

DESCRIPTION

SHAPE MODIFIER FOR LAYERED PUFFED FOOD

5 TECHNICAL FIELD

[0001] The present invention relates to a shape modifier for a layered puffed food, which can improve the shape of the layered puffed food. The present invention also relates to a plastic oil-and-fat composition for a layered puffed food, dough for a layered puffed food, and a method for producing a layered puffed food, using the shape modifier for a layered
10 puffed food. The invention further relates to a method for improving the shape of a layered puffed food.

BACKGROUND ART

[0002] Layered puffed foods, such as pies, Danish pastries, and croissants, are produced
15 by applying and rolling a plastic oil-and-fat composition into grain flour dough to form a multilayer structure of grain flour dough layers and fat-and-oil layers, and heating the dough. The shape, such as puffing (volume), of a layered puffed food is one of the important factors for the enhancement of the product value of the layered puffed food, because it not only imparts an excellent appearance but also can affect the crispy texture and meltability in
20 mouth.

Various roll-in plastic oil-and-fat compositions are known (e.g., Patent literature 1 to 4, etc.). Among these, Patent literature 1 describes that an oil-and-fat composition containing two kinds of transesterified oil-and-fat and liquid oil-and-fat with different melting points and solid fat contents has excellent extensibility at a low temperature and can
25 provide a layered puffed food with favorable volume.

CITATION LIST

Patent Literature

[0003] Patent Literature 1: Japanese Unexamined Patent Application Publication No.
30 2019-170231

Patent literature 2: Japanese Unexamined Patent Application Publication No. 2019-122304

Patent literature 3: Japanese Unexamined Patent Application Publication No. 2019-193610

SUMMARY OF INVENTION

5 Technical Problem

[0004] It is desirable to further enhance the product value of a layered puffed food by ensuring that the shape, such as puffing, of the layered puffed food is favorable.

Solution to Problem

10 [0005] The present inventors found that a phytosterol fatty acid ester is effective in improving the shape of a layered puffed food, thereby accomplishing the present invention.

[0006] Thus, the present invention is as follows.

[1] A shape modifier for a layered puffed food comprising a phytosterol fatty acid ester.

[2] The shape modifier for a layered puffed food according to [1] above, wherein the phytosterol of the phytosterol fatty acid ester is derived from a soybean.

15 [3] The shape modifier for a layered puffed food according to either one of [1] and [2] above, wherein the iodine value of the fatty acid of the phytosterol fatty acid ester is 0 or more and 150 or less.

[4] A method for producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat, the method comprising:

20 a step of adding a phytosterol fatty acid ester to the edible oil and fat,
 wherein the amount of the phytosterol fatty acid ester added is 0.02 parts by mass or more and 5 parts by mass or less relative to 100 parts by mass of the edible oil and fat.

[5] The production method according to [4] above, wherein, in the step of adding a phytosterol fatty acid ester to the edible oil and fat, the ratio of the amount (parts by mass)
25 of the phytosterol fatty acid ester added relative to 100 parts by mass of the edible oil and fat to the solid fat content (%) of the edible oil and fat at 10°C is 0.0003 or more and 0.08 or less.

[6] A method for producing dough for a layered puffed food, the method comprising the steps of:

30 (1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;

 (2) preparing grain flour dough; and

 (3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough,

wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

[7] A method for producing a layered puffed food, the method comprising the steps of:

- (1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;
- (2) preparing grain flour dough;
- (3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough, thereby obtaining dough for a layered puffed food; and

- (4) heating the dough for a layered puffed food,

wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

[8] A method for improving the puffing of a layered puffed food, the method comprising the steps of:

- (1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;
- (2) preparing grain flour dough;
- (3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough, thereby obtaining dough for a layered puffed food; and
- (4) heating the dough for a layered puffed food,

wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

ADVANTAGEOUS EFFECTS OF INVENTION

[0007] The shape modifier for a layered puffed food of the present invention can be blended with dough for a layered puffed food, especially with a plastic oil-and-fat composition for a layered puffed food that is rolled into the dough, to improve the shape, such as the puffing, of the layered puffed food. According to a preferred aspect of the invention, the shape modifier for a layered puffed food of the present invention can be blended with dough for a layered puffed food to further enhance the product value of the layered puffed food. In addition, according to a preferred aspect of the invention, the shape modifier for a layered puffed food of the present invention can be blended to further improve the workability upon producing dough for a layered puffed food.

DESCRIPTION OF EMBODIMENTS

[0008] The present invention relates to a shape modifier for a layered puffed food. The present invention also relates to a plastic oil-and-fat composition for a layered puffed food, dough for a layered puffed food, and a method for producing a layered puffed food, which can improve the shape of the layered puffed food. The invention further relates to a method for improving the shape of a layered puffed food. According to the present invention, the shape of a layered puffed food can be evaluated by the height or specific volume of the layered puffed food. Hereinafter, each of the inventions will be described in detail.

10 [0009] 1. Shape modifier for layered puffed food

A shape modifier for a layered puffed food of the present invention is characterized by containing a phytosterol fatty acid ester. As mentioned above, a phytosterol fatty acid ester is effective in improving the shape of a layered puffed food when blended with dough for the layered puffed food, especially with a plastic oil-and-fat composition for a layered puffed food that is rolled into the dough.

[0010] As a phytosterol resulting a phytosterol fatty acid ester, any of various phytosterols obtained from a lipid-soluble fraction of a suitable plant such as soybean, rapeseed, rice bran, rice germ, corn, or olive can be used. Typical examples of the phytosterol include β -sitosterol, β -sitostanol, stigmasterol, stigmastanol, campesterol, campestanol, brassicasterol, brassicastanol, avenasterol, and sitrostadienol.

[0011] Among these, soy-derived phytosterols are favorable according to the present invention because they can further improve the puffing of a layered puffed food.

[0012] The number of carbon atoms of the fatty acid resulting the phytosterol fatty acid ester is not particularly limited, but it is preferably 4 or more and 24 or less, more preferably 12 or more and 22 or less, and still more preferably 16 or more and 20 or less.

[0013] Moreover, the iodine value of the fatty acid resulting the phytosterol fatty acid ester is preferably 0 or more and 150 or less, more preferably 0 or more and 140 or less, and still more preferably 0 or more and 130 or less. Here, the "iodine value of the fatty acid" resulting the phytosterol fatty acid ester is measured as follows.

30 After obtaining a fatty acid methyl ester from a phytosterol fatty acid ester according to "2.4.1.2-1996 Methyl Esterification Method (Boron Trifluoride-Methanol Method)" of the Standard Methods for the Analysis of Fats, Oils and Related Materials (The Japan Oil Chemists' Society), the composition of the fatty acid is determined according to "2.4.2.1-1996 Fatty Acid Composition (FID Gas Chromatography)" of the Standard

Methods for the Analysis of Fats, Oils and Related Materials (The Japan Oil Chemists' Society). From the determined fatty acid composition, the iodine value of the fatty acid is calculated according to "Provisional 14-2003 Iodine Value (Method of Calculating from Fatty Acid Composition)" of the Standard Methods for the Analysis of Fats, Oils and Related
5 Materials (The Japan Oil Chemists' Society).

[0014] Examples of the phytosterol fatty acid ester include (1) those extracted from a lipid-soluble fraction of a plant, or (2) those obtained through esterification reaction between a phytosterol and one or more selected from fatty acids and fatty acid esters under solvent-free conditions using lipase or alkali as a catalyst. Examples of the above fatty acid esters include
10 fatty acid methyl esters, fatty acid ethyl esters, and glycerol fatty acid esters. If necessary, the aforementioned phytosterol fatty acid ester can be further hydrogenated, preferably extremely hydrogenated, before use.

[0015] In the shape modifier for a layered puffed food of the present invention, one kind of phytosterol fatty acid ester may be used alone or two or more kinds of them may be used
15 in combination.

In the shape modifier for a layered puffed food of the present invention, the content of the phytosterol fatty acid ester is preferably 70 mass% or more and 100 mass% or less, more preferably 80 mass% or more and 100 mass% or less, still more preferably 90 mass% or more and 100 mass% or less, and particularly preferably 93 mass% or more and 100
20 mass% or less. In addition to the phytosterol fatty acid ester, the shape modifier for a layered puffed food of the present invention may contain a component other than the phytosterol fatty acid ester. For example, it may contain a trace component that is contained in the phytosterol extracted from a plant matter, or other kind of shape modifier for a layered puffed food such as an edible oil and fat or baking soda.

[0016] The shape modifier for a layered puffed food of the present invention can be blended with dough for a layered puffed food so as to exert the effect of improving the shape of the layered puffed food obtained by heating the dough. The shape, such as puffing, of a layered
25 puffed food is one of the important factors for the enhancement of the product value of the layered puffed food, because it can affect the crispy texture and meltability in mouth.

The term "layered puffed food" as used herein refers to a product which is produced by applying a plastic oil-and-fat composition to grain flour dough to form a multilayer structure of grain flour dough layers and oil-and-fat layers, and heating the dough. Such products include pies such as kneaded pies and folded pies; Danish pastries; croissants; and
30 the like.

Using the height or specific volume of a layered puffed food as a measure, the "puffing of a layered puffed food" can be evaluated by comparing the heights or specific volumes of the layered puffed food between the cases where the shape modifier for a layered puffed food of the present invention is blended with the dough and where it is not blended with the dough.

According to a preferred aspect of the invention, the shape modifier for a layered puffed food of the present invention is preferably added to a plastic oil-and-fat composition for a layered puffed food in advance, which is then rolled in or applied to grain flour dough, thereby blending the shape modifier with the dough for the layered puffed food.

[0017] 2. Method for producing plastic oil-and-fat composition for layered puffed food

A method for producing a plastic oil-and-fat composition for a layered puffed food according to the present invention is a method for producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat, the method comprising:

a step of adding a phytosterol fatty acid ester to the edible oil and fat,

wherein the amount of the phytosterol fatty acid ester added is 0.02 parts by mass or more and 5 parts by mass or less relative to 100 parts by mass of the edible oil and fat. The term "plastic oil-and-fat composition for a layered puffed food" as used herein refers to a plastic oil-and-fat composition that is not kneaded homogeneously into the dough, but that is used by being applied to the dough such that the oil and fat form a multilayered structure in the dough.

[0018] The plastic oil-and-fat composition for a layered puffed food of the present invention is obtained by plasticizing an oil-and-fat composition containing an edible oil and fat, and is produced by a method generally known in the art, except that the method includes a step of adding a phytosterol fatty acid ester to an edible oil and fat, in other words, a method including a step of preparing an oil-and-fat composition and a step of kneading the oil-and-fat composition with rapid cooling.

[0019] According to the method for producing a plastic oil-and-fat composition for a layered puffed food of the present invention, the step of preparing the oil-and-fat composition includes a step of adding a phytosterol fatty acid ester to the edible oil and fat.

While the method for adding a phytosterol fatty acid ester to the edible oil and fat is not particularly limited, the step of adding a phytosterol fatty acid ester to the edible oil and fat is preferably performed before the step of kneading the oil-and-fat composition containing the edible oil and fat with rapid cooling. After adding a phytosterol fatty acid ester to the edible oil and fat, the edible oil and fat and the phytosterol fatty acid ester are

preferably mixed homogeneously.

[0020] According to the present invention, the step of preparing the oil-and-fat composition may also include a step of dissolving a lipid-soluble component such as an emulsifier, a flavoring agent, and a coloring in the edible oil and fat, and may also include a step of adding
5 an aqueous phase component to the edible oil and fat. When the step of adding an aqueous phase component is included, it is preferable to include a step of emulsifying the resulting composition. Other than water, the aqueous phase component may contain a seasoning, a milk ingredient, and the like.

[0021] The phytosterol fatty acid ester used in the present invention may be one described
10 in "1. Shape modifier for layered puffed food" above.

[0022] The amount of the phytosterol fatty acid ester added relative to 100 parts by mass of the edible oil and fat in the plastic oil-and-fat composition for a layered puffed food is 0.02 parts by mass or more and 5 parts by mass or less, preferably 0.03 parts by mass or more and 4 parts by mass or less, more preferably 0.04 parts by mass or more and 3 parts by mass or less,
15 mass or less, still more preferably 0.06 parts by mass or more and 2 parts by mass or less, and particularly preferably 0.1 parts by mass or more and 1.5 parts by mass or less. The amount in the above range enables production of a plastic oil-and-fat composition that gives a layered puffed food with a good shape, especially good puffing. It also enables production of a plastic oil-and-fat composition with excellent extensibility that can follow grain flour
20 dough well when producing dough for a layered puffed food. Herein, when a numerical range is mentioned as above, the upper and lower limits thereof may be combined as appropriate.

[0023] The plastic oil-and-fat composition for a layered puffed food of the present invention contains the edible oil and fat in an amount of 60 mass% or more and 100 mass%
25 or less on the basis of the total amount of the plastic oil-and-fat composition. The content is preferably 70 mass% or more and 100 mass% or less, and more preferably 80 mass% or more and 100 mass% or less. The content in the above range makes the plastic oil-and-fat composition suitable for use in dough for a layered puffed food.

[0024] The solid fat content of the edible oil and fat at 10°C is preferably 20% or more and
30 70% or less, and more preferably 30% or more and 65% or less. The solid fat content at 20°C is preferably 20% or more and 50% or less, and more preferably 25% or more and 45% or less. The solid fat content at 30°C is preferably 10% or more and 25% or less, and more preferably 12% or more and 22% or less. The solid fat content at 35°C is preferably 0% or more and 15% or less, and more preferably 2% or more and 12% or less. The solid fat content

of the edible oil and fat can be determined by METHOD I described in AOCS Official Method Cd 16b-93.

[0025] In the step of adding a phytosterol fatty acid ester to the edible oil and fat, the ratio of the amount (parts by mass) of the phytosterol fatty acid ester added relative to 100 parts
5 by mass of the edible oil and fat to the solid fat content (%) of the edible oil and fat at 10°C is preferably 0.0003 or more and 0.08 or less, more preferably 0.0005 or more and 0.06 or less, still more preferably 0.0007 or more and 0.04 or less, and particularly preferably 0.002 or more and 0.03 or less. The amount in the above range enables production of a plastic oil-and-fat composition that gives a layered puffed food with a good shape, especially good
10 puffing. Moreover, a plastic oil-and-fat composition that has excellent extensibility in grain flour dough can be produced.

[0026] Examples of raw material oils and fats that can be used as the edible oil and fat include vegetable oils and fats such as soybean oil, rapeseed oil, corn oil, cottonseed oil, rice
15 oil, sunflower oil, safflower oil, sesame oil, olive oil, palm oil, palm kernel oil, and coconut oil; animal oils and fats such as fish oil, lard, tallow, and milk fat; triglycerides of medium-chain fatty acid; and processed oils and fats obtained by subjecting them to one or more kinds of processing selected from the group consisting of transesterification, hydrogenation, and fractionation. One kind of raw material fat or oil alone, or a mixture of two or more kinds of raw material oils and fats can be used as the edible oil and fat.

[0027] The plastic oil-and-fat composition for a layered puffed food of the present
20 invention preferably contains water in an amount of 0 mass% or more and 40 mass% or less, more preferably 0 mass% or more and 30 mass% or less, and still more preferably 0 mass% or more and 20 mass% or less.

The plastic oil-and-fat composition for a layered puffed food of the present
25 invention may contain an emulsifier as needed. The content of the emulsifier, if any, is preferably more than 0 mass% but less than or equal to 5 mass%, more preferably more than 0 mass% but less than or equal to 3 mass%, and still more preferably more than 0 mass% but less than or equal to 2 mass%. Examples of the emulsifier include, but are not particularly limited to, lecithin, monoglycerol fatty acid esters (monoglycerides), organic acid esters of
30 monoglycerides, polyglycerol fatty acid esters, polyglycerol polyricinoleate, propylene glycol fatty acid esters, sorbitan fatty acid esters, sucrose fatty acid esters, and polyoxyethylene sorbitan fatty acid esters.

[0028] The plastic oil-and-fat composition for a layered puffed food of the present invention may contain other components to the extent that the effects of the invention are

not impaired. Examples of such components include, but are not particularly limited to: antioxidants such as L-ascorbic acid, L-ascorbic acid derivatives, tocopherols, tocotrienols, lignans, ubiquinones, xanthines, oryzanol, catechins, polyphenols, and tea extracts; coloring agents such as carotene; aroma; seasonings such as salt, sugar, and amino acids; polysaccharides such as starch, xanthan gum, guar gum, Arabic gum, pectin, locust bean gum, alginic acid, dextrin, and cellulose; and milk ingredients such as sodium caseinate and nonfat milk powder.

[0029] When the plastic oil-and-fat composition for a layered puffed food contains water, the sum content of the edible oil and fat, phytosterol fatty acid ester, and water is preferably 60 mass% or more and 100 mass% or less, more preferably 75 mass% or more and 100 mass% or less, still more preferably between 90 mass% or more and 100 mass% or less, and yet still more preferably between 95 mass% or more and 100 mass% or less.

[0030] The step of kneading the oil-and-fat composition with rapid cooling is a step of plasticizing the oil-and-fat composition to produce a plastic oil-and-fat composition.

For example, the aforementioned oil-and-fat composition can be rapidly cooled and kneaded, if necessary, by passing it through a rapid cooling/kneading device, such as Kombinator, Perfector, Votator, or Nexus, shaped and loaded as appropriate to obtain a plastic oil-and-fat composition for a layered puffed food.

[0031] The shape of the plastic oil-and-fat composition for a layered puffed food is not particularly limited and can be formed into any desired shape for use. For example, the plastic oil-and-fat composition for a layered puffed food may have a sheet-, chip-, or block-like shape, etc., preferably a sheet- or chip-like shape. Here, the term "sheet-like" refers to a plate-like product with a thickness of about 5 mm to 5 cm. The term "chip-like" refers to a small piece of about 1 to 5 cm on the long side, and the term "block-like" refers to a lumpy piece larger than the chip.

[0032] 3. Method for producing dough for layered puffed food

A method for producing dough for a layered puffed food according to the present invention comprises the steps of:

(1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;

(2) preparing grain flour dough; and

(3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough,

wherein the step of producing the plastic oil-and-fat composition for a layered

puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

[0033] <Step (1)>

In Step (1), a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat is produced. The method is specifically as described in "2. Method for
5 producing plastic oil-and-fat composition for layered puffed food" above.

[0034] <Step (2)>

Next, in Step (2), grain flour dough is prepared. The term "grain flour dough" refers to dough obtained by uniformly mixing raw ingredients including grain flour.

[0035] Grain flour used in the present invention include wheat flour, rice flour, soy flour,
10 rye flour, barley flour, corn flour, and the like.

Wheat flour is not particularly limited as long as it can be used for layered puffed foods. For example, strong flour, all-purpose flour, weak flour, or a combination thereof can be used, where strong flour is preferred.

Rice flour is not particularly limited as long as it can be used for layered puffed
15 foods. For example, *Uruchi* rice (Japanese non-glutinous rice) flour can be used.

Soy flour is not particularly limited as long as it can be used for layered puffed foods. For example, full-fat soy flour, defatted soy flour, or a combination thereof can be used.

Rye flour, barley flour, and corn flour are not particularly limited as long as they
20 can be used for layered puffed foods.

One of these grain flours may be used alone or two or more kinds of them may be used in combination.

[0036] The content of the grain flour is preferably 20 mass% or more and 60 mass% or less, more preferably 25 mass% or more and 55 mass% or less, still more preferably 30 mass%
25 or more and 50 mass% or less, and particularly preferably 35 mass% or more and 50 mass% or less, relative to the total amount of the dough for a layered puffed food.

[0037] In addition to the grain flour, one or more of the following may be added to the grain flour dough: water, egg, milk, salt, sugar, an oil and fat to be kneaded, a yeast, a starch, an expander, salt, a sweetener, nonfat milk powder, flavor powder, a quality improver, gluten,
30 etc. The amount of these raw ingredients to be blended can be determined as appropriate for the application and purpose.

Expanders are not particularly limited as long as they can be used for layered puffed foods. For example, sodium bicarbonate, potassium bicarbonate, sodium aluminum phosphate, acid sodium pyrophosphate, sodium aluminum sulfate, monocalcium phosphate,

and combinations thereof can be used.

Sweeteners are not particularly limited as long as they can be used for layered puffed foods. For example, a monosaccharide such as glucose, fructose, or isomerized sugar; a disaccharide such as sugar, maltose, or trehalose; a synthetic sweetener such as an oligosaccharide, a reduced starch degradation product, honey, syrup, maple syrup, or aspartame; a natural sweetener such as stevia; or a combination thereof can be used.

[0038] These raw ingredients can be mixed homogeneously to prepare grain flour dough.

[0039] <Step (3)>

Next, in Step (3), the plastic oil and fat composition is applied to the grain flour dough such that the plastic oil-and-fat composition forms a multilayered structure in the grain flour dough to produce layered puffed food dough. Herein, the phrase "(to) apply the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms a multilayered structure in the grain flour dough" means that the plastic oil-and-fat composition is blended with the grain flour dough such that the plastic oil-and-fat composition forms a multilayered structure in the grain flour dough. In the layered puffed food dough obtained in Step (3), the number of layers of the plastic oil-and-fat composition is not particularly limited and differs depending on the application and purpose, but it is usually 27 or more.

[0040] The method for applying the plastic oil-and-fat composition to the grain flour dough such that it forms multiple layers in the grain flour dough may suitably be selected according to the desired layered puffed food.

[0041] For example, in the case of layered puffed foods such as folded pies, Danish pastries, and croissants, in which each layer puffs up to create a crispy and crumble texture, the plastic oil-and-fat composition in sheet form can be wrapped in the grain flour dough and the resultant can be stretched and folded for multiple times so that the plastic oil-and-fat composition is folded to form multiple layers in the grain flour dough.

Alternatively, in the case of layered puffed foods such as kneaded pies, for example, which produce a crispy texture without going through a folding process, the plastic oil-and-fat composition in chip form can be mixed into the grain flour dough and the resultant can be lightly kneaded to disperse the plastic oil-and-fat composition in the grain flour dough to the extent that the plastic oil-and-fat composition is not completely kneaded into the grain flour dough so that the plastic oil-and-fat composition can form multiple layers in the grain flour dough. In the case of layered puffed foods such as kneaded pies, a folding process may be performed as appropriate.

[0042] Thus, dough for a layered puffed food can be produced as described above.

The content of the plastic oil-and-fat composition in the resulting dough for a layered puffed food is not particularly limited and can be adjusted appropriately depending on the desired layered puffed food, but, in general, it is preferably 10 mass% or more and 45 mass% or less, more preferably 12 mass% or more and 45 mass% or less, still more preferably 13 mass% or more and 40 mass% or less, and particularly preferably 14 mass% or more and 35 mass% or less.

[0043] 4. Method for producing layered puffed food

A method for producing a layered puffed food according to the present invention comprises the steps of:

- (1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;
- (2) preparing grain flour dough; and
- (3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough, thereby obtaining dough for a layered puffed food; and
- (4) heating the dough for a layered puffed food,

wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

[0044] Steps (1) to (3) are the same as those described in "3. Method for producing dough for layered puffed food" above. Hereinafter, Step (4) will be described.

[0045] <Step (4)>

In Step (4), the layered puffed food dough is heated to produce a layered puffed food.

The heating temperature may be selected appropriately according to the desired layered puffed food. In the case of baking in an oven or the like, the temperature is preferably 150°C or higher and 250°C or lower, more preferably 170°C or higher and 240°C or lower, and still more preferably 180 °C or higher and 220°C or lower. In the case of oil cooking, the temperature is preferably 150°C or higher and 200°C or lower, more preferably 160°C or higher and 190°C or lower, and still more preferably between 170°C or higher and 185°C or lower.

[0046] The layered puffed food dough obtained in Step (3) is preferably formed into a desired shape before heating.

For example, if the layered puffed food is a filled layered puffed food with a filling

inside, the process of filling can be done either before or after heating. The shape of the layered puffed food is not particularly limited and can be determined appropriately according to the purpose and application. Examples of fillings include red bean paste, chocolate, jam, custard, cheese, curry, stew, meat sauce, and gratin.

5 Thus, a desired layered puffed food can be produced.

[0047] 5. Method for improving puffing of layered puffed food

The present invention is a method for improving the puffing of a layered puffed food, the method comprising the steps of:

10 (1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;

 (2) preparing grain flour dough; and

 (3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough, thereby obtaining dough for a layered puffed food; and

15 (4) heating the dough for a layered puffed food,

 wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

[0048] According to this method, Steps (1) to (3) are the same as those described in "3. Method for producing dough for layered puffed food" above. Moreover, Step (4) is the same as that described in "4. Method for producing layered puffed food" above.

[0049] According to the present invention, the puffing of the layered puffed food can be evaluated by the height and specific volume of the layered puffed food.

[0050] The height of a layered puffed food is a measure of how much the layered puffed food has expanded vertically. According to the present invention, a phytosterol fatty acid ester is added to an edible oil and fat to produce a plastic oil-and-fat composition for a layered puffed food so as to increase the height of the layered puffed food compared to the case of producing a layered puffed food under the same conditions except that the step of adding a phytosterol fatty acid ester to the edible oil and fat is not included in Step (1). Herein, the "height of a layered puffed food" is measured by the measurement method described in EXAMPLES.

[0051] The specific volume of a layered puffed food is a measure of how much the layered puffed food has expanded as a whole. According to the present invention, a phytosterol fatty acid ester is added to an edible oil and fat to produce a plastic oil-and-fat composition for a layered puffed food so as to increase the specific volume of the layered puffed food

compared to the case of producing a layered puffed food under the same conditions except that the step of adding a phytosterol fatty acid ester to the edible oil and fat is not included in Step (1). Herein, the "specific volume of a layered puffed food" is measured by the measurement method described in EXAMPLES.

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EXAMPLES

[0052] Hereinafter, the present invention will be described in more detail by way of examples and comparative examples. The following examples, however, are not intended to limit the present invention.

10 [0053] (A) Preparation of plastic oil-and-fat composition for layered puffed food

(1) Raw ingredients

The following raw ingredients were used for the preparation of a plastic oil-and-fat composition for a layered puffed food.

<Raw material oils and fats>

15 Soybean oil (solid fat content at 10°C: 0%, Refined Soybean Oil NS, manufactured by J-OIL MILLS)

Rapeseed oil (solid fat content at 10°C: 0%, AJINOMOTO Sarasara (registered trademark) Canola Oil, manufactured by J-OIL MILLS)

Palm oil (solid fat content at 10°C: 50%, manufactured by J-OIL MILLS)

20 Palm olein (solid fat content at 10°C: 35%, iodine value: 56, manufactured by J-OIL MILLS)

Transesterified oil-and-fat 1 (solid fat content at 10°C: 96%, prepared by Production method 1 below)

25 Transesterified oil-and-fat 2 (solid fat content at 10°C: 69%, prepared by Production method 2 below)

<Other raw ingredients>

Phytosterol fatty acid ester 1 (fatty acid ester of soy-derived phytosterol, iodine value of fatty acid: 128, "Vegapure 95 FF", manufactured by BASF Japan Ltd.)

30 Phytosterol fatty acid ester 2 (prepared by Production method 3 below, iodine value of fatty acid: 0)

Monoglycerol fatty acid ester (Monoglyceride) (Emulsee P-100, manufactured by RIKEN VITAMIN Co., Ltd.)

Lecithin (Lecithin FA, manufactured by J-OIL MILLS)

[0054] [Production method 1] Production of Transesterified oil-and-fat 1

To a mixed oil of 30 parts by mass of palm oil and 70 parts by mass of palm kernel oil (manufactured by J-OIL MILLS), 0.3 parts by mass of sodium methoxide was added as a catalyst to carry out random transesterification reaction at a temperature of 80°C and a degree of vacuum of 2.7 kPa while stirring for 60 minutes. After the random transesterification reaction, the catalyst was removed by washing with water, and hydrogenation was carried out until an extremely hydrogenated oil was obtained. Hydrogenation was followed by decolorization with activated white clay, and further followed by deodorization, thereby obtaining Transesterified oil-and-fat 1.

[0055] [Production method 2] Production of Transesterified oil-and-fat 2

To a mixed oil of 75 parts by mass of palm stearin (iodine value: 32, manufactured by J-OIL MILLS), 10 parts by mass of palm oil, and 15 parts by mass of soybean oil, 0.3 parts by mass of sodium methoxide was added as a catalyst to carry out random transesterification reaction at a temperature of 80°C and a degree of vacuum of 2.7 kPa while stirring for 60 minutes. After the random transesterification reaction, the catalyst was removed by washing with water, and deodorization was further carried out, thereby obtaining Transesterified oil-and-fat 2.

[0056] [Production method 3] Production of Phytosterol fatty acid ester 2

To 600 g of Phytosterol ester 1, 1.2 g of nickel catalyst was added, and hydrogenation reaction was carried out at 180°C while blowing hydrogen gas until hydrogen consumption was completed. After the hydrogenation reaction, the reaction solution was filtered to remove the nickel catalyst, and the filtrate was collected, which was decolorized by adding 1.5 mass% activated white clay thereto and stirring it at 110°C for 20 minutes under reduced pressure.

[0057] (2) Preparation of edible oil and fat

Edible oils and fats 1 and 2 were prepared according to the formulas shown in Table 1.

Table 1

Unit: mass%

Raw material oil and fat	Edible oil and fat 1	Edible oil and fat 2
Soybean oil		25
Rapeseed oil	5	
Palm oil	10	29
Palm olein	25	
Transesterified oil-and-fat 1	10	10
Transesterified oil -and-fat 2	50	36
Total	100	100
Solid fat content (%)		
10°C	60.8	47.9
20°C	38.7	29.8
30°C	18.1	14.5
35°C	11.5	9.2

[0058] <Solid fat content>

The solid fat content (%) of each of the edible oils and fats was determined by METHOD I described in AOCS Official Method Cd 16b-93.

5 [0059] (3) Preparation of chip-like plastic oil-and-fat composition

Raw ingredients for an oil phase were added to a mixing tank in the quantities indicated in Table 2 and stirred while heating to 65°C. Next, raw ingredients for an aqueous phase in the quantities indicated in Table 2 were mixed and dissolved in advance, then added to the mixing tank, and kept at 65°C to continue stirring to obtain an emulsion. The resulting emulsion was passed through Perfector to be kneaded with rapid cooling to obtain a plastic oil-and-fat composition. The plastic oil-and-fat composition was formed to have a cylindrical (chip-like) shape that was 6 mm in diameter and 3 cm long when loaded.

Table 2

Unit: mass%

Raw ingredients		Comparative example 1-1	Example 1-1	Example 1-2
Oil phase	Edible oil and fat 1	81.94	81.89	81.54
	Monoglycerol fatty acid ester	0.4	0.4	0.4
	Lecithin	0.16	0.16	0.16
	Phytosterol fatty acid ester 1		0.05	0.4
Aqueous phase	Water	16	16	16
	Salt	1.5	1.5	1.5
Total		100	100	100
Amount (parts by mass) of phytosterol fatty acid ester added relative to 100 parts by mass of edible oil and fat		-	0.061	0.491
Ratio of amount (parts by mass) of phytosterol fatty acid ester added relative to 100 parts by mass of edible oil and fat to solid fat content (%) of edible oil and fat at 10°C		-	0.00100	0.00807

[0060] (4) Preparation of sheet-like plastic oil-and-fat composition

Raw ingredients for an oil phase were added to a mixing tank in the quantities indicated in Table 3 and stirred while heating to 65°C. Next, raw ingredients for an aqueous phase in the quantities indicated in Table 3 were mixed and dissolved in advance, then added to the mixing tank, and kept at 65°C to continue stirring to obtain an emulsion. The resulting emulsion was passed through Perfector to be kneaded with rapid cooling to obtain a plastic oil-and-fat composition. The plastic oil-and-fat composition was formed into a 500 g sheet that was 10 mm thick, 21 cm wide, and 24 cm long when loaded.

Table 3

Unit: mass%

Raw ingredients		Comparative example 2-1	Reference Example 2	Example 2-1	Example 2-2	Example 2-3	Example 2-4
Oil phase	Edible oil and fat 2	83	82.99	82.87	82	82.9	82
	Phytosterol fatty acid ester 1		0.01	0.13	1		
	Phytosterol fatty acid ester 2					0.1	1
Aqueous phase	Water	16	16	16	16	16	16
	Salt	1	1	1	1	1	1
Total		100	100	100	100	100	100
Amount (parts by mass) of phytosterol fatty acid ester added relative to 100 parts by mass of edible oil and fat		-	0.012	0.157	1.220	0.121	1.220
Ratio of amount (parts by mass) of phytosterol fatty acid ester added relative to 100 parts by mass of edible oil and fat to solid fat content (%) of edible oil and fat at 10°C		-	0.00025	0.00327	0.02546	0.00252	0.02546

[0061] (B) Production of layered puffed food (kneaded pie)

A kneaded pie was made according to the formula indicated in Table 4.

Table 4

Raw ingredients	Amount (g)
Strong flour (20°C)	450
Weak flour (20°C)	1,050
Salt (20°C)	18
Whole egg (5°C)	180
Water (5°C)	720
Chip-like plastic oil-and-fat composition (5°C)	750

5 In Table 4, the following was used.

Chip-like plastic oil-and-fat composition: Chip-like plastic oil-and-fat composition prepared in (3) above

[0062] First, raw ingredients other than the chip-like plastic oil-and-fat composition were placed in a bowl of a vertical mixer (manufactured by Kanto Kongoki Industrial Co., Ltd.).

10 Then, the bowl was attached to the vertical mixer fitted with a hook and mixed at low speed for 4 minutes to prepare grain flour dough.

The mixing was paused and the chip-like plastic oil-and-fat composition was added to the bowl and mixed at low speed for 60 seconds to prepare pie dough.

15 The mixed pie dough was transferred from the bowl to a reverse sheeter, stretched to a thickness of 6 mm, folded in four, stretched again to a thickness of 6 mm, and further folded in four. After resting the pie dough that had been folded twice in four at 5°C for 90 minutes, the dough was stretched to a thickness of 6 mm using a reverse sheeter, folded in four, stretched to a thickness of 4 mm, and then cut into a square with a side length of 10 cm. The cut-out pie dough was stored in a cold storage set at 5°C for 15 hours. The pie dough
20 was taken out from the cold storage to adjust the temperature to 15°C, and then baked in an oven set at 210°C for the top and 210°C for the bottom for 22 minutes, thereby producing a kneaded pie.

[0063] The height and specific volume of the resulting kneaded pie was measured to evaluate the puffing of the kneaded pie. Measurements were carried out for 18 samples, and
25 the average values were used as the measured height and specific volume. The results are

shown in Table 5, along with the results of the evaluation of workability.

Table 5

Plastic oil-and-fat composition used	Comparative example 1-1	Example 1-1	Example 1-2
Height (mm)	18.7	21.3	24.5
Specific volume (mL/g)	2.0	2.5	2.8
Workability (evaluation during the work in blue in kneaded pie production method)	When the dough was stretched, there were many areas where the plastic oil-and-fat composition did not stretch along with the dough and left lumps.	When the dough was stretched, the plastic oil-and-fat composition stretched along with the dough. Few lumpy areas were observed.	When the dough was stretched, the plastic oil-and-fat composition stretched along with the dough. No lumpy areas were observed.

[0064] <Height of kneaded pie>

5 The height of the kneaded pie was measured by the following procedure.

The kneaded pie was placed on a flat worktable and the length from the worktable to the highest point of the kneaded pie was defined as the height.

[0065] <Specific volume of kneaded pie>

The specific volume of the kneaded pie was measured by the following procedure.

10 A rectangular container was filled with a level volume of rapeseed seeds.

Then, the rapeseed seeds in the container were collected to empty the container.

Subsequently, a layered puffed food with a premeasured mass was placed in the empty container.

15 The collected rapeseed seeds were put in a container containing the kneaded pie, and the volume of rapeseed seeds that overflowed from the container was measured using a graduated cylinder.

The specific volume was calculated according to the following equation.

Specific volume (mL/g) = (Volume of overflowed rapeseed seeds (mL))/(Mass of kneaded pie (g))

20 [0066] <Workability >

Workability upon transferring the mixed pie dough from the bowl to a reverse sheeter, stretching it to a thickness of 6 mm, folding it into four, stretching it again to a

thickness of 6 mm, and further folding it into four was evaluated.

[0067] As can be appreciated from Table 5, the height and specific volume of the kneaded pie were found to be improved when the kneaded pie was made using a plastic oil-and-fat composition prepared by adding a phytosterol fatty acid ester to an edible oil and fat, compared to the case where a phytosterol fatty acid ester was not added. In addition, workability was also found to be good when the kneaded pie was made using a plastic oil-and-fat composition prepared by adding a phytosterol fatty acid ester to an edible oil and fat.

[0068] (C) Preparation of layered puffed food (Danish pastry)

Danish pastries were made according to the formula indicated in Table 6.

Table 6

Raw ingredients	Amount (g)
Strong flour (20°C)	1,667
Bread improver (20°C)	8
Fresh yeast (15°C)	83
Caster sugar (20°C)	133
Salt (20°C)	22
Nonfat milk powder (20°C)	50
Oil and fat to be kneaded (15°C)	133
Whole egg (5°C)	100
Water (2°C)	750
Sheet-like plastic oil-and-fat composition	500

In Table 6, the following were used.

Sheet-like plastic oil-and-fat composition: Sheet-like plastic oil-and-fat composition prepared in (4) above

Bread improver: Prima Pane (manufactured by Puratos Japan Co., Ltd.)

Fresh yeast: Regular Fresh Yeast (manufactured by Oriental Yeast Co. Ltd.)

Oil and fat to be kneaded: Facier (manufactured by J-OIL MILLS)

[0069] First, raw ingredients other than the sheet-like plastic oil-and-fat composition were placed in a bowl of a vertical mixer (manufactured by Kanto Kongoki Industrial Co., Ltd.).

Then, the bowl was attached to the vertical mixer fitted with a hook and mixed, 6 minutes in 1st gear and 6 minutes in 2nd gear, to prepare grain flour dough.

The prepared grain flour dough was removed from the bowl, rested at 23°C for 20

minutes, made 10 mm thick, and stored in a freezer set at -5°C for 16 hours. The sheet-like plastic oil-and-fat composition adjusted to 15°C was wrapped in the grain flour dough removed from the freezer to prepare Danish pastry dough.

5 The Danish pastry dough was stretched to a thickness of 8 mm using a reverse sheeter, folded in three, stretched again to a thickness of 8 mm, further folded in three, and stretched to a thickness of 7 mm using a reverse sheeter. The Danish pastry dough that had been folded twice in three was stored in a freezer set at -5°C for 60 minutes. The Danish pastry dough was removed from the freezer, stretched to a thickness of 7 mm using a reverse sheeter, folded in three, and stored again in a freezer set at -5°C for 60 minutes. The Danish
10 pastry dough was removed from the freezer, stretched to a thickness of 3 mm using a reverse sheeter, and cut into a square with a side length of 11 cm.

The cut-out dough for a Danish pastry was fermented at a temperature of 36°C and 75% relative humidity for 60 minutes. The fermented Danish pastry dough was baked in an oven set at 200°C for the top and 190°C for the bottom for 14 minutes to obtain a Danish
15 pastry.

[0070] The height and specific volume of the resulting Danish pastry was measured to evaluate the puffing of the Danish pastry. Measurements were carried out for 18 samples, and the average values were used as the measured height and specific volume. The height and specific volume of the Danish pastry were measured in accordance with the
20 measurement of the height and specific volume of the kneaded pie described in (B) above by replacing the kneaded pie with the Danish pastry. The results are shown in Table 7, along with the results of the evaluation of workability.

Table 7

Plastic oil-and-fat composition used	Comparative example 2-1	Reference Example 2	Example 2-1	Example 2-2	Example 2-3	Example 2-4
Height (mm)	38.4	39.1	41.8	45.9	42.2	44.0
Specific volume (mL/g)	6.3	6.0	6.6	6.9	6.6	6.9
Workability	When the dough was stretched, the plastic oil-and-fat composition broke and thus the plastic oil-and-fat composition was not folded into the dough evenly.	When the dough was stretched, the plastic oil-and-fat composition broke a little and thus there were some areas where the plastic oil-and-fat composition was not folded into the dough evenly.	When the dough was stretched, the plastic oil-and-fat composition did not break, and the plastic oil-and-fat composition was folded into the dough evenly.	When the dough was stretched, the plastic oil-and-fat composition did not break, and the plastic oil-and-fat composition was folded into the dough evenly.	When the dough was stretched, the plastic oil-and-fat composition did not break, and the plastic oil-and-fat composition was folded into the dough evenly.	When the dough was stretched, the plastic oil-and-fat composition did not break, and the plastic oil-and-fat composition was folded into the dough evenly.

[0071] <Workability >

Workability upon stretching the Danish pastry dough to a thickness of 8 mm using a reverse sheeter, folding it in three, stretching it again to a thickness of 8 mm, further folding it in three, and stretching it to a thickness of 7 mm using a reverse sheeter was evaluated.

[0072] As can be appreciated from Table 7, the height and specific volume of the Danish pastry were found to be improved when the Danish pastry was made using a plastic oil-and-fat composition prepared by adding a phytosterol fatty acid ester to an edible oil and fat, compared to the case where a phytosterol fatty acid ester was not added. In addition, workability was also found to be good when the Danish pastry was made using a plastic oil-and-fat composition prepared by adding a phytosterol fatty acid ester to an edible oil and fat.

[0073] As can be appreciated from these results, phytosterol fatty acid esters are effective in improving the shape of layered puffed foods. Moreover, the addition of a phytosterol fatty acid ester to an edible oil and fat also has the effect of improving the extensibility of the plastic oil-and-fat composition, thereby improving the workability upon producing dough for layered puffed foods. The addition of a phytosterol fatty acid ester to dough for layered puffed foods can further enhance the commercial value of the layered puffed foods.

CLAIMS

1. A shape modifier for a layered puffed food comprising a phytosterol fatty acid ester.
2. The shape modifier for a layered puffed food according to claim 1, wherein the phytosterol of the phytosterol fatty acid ester is derived from a soybean.
3. The shape modifier for a layered puffed food according to either one of claims 1 and 2, wherein the iodine value of the fatty acid of the phytosterol fatty acid ester is 0 or more and 150 or less.
4. A method for producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat, the method comprising:
 - a step of adding a phytosterol fatty acid ester to the edible oil and fat,
 - wherein the amount of the phytosterol fatty acid ester added is 0.02 parts by mass or more and 5 parts by mass or less relative to 100 parts by mass of the edible oil and fat.
5. The production method according to claim 4, wherein, in the step of adding a phytosterol fatty acid ester to the edible oil and fat, the ratio of the amount (parts by mass) of the phytosterol fatty acid ester added relative to 100 parts by mass of the edible oil and fat to the solid fat content (%) of the edible oil and fat at 10°C is 0.0003 or more and 0.08 or less.
6. A method for producing dough for a layered puffed food, the method comprising the steps of:
 - (1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;
 - (2) preparing grain flour dough; and
 - (3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough,wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.
7. A method for producing a layered puffed food, the method comprising the steps of:

(1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;

(2) preparing grain flour dough;

(3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough, thereby obtaining dough for a layered puffed food; and

(4) heating the dough for a layered puffed food,

wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.

8. A method for improving puffing of a layered puffed food, the method comprising the steps of:

(1) producing a plastic oil-and-fat composition for a layered puffed food containing an edible oil and fat;

(2) preparing grain flour dough;

(3) applying the plastic oil-and-fat composition to the grain flour dough such that the plastic oil-and-fat composition forms multiple layers in the grain flour dough, thereby obtaining dough for a layered puffed food; and

(4) heating the dough for a layered puffed food,

wherein the step of producing the plastic oil-and-fat composition for a layered puffed food comprises a step of adding a phytosterol fatty acid ester to the edible oil and fat.