thus it was used as a batter (the content of the acid-treated pea starch A processed with oil or fat in the batter was 30 mass%).

Frozen pork (about 80 g) was put in the batter, further coated with bread crumbs, and then preserved overnight in a frozen state. Thereafter, the pork was deep-fried for 5 minutes in canola oil at 170°C, thereby obtaining a pork cutlet. By eating the obtained pork cutlet, it was confirmed that the stickiness of coating was hardly felt.

[0083]

[Test Example 8] Evaluation with Curry Bread

Curry breads were manufactured by the following procedure using batters described in Table 8. Six professional panelists ate the obtained curry breads, and evaluated them according to the following evaluation standards based on consensus. The results are illustrated in Table 8. Note that in Comparative Example 8-1, the batter was not used.

[0084]

(Evaluation Standards: Stickiness of Coating)

5: hardly felt, or felt not at all

4: slightly felt

3: felt a little

2: significantly felt

1: strongly felt

[0085]

Method for Manufacturing Curry Bread

1. Dough materials were put into a mixer bowl, and mixing was performed under the conditions of two minutes at a low speed and five minutes at medium speed by a vertical bread mixer (HPi-20M, manufactured by Kanto Kongoki Industrial Co., Ltd.).
2. The dough was taken out of the mixer and was fermented at 27°C for 30 minutes under the condition of the relative humidity of 80%.
3. The dough was divided into 50-g portions, rolled, and after 15 minutes of bench time, formed by rounding.
4. Curry filling (manufactured by SONTON CO., LTD., product name RN "Torotto Amakuchi" onion curry (thick and sweet onion curry)) was stuffed by 30 g for each.
5. The dough of 4 was immersed in the batters described in Table 8.
6. The dough of 5 was coated with raw bread crumbs.

7. The dough coated with the raw bread crumbs was fermented in a proofer at 38°C and a relative humidity of 50% for 30 to 40 minutes.
8. After fermentation, the dough was deep fried in an oil (manufactured by J-OIL MILLS, INC., product name Super Canola Oil) heated to 180°C for two minutes on one side and for one minute 30 seconds on the other side (three minutes 30 seconds in total).
9. After deep frying, the breads were left at room temperature for 5.5 hours, and then the evaluation was performed.

[0086]

(Dough Materials)

The dough materials of the curry bread were prepared by combining raw materials below.

Strong flour (Super Camellia, manufactured by Nisshin Flour Milling Inc.) 850 g

Soft flour (Flour, manufactured by Nisshin Flour Milling Inc.) 150 g

Superfine sugar 50 g

Salt 18 g

Skimmed milk powder (Yotsuba Hokkaido Skimmed Milk Powder, Yotsuba Milk Products Co., Ltd.) 30 g

Shortening (SPLENDOR L, manufactured by J-OIL MILLS, INC.) 60 g

Whole egg 150 g

Bread yeast (saf semi-dry yeast red, manufactured by NICHIFUTSU SHOJI CO.,LTD./Lesaffre Corporation) 18 g

Water 450 g

[0087]

[Table 8]

Batter (mass%)	Comparative Example 8-1	Comparative Example 8-2	Example 8-1
Xanthan Gum [※]		0.15	0.15
Pea Starch (Unprocessed)		10	
Acid-Treated Pea Starch A			10
Water	100	89.85	89.85
(Evaluation)			
Coating Stickiness	2	3	5

※: ECHOGUM F manufactured by DSP Gokyo Food & Chemical Co., Ltd.

[0088]

As illustrated in Table 8, it was able to be confirmed that the batter containing the acid-treated starch, such as an acid-treated pea starch, had the effect of reducing the stickiness of coating also in the curry bread.

[0089]

[Manufacturing Example 1] Manufacture of Predust

700 g of the acid-treated pea starch B and 300 g of the cornstarch were mixed, and thus the predust was obtained.

[0090]

[Manufacturing Example 2] Manufacture 1 of Composition for Batter

500 g of the acid-treated pea starch C, 300 g of the cornstarch, and 200 g of the soft flour were mixed, and thus the composition for batter was obtained.

[0091]

[Manufacturing Example 3] Manufacture 2 of Composition for Batter

300 g of the acid-treated pea starch B, 300 g of the phosphate cross-linked tapioca starch, and 400 g of the soft flour were mixed, and thus the composition for batter was obtained.

[0092]

[Manufacturing Example 4] Manufacture of Batter

300 g of the acid-treated pea starch B was dissolved in 1500 g of ice-cooled water, and then 300 g of the phosphate cross-linked tapioca starch and 400 g of the soft flour were added and sufficiently stirred, thus the batter was obtained.

[0093]

The predust and the composition for batter of the present invention are not limited to the above-described embodiments and examples, and various changes can be made within the scope that does not impair the effects of the invention.

CLAIMS

1. A predest containing one or two selected from the group consisting of acid-treated legume starches and oxidation-treated legume starches.
2. The predest according to claim 1, wherein
a content of the one or two selected from the group consisting of the acid-treated legume starches and the oxidation-treated legume starches is 10 mass% or more and 100 mass% or less.
3. The predest according to claim 1 or 2, wherein
an average molecular weight of the acid-treated legume starch and/or an average molecular weight of the oxidation-treated legume starch is 15×10^3 or more and 800×10^3 or less.
4. The predest according to any one of claims 1 to 3, wherein
a raw material of the legume starch is one or two or more selected from the group consisting of pea, mung bean, and lentil bean.
5. A method for reducing a stickiness of a coating of a deep-fried food or a deep-fried food-like food, comprising
a step of coating an outside of an ingredient with the predest according to any one of claims 1 to 4.
6. A deep-fried food or a deep-fried food-like food, comprising
the predest according to any one of claims 1 to 4.

7. A method for manufacturing a deep-fried food or a deep-fried food-like food, comprising:

a step of coating an outside of an ingredient with the predust according to any one of claims 1 to 4;

a step of coating the outside of the ingredient that has been coated with the predust with a batter; and

a step of cooking the ingredient that has been coated with the batter with heat.

8. A composition for batter containing an acid-treated legume starch having an average molecular weight of 15×10^3 or more and 400×10^3 or less.

9. The composition for batter according to claim 8, wherein

a content of the acid-treated legume starch is 15 mass% or more and 100 mass% or less.

10. The composition for batter according to claim 8 or 9, wherein

a raw material of the legume starch is one or two or more selected from the group consisting of pea, mung bean, and lentil bean.

11. A method for reducing a stickiness of a coating of a deep-fried food or a deep-fried food-like food, comprising

a step of coating an outside of an ingredient with a batter containing the composition for batter according to any one of claims 8 to 10.

12. A batter containing the composition for batter according to any one of claims 8 to 10.
13. A batter containing an acid-treated legume starch by 5 mass% or more and 50 mass% or less, the acid-treated legume starch having an average molecular weight of 15×10^3 or more 400×10^3 or less.
14. A deep-fried food or a deep-fried food-like food, comprising the batter according to claim 12 or 13.
15. A method for manufacturing a deep-fried food or a deep-fried food-like food, comprising:
a step of coating an outside of an ingredient with the batter according to claim 12 or 13; and
a step of cooking the ingredient that has been coated with the batter with heat.