

PACKAGED FISH MEAT PASTE PRODUCT

TECHNICAL FIELD

[0001]

The present invention relates to a packaged fish meat paste product.

BACKGROUND ART

[0002]

Conventionally, a fish meat paste product has been produced as follows: fish meat serving as a raw material is pretreated, ground, formed into a desired shape, and then heated by steam, boiling water, direct fire, oil, or infrared rays.

[0003]

Such a fish meat paste product contains a nutrient such as a protein, a sugar, and a mineral and has a high-water content, and is therefore susceptible to a bacterium, a fungus, a yeast, and chemical or physical degeneration and easily deteriorates in quality. Therefore, the fish meat paste product often needs to be distributed and stored at a low temperature. Even when stored at such a low temperature, the fish meat paste product can be stored for only a few weeks at the most.

[0004]

For this reason, there has always been a desire to store the fish meat paste product at a normal temperature for a long

time. However, when the fish meat paste product is stored at a normal temperature, retort sterilization is commonly used to ensure sufficient sterility to withstand such storage.

[0005]

The retort sterilization has been widely used in the food industry as a method to allow a product to be stored for a long time at a normal temperature, but the retort sterilization of the fish meat paste product causes problems such as deterioration of texture (elasticity) and impairment of taste and flavor.

[0006]

In order to improve such problems caused by the retort sterilization of the fish meat paste product, for example, Patent Document 1 has proposed a method for producing a fish meat paste product in which a fish meat paste raw material is vacuum-packaged in a flexible container, pretreated under high pressure, and retort-sterilized and Patent Document 2 has proposed a method for producing a satsuma-age (deep-fried fish cake) in which a product produced from paste mainly made of fish meat and a sugar alcohol and Shochu (Japanese distilled spirit) serving as a seasoning is packed in a container and retort-sterilized.

[0007]

Patent Document 1: Japanese Unexamined Patent Application,
Publication No. H10-14543

Patent Document 2: Japanese Unexamined Patent Application,
Publication No. 2007-259843

Patent Document 3: Japanese Unexamined Patent Application,
Publication No. H05-270520

Patent Document 4: Japanese Unexamined Patent Application,
Publication No. 2000-316533

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

[0008]

However, even in the methods described in Patent Documents 1 and 2, the sterilization is performed by retort sterilization, and therefore the texture and the taste are still impaired. Moreover, when a food raw material undergoes a heat history at a high temperature for sterilization as mentioned above, the food raw material is overheated to thereby generate an unpleasant cooking odor inherent to retort-heated food, a so-called retort odor, which deteriorates the flavor of the food.

[0009]

Meanwhile, Patent Documents 3 and 4 describe a vacuum packaged fish meat paste food that has been subjected to non-retort heat treatment. However, since the heat treatment under the conditions described in Patent Documents 3 and 4 is not assumed to give the food sterility sufficient for storage at a normal temperature, it is common general technical knowledge to keep the food refrigerated.

[0010]

An object of the present invention is to provide a

packaged fish meat paste product that can be stored at a normal temperature for a long time and that has excellent texture, taste, and flavor.

Means for Solving the Problems

[0011]

The present inventor has conducted extensive studies to solve the problems and found that a packaged fish meat paste product that can be stored at a normal temperature for a long time, that has a texture inherent to the fish meat paste product, and that has an excellent taste and flavor can be obtained by setting conditions of a heat sterilization treatment after vacuum packaging in a moderate manner and subjecting the fish meat paste product to the heat sterilization treatment for an appropriate time. Thus, the present invention has been completed.

[0012]

Specifically, the present invention, which solves the above problems, is directed to a fish meat paste product including:

a fish meat paste food; and

a vacuum package,

the fish meat paste food being contained in the vacuum package,

the product having been heat-sterilized, having no retort odor, and being for storing at a normal temperature,

when tested after storage in the vacuum package at $30 \pm 2^{\circ}\text{C}$ for 90 days in accordance with a method described in Standard

methods of analysis in food safety regulation - Microorganism
(Revised 2nd edition, 2018),

the fish meat paste food satisfying the following aseptic
conditions:

the viable bacterial count is less than 300 CFU/g as tested on
a standard agar medium;

the food is tested negative for coliforms on an XM-G agar
medium;

the food is tested negative for *Escherichia coli* on an XM-G
agar medium; and

the food is tested negative for *Staphylococcus aureus* on an
egg-yolk mannitol salt agar medium.

[0013]

The present invention, which solves the above problems,
is also directed to a product including:

a fish meat paste food; and

a vacuum package,

the fish meat paste food being contained in the vacuum
package,

the product being a product obtained by putting the fish meat
paste food into the vacuum package and then subjecting the
vacuum package to a heat sterilization treatment at a
temperature of less than 105°C, and

being for storing at a normal temperature,

when tested after storage in the vacuum package at $30 \pm 2^{\circ}\text{C}$
for 90 days in accordance with a method described in Standard
methods of analysis in food safety regulation - Microorganism

(Revised 2nd edition, 2018),

the fish meat paste food satisfying the following aseptic conditions:

the viable bacterial count is less than 300 CFU/g as tested on a standard agar medium;

the food is tested negative for coliforms on an XM-G agar medium;

the food is tested negative for *Escherichia coli* on an XM-G agar medium; and

the food is tested negative for *Staphylococcus aureus* on an egg-yolk mannitol salt agar medium.

[0014]

In one embodiment of the present invention, a product satisfying the above-mentioned aseptic conditions after storage in the vacuum package at $30 \pm 2^{\circ}\text{C}$ for 240 days is described.

[0015]

In one embodiment of the present invention, a product in which the fish meat paste food is in a form selected from the group consisting of a steamed form, a grilled form, a boiled form, and a deep-fried form is described.

Effects of the Invention

[0016]

The present invention can provide a fish meat paste product that can be stored at a normal temperature for a long time and that has an excellent flavor, texture, and taste.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a graph showing sterilization treatment conditions of products according to Examples and Comparative Examples of the present invention.

PREFERRED MODE FOR CARRYING OUT THE INVENTION

[0018]

The present invention will be described in detail with reference to embodiments.

[0019]

<<Packaged fish meat paste product>>

A packaged fish meat paste product according to the present invention is a product that includes a fish meat paste food contained in a vacuum package and that, when tested after storage at $30 \pm 2^{\circ}\text{C}$ for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018), satisfies aseptic conditions below:

viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;

coliforms: test negative on an XM-G agar medium;

Escherichia coli: test negative on an XM-G agar medium; and

Staphylococcus aureus: test negative on an egg-yolk mannitol salt agar medium.

[0020]

The product preferably satisfies the above-mentioned

aseptic conditions even after storage for 120 days, more preferably 240 days, or even longer.

[0021]

In a product according to one embodiment of the present invention, the packaged fish meat paste product is sufficiently sterile as mentioned above, but does not have a retort odor.

[0022]

In general, although a causative substance of the "retort odor" has not yet been definitely identified, food contained in a package is known to present an unpleasant odor or an unusual odor generated as a result of a retort process for sterilization, representatively a severe heat history of 120°C for about 15 minutes. The "retort odor" representatively includes, but is not limited to, a resin odor and a metallic odor which are generated as a result of materials such as a synthetic resin that make up the package being exposed to harsh conditions of the retort process to thereby partially decompose the materials or elute and transfer low-molecular-weight components in the materials to transfer an odor to a raw material of the food; and an odor due to amines and aldehydes generated by decomposition of amino acids as well as a sulfur-containing compound such as hydrogen sulfide generated by decomposition of a sulfur-containing amino acid included in the raw material of the fish meat paste food as a result of the raw material of the fish meat paste food being exposed to an overheated condition during the retort process.

In particular, the latter is difficult to avoid as far as it undergoes a heat history at a high temperature, that is, the retort process.

[0023]

The raw material of the food in the fish meat paste product according to the present invention preferably does not have the odor generated as a result of the raw material being exposed to an overheated condition, among such various retort odors. More preferably, the raw material has neither the odor generated as a result of the raw material of the fish meat paste food being exposed to an overheated condition nor the resin odor and the metallic odor which are generated as a result of materials such as a synthetic resin that make up the package being exposed to the retort process.

[0024]

The reason why the fish meat paste food does not have the retort odor in one embodiment of the present invention is that the fish meat paste food is heat-sterilized in a sufficiently low-temperature range compared to the retort process as described below in order to achieve the desired aseptic conditions.

[0025]

When seen from another standpoint, the packaged fish meat paste product according to the present invention satisfies the above-mentioned aseptic conditions, and the product according to the present invention is obtained by putting the raw material of the fish meat paste food serving

as a raw material into a vacuum package and then heat-sterilizing the vacuum package at a temperature of less than 105°C, preferably 90°C or more (more preferably 95°C or more) but less than 105°C.

[0026]

The product according to the present invention obtained by a heat sterilization treatment at a temperature of less than 105°C and is not easily distinguishable in terms of sterility and is difficult to adequately differentiate in terms of chemical composition, structure, or other testable parameters, etc. from, for example, a product obtained by a heat sterilization treatment at a temperature of 120°C or more, that is, retort-sterilization process. However, the product according to the present invention can be easily and clearly distinguished from the retort-sterilized product at least with a human sense of taste (and sense of smell). The product according to the present invention obtained by a heat sterilization treatment at a temperature of less than 105°C would be evaluated as superior to the retort-sterilized product in terms of taste, texture, flavor, gustation, etc. by at least half of those who eat both the products and generally almost all of those who eat both the products.

[0027]

Note that, in one embodiment of the present invention, the above-mentioned aseptic conditions have only to be satisfied in one or more products, but preferably five or more products and specifically all of ten or more products satisfy

the conditions. The upper limit of the number of the products satisfying the aseptic conditions is not particularly limited, but may be 20 or less.

[0028]

Each component of the product according to the present invention will be described in more detail.

[0029]

<Raw material>

The raw material of the fish meat paste food is not particularly limited. For example, warmwater or tropical fish such as Silver croaker, Deep-sea smelt, lizard fish, Daggertooth pike conger, hairtail, flying fish, Golden threadfinbream, and Red bigeye; coldwater fish such as Walleye pollack, grenadiers, arabesque greenling, Broadbanded thornyhead, Long shanny, and salmon; Hake (sea fish belonging to the family Merlucciidae of the order Gadiformes) such as Pacific whiting, Blue grenadier, and Southern blue whiting; pelagic large fish such as tuna, marlin, and sharks; dark fleshed fish such as sardines, mackerel, and horse mackerel; cephalopods such as squid and octopus; crustaceans such as shrimp, crab, and krill; as well as eggs thereof may be used alone or a plurality thereof may be used in combination. Note that, for simplicity, the term "fish" or "fish meat" are hereinafter simply used, but the term means not only fish, but also non-fish aquatic products such as cephalopods and crustaceans as mentioned above and meat thereof.

[0030]

Commercially available fish meat paste, especially frozen fish meat paste, prepared from such a raw material may also be used. When such fish meat paste is used, many of preliminary steps of refining fish meat can be omitted from a process for producing the raw material of the fish meat paste food as described below.

[0031]

<Secondary material>

For example, vegetables such as onion, spring onion, burdock, carrot, ginger, and mibuna (Japanese greens); fillets of squid, octopus, shrimp, and crab; small fish such as young sardines; quail egg, tofu, cheese, and other processed food may be added in an appropriate amount.

[0032]

<Seasoning>

Various seasonings may be added to the product according to the present invention. For example, high-fructose corn syrup, soy sauce, thick malt syrup, sake, starch, spices, salt, seafood extracts, water, and other minor additive ingredients may be contained.

[0033]

<Fish meat paste food>

In the product according to the present invention, a form of the fish meat paste food contained in a vacuum package is not particularly limited and may be any of conventionally known forms. Specific examples thereof include a steamed form such as kamaboko (steamed fish cake) including steamed fish

cake served on a board, kanikama (steamed fish cake shaped and colored to resemble crab meat), sujikamaboko (gristly fish cake), sumaki (roll-shaped steamed fish cake), and the like, hanpen (white square fish cake), and a fish meat sausage; a grilled form such as chikuwa (tube-shaped fish cake), bamboo-leaf-shaped fish cake, and datemaki (rolled omelet mixed with fish meat paste); a boiled form such as hanpen, a fish ball, and naruto-maki (fish cake with a spiral whirlpool-like pattern); and a deep-fried form such as deep-fried fish cake (called as satsuma-age, tempura, tsuke-age, or the like depending the region), deep-fried shrimp cake, deep-fried young sardine cake, and gansu (fish paste cutlet). The deep-fried fish cake includes not only those having the above-mentioned names but also those affixed with names of the above-mentioned secondary materials added in various aspects.

[0034]

The raw material of the fish meat paste food may be a processed food utilizing properties of actin and myosin which are salt-soluble proteins constituting main components of fish myofibrils.

[0035]

The raw material of the fish meat paste food may be generally produced by mincing a fish meat paste raw material such as fish meat with salt, adding a seasoning, etc., shaping, and then heating at a temperature of 95°C or less to thereby form a gel, as described below. In this process, the actin and the myosin in the raw material are dissolved to form

a network structure by adding salt to the raw material and kneading together, which gives the product the "ashi", that is, a highly elastic and resilient texture inherent to fish meat paste products. An extent of the ashi can generally be assessed by a combination of a sensory evaluation (chewing and bending tests) and a physical measurement (tensile and plunger indentation tests).

[0036]

<Process for producing raw material of fish meat paste food>

<Cooking method>

In the product according to the present invention, the fish meat paste food or raw materials thereof can take various forms. A basic cooking method may be any form of cooking, for example, grilling, simmering, deep-frying (frying), or steaming. When cooking, various seasonings and spices, as well as the above-mentioned various vegetables, especially condiment vegetables, marine products, and other secondary materials can be included together in the product.

[0037]

Note that, the above-listed cooking forms are mere common methods for processing the raw material of the fish meat paste product, and the packaged fish meat paste product according to the present invention or raw materials thereof do not need to be cooked exactly according to such cooking methods or recipes.

[0038]

<Vacuum packaging>

In the product according to the present invention, the fish meat paste food is packaged by a vacuum package. The "vacuum packaging", as used herein, means packaging with a degree of internal decompression as commonly used in the field of food packaging, not limited to an absolute vacuum state. Specifically, for example, the inside of the package can be decompressed to a pressure below an atmospheric pressure including, but is not limited to, 2×10^2 Pa or less and more preferably 10^1 Pa or less.

[0039]

A package to be used for vacuum packaging may be a common package to be used for vacuum-packaging processed food. For example, oxygen permeability at 23°C (0% relative humidity) of the package is not particularly limited, but is preferably 500 $\text{cm}^3/(\text{m}^2 \cdot 24\text{hr} \cdot \text{atm})$ or less, 50 $\text{cm}^3/(\text{m}^2 \cdot 24\text{hr} \cdot \text{atm})$ or less, and further preferably 10 $\text{cm}^3/(\text{m}^2 \cdot 24\text{hr} \cdot \text{atm})$ or less. The oxygen permeability is measured in accordance with JIS K 7126A, Method B (23°C, 0% RH).

[0040]

Examples of such a low-oxygen-permeable packaging material include appropriately molded single- or multi-layered sheet or film packaging materials with an oxygen barrier layer used for ordinary processed food. As the oxygen barrier layer, a layer including conventionally known materials, for example, a metal foil such as an aluminum foil; an inorganic deposited film such as a silica deposited film and an alumina deposited film; an oriented nylon (ONY) film, a non-oriented nylon film,

an oriented polypropylene (OPP) film, a polyethylene terephthalate (PET) film, a polyvinylidene chloride-coated oriented nylon (KON) film, a polyvinylidene chloride-coated oriented polypropylene film, a polyvinylidene chloride film, and an ethylene-vinyl acetate copolymer saponified film is preferably used.

[0041]

A film with an excellent sealing property can be disposed on an inner layer of the packaging material as a sealant layer. As the film, for example, a film of low-density polyethylene, medium-density polyethylene, high-density polyethylene, non-oriented polypropylene, linear low-density polyethylene (LLDPE), ultra-low-density polyethylene, an ethylene-vinyl acetate copolymer, an ethylene-acrylic acid copolymer, an ethylene-methacrylic acid copolymer, etc. can be used.

[0042]

Specific examples of a shape of the package include a flat pouch, a standing pouch, a pouch with nozzle, a pillow bag, and a gusset bag. The package can be provided with an easy opening property, an easy tearing property, a shrinking property, a microwave oven suitability, a UV blocking property, a design property, etc. by arbitrarily selecting a material composition in a laminate film which is the packaging material constituting the package. Vacuum-packaging may be performed, for example, using the following method: a three-sided seal bag is made of a film, a content, that is, the raw

material of the fish meat paste food is put into the bag, and then the bag is sealed by decompressing and then sealing at an opening using a vacuum packaging machine.

[0043]

The packaging material is not particularly limited, but, for example, those made of a laminated film having three or more layers at least including a deposited polyethylene terephthalate (PET) film layer, an oriented nylon (ONY) film layer, and a non-oriented polypropylene (CPP) film layer from an outer side, specifically, for example, a laminated film of deposited PET12/ONY15/CPP60 (numerals correspond to film thicknesses (μm)) are preferably used from the viewpoints of excellent gas impermeability, stable storage and transportation abilities, compatibility with boiling and electron beam heating such as microwaving, and less odor transferred from plastic constituting the package to the raw material of the fish meat paste food.

[0044]

In the product according to the present invention, the packaging material is preferably transparent or translucent so that the fish meat paste food therein being aesthetically pleasing can be seen.

[0045]

In the product according to the present invention, the fish meat paste food is vacuum-packaged in such a package and is sufficiently aseptic. Therefore, the product can maintain stable quality over a long time not only when refrigerated- or

frozen-stored but also when stored at a normal temperature.

[0046]

The product according to the present invention, when tested after storage at $30 \pm 2^{\circ}\text{C}$ for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018), satisfies aseptic conditions below:

viable bacterial count: less than 300 CFU/g as tested on a standard agar medium;

coliforms: test negative on an XM-G agar medium;

Escherichia coli: test negative on an XM-G agar medium; and

Staphylococcus aureus: test negative on an egg-yolk mannitol salt agar medium.

[0047]

The product preferably satisfies the above-mentioned aseptic conditions even after storage for 120 days, more preferably 240 days, or even longer.

[0048]

The product according to the present invention may be refrigerated- or frozen-stored. The number of days specified herein, such as after storage for 90 days, after storage for 120 days, after storage for 240 days, etc. at a normal temperature ($25 \pm 2^{\circ}\text{C}$) is the number of days from the time point at which the product begins to be stored after the product is brought back to a normal temperature ($25 \pm 2^{\circ}\text{C}$).

[0049]

<Method for producing packaged fish meat paste product>

A method for producing the packaged fish meat paste product according to the present invention will be described in detail with reference to specific embodiments.

[0050]

For producing the product according to the present invention, steps of processing the raw material of the fish meat paste food prior to vacuum packaging can take various aspects in accordance with a type of the fish meat paste food. When the raw material of the fish meat paste food is put into a package, vacuum-packaged, and then heat-sterilized, the thus- vacuum-packaged raw material of the fish meat paste food is desirably heat-sterilized at a temperature of 90°C or more (preferably 95°C or more) but less than 105°C for 120 to 40 minutes.

[0051]

Generally, a retort pouch is representatively sterilized under conditions at 120°C for 5 to 20 minutes, but a product produced under such conditions loses the ashi inherent to the fish meat paste food, deteriorates in texture (elasticity), and is impaired in terms of taste and flavor. In particular, when the product of the fish meat paste food is provided as in the present invention, the raw material of the fish meat paste food typically contains a certain level of salt (including salt from seasonings). However, when the raw material containing the salt is heat-treated at such a high temperature of 120°C or more, properties of fish meat serving as the raw material tend to be greatly impaired. On the contrary, when

the raw material undergoes a heat sterilization treatment at a temperature of 90°C or more (preferably 95°C or more) but less than 105°C, properties such as texture, taste, and flavor inherent to the fish meat paste food can be significantly prevented from deteriorating.

[0052]

Conditions for the heat sterilization treatment may be more preferably at a temperature of 90°C or more and 100°C or less for 120 to 80 minutes, and specifically at about 95°C for about 100 minutes. The present inventor has found that a heat sterilization treatment at a temperature of 90°C or more but less than 105°C for an appropriate treatment time surprisingly achieves both sufficient sterility to withstand storage at a normal temperature and a texture, etc.

[0053]

It is enough to perform once the heat sterilization treatment at a temperature of 90°C or more (preferably 95°C or more) but less than 105°C for 120 to 40 minutes, but, in order to improve sterility, a treatment for a relatively short time such as 50 minutes or less is preferably performed twice or more, in particular, twice. Note that, when the heat sterilization treatment is performed more than once as mentioned above, the raw material of the packaged fish meat paste product is placed at a temperature lower than the temperature during the heat sterilization treatment and preferably cooled to a normal temperature such as about 23°C $\pm$ 5°C between the heat sterilization treatments.

[0054]

A method for processing the raw material of the fish meat paste food prior to the heat sterilization treatment can take various aspects in accordance with a type of the fish meat paste food or a cooking method thereof. However, the raw material is preferably not treated at such a high temperature of 120°C or more for a long time (specifically 5 minutes or more) even if heated; and a seafood material is also preferably cooled to 20°C or less after the heat treatment.

[0055]

A method for producing a packaged fish meat paste product according to the present invention will be described in detail with reference to specific examples.

[0056]

In this embodiment, frozen fish meat paste serving as a raw material is received at a raw material receiving inspection, and checked whether a product name, specifications, an expiration date, a place of origin, or the like is correct. Fresh fish meat paste can also be used as the raw material instead of the frozen fish meat paste. However, the frozen fish meat paste is preferably used to maintain uniform and stable product quality without being affected by factors such as seasonal variation and a temperature change in a raw material supply route or factory facilities, etc. In order to prevent product defects due to the raw material itself from occurring, the raw material brought in is checked for an initial temperature of -18°C or less and the presence

of a broken packaging box, etc. Then, in a raw material thawing step, the raw material is put into a special container with drainage holes at the bottom and naturally thawed. Note that, a thawing temperature is not particularly limited, but is desirably a temperature of 15°C or less. This is because the thus-thawed raw material may be perishable when the temperature is 20°C or more. The period of time for natural thawing may be any as long as the raw material is sufficiently thawed, but usually about 12 to 24 hours and representatively about one night is enough for natural thawing.

[0057]

The thus-thawed fish meat is then roughly ground using a grinder. Upon rough grinding, ice is added to prevent a temperature from increasing. Then, the thus-roughly ground fish meat is ground with salt in an amount of about 2 to 3%, and then with a seasoning, as necessary.

[0058]

If a secondary material for filling is added to the thus-produced fish paste, the fish paste is checked for quality prior to the addition of the secondary material for filling.

[0059]

The thus-produced fish paste including the filling is formed into a predetermined shape and then left to stand until high elasticity is generated (this step is called "suwari").

[0060]

The fish paste is then heated in a heating device by any of boiling, deep-frying, steaming, or grilling to be formed

into a predetermined product form. Thus, the raw material of the fish meat paste food is obtained and then cooled once for bagging.

[0061]

Then, for bagging, the raw material of the fish meat paste food is individually put into a package. The package is, for example, a three-sided seal bag made of a film. After the raw material of the fish meat paste food is put into the package, for vacuum packaging, the package is decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine.

[0062]

After vacuum packaging, for a weight inspection, the package is checked whether a product mass is in accordance with the specification and for the presence of vacuum leakage, and then, for a metal inspection, the package is checked for the presence of metal such as Fe or SUS potentially mixed into the package from manufacturing equipment, etc.

[0063]

Once the content of the vacuum-packaged product has been confirmed to be safe, for sterilization, the vacuum-packaged raw material of the fish meat paste food is heat-sterilized at 95°C for 100 minutes, which is an example falling within a range of conditions of a temperature of 90°C or more (preferably 95°C or more) but less than 105°C for 120 to 40 minutes. Note that, heat sterilization treatment conditions typical for the present invention are in the vicinity of the

virtual line shown in Figure 1 below (for example, but not limited to, within ± 5 minutes from the virtual line in 90°C or more but less than 105°C).

[0064]

After the heat sterilization treatment is completed, the product is immediately cooled using a refrigerator to a temperature of 20°C or less within one hour. Such rapid cooling suppresses further embrittlement of a cooked seafood material (steamed fish cake) than necessary and produces a steamed fish cake with a predetermined shape and softness (hardness).

[0065]

The thus-produced, vacuum-packaged fish meat paste product is then cooled, checked for the presence of a defect of vacuum packaging in a draining step, frozen-stored until shipment, if necessary, boxed, and shipped.

[0066]

The present invention has been described with reference to embodiments, but the present invention is not limited to these embodiments, and various changes or modifications may be made within the scope of the present invention as defined in the claims.

EXAMPLES

[0067]

The present invention will be specifically described with reference to Examples. Methods for evaluating characteristic

values are described below.

[0068]

Bacteriological examination

Fish meat paste foods were put into packaging containers, cooled, and immediately thereafter stored at $30 \pm 2^{\circ}\text{C}$ for 90 days, stored at $30 \pm 2^{\circ}\text{C}$ for 120 days, and stored at $30 \pm 2^{\circ}\text{C}$ for 240 days. Then, the fish meat paste foods were removed from the packaging containers and then tested for viable bacterial count using a standard agar medium; coliforms using an XM-G agar medium; *Escherichia coli* using an XM-G agar medium; and *Staphylococcus aureus* using an egg-yolk mannitol salt agar medium in accordance with the method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018).

[0069]

Retort odor and taste

After thawing in the packaging containers and then stored at a normal temperature ($25 \pm 2^{\circ}\text{C}$) for 30 days, the fish meat paste foods were removed from the packaging containers and subjected to a sensory test with the cooperation of 6 panelists including males and females. The age composition of the panelists who participated in the test was 2 in their 30s, 2 in their 40s, and 2 in their 50s, with a gender ratio of 1:1.

[0070]

Note that, each of the panelists was asked to eat the fish meat paste food that was removed from the packaging

container as it is (a normal temperature state) and to evaluate the presence or absence of a retort odor, taste (palatability as fish), and texture. Note that, evaluation criteria were as described below, and values obtained by averaging scoring results by the panelists and then rounding to the nearest whole number were determined as evaluation results. Note that, the panelists were not informed of, for example, a process by which each product was produced and the order of the fish meat paste foods served to each panelist was also randomized so as to be unpredictable.

[0071]

(Evaluation item: Retort odor)

5: There is only a smell inherent to a cooked product and no retort odor at all.

4: An unpleasant odor may be perceived somehow.

3: A retort odor is slightly perceived.

2: A retort odor is clearly perceived.

1: A retort odor is strongly perceived.

[0072]

(Evaluation item 2: Taste)

5: Very tasty with a taste inherent to a steamed fish cake (kamaboko).

4: Tasty with a taste inherent to a steamed fish cake.

3: Not bad.

2: Unpleasant with less taste inherent to a steamed fish cake.

1: Not tasty without a taste inherent to a steamed fish cake.

[0073]

(Evaluation item 3: Texture)

5: Very good.

4: Good.

3: Not bad.

2: Slightly bad.

1: Bad.

[0074]

Discrimination and preference between Example 1 and Comparative Example 1, Example 2 and Comparative Example 2, Example 3 and Comparative Example 3, and Example 4 and Comparative Example 4 were examined for the retort odor and the taste using a pair test.

[0075]

Example 1

Each of the heated deep-fried fish cakes (agekamaboko) was put into a three-sided seal bag made of a film (custom-made product made of a laminated film of deposited PET12/ONY15/PPP60, manufactured by REPLUS CO., LTD.). The bag was decompressed and then sealed by heat-sealing an opening with high-frequency induction heating, etc. using a vacuum packaging machine. After the vacuum packaging, the resultant product was heat-sterilized in a steam kettle at 90°C for 100 minutes. Immediately after the heat sterilization, the product was cooled using a refrigerator to a temperature of 20°C or less within one hour.

[0076]

Comparative Example 1

The products were produced in the same manner as in Example 1, except that the heat sterilization treatment in Example 1 was changed to a heat sterilization treatment at 100°C for 130 minutes (Comparative Examples 1-1), at 110°C for 50 minutes (Comparative Examples 1-2), at 120°C for 20 minutes (Comparative Examples 1-3), at 75°C for 150 minutes (Comparative Examples 1-4), or at 100°C for 30 minutes (Comparative Examples 1-5).

[0077]

Example 2

The product was produced in the same manner as in Example 1, except that the deep-fried fish cake (agekamaboko) in Example 1 was changed to a gristly fish cake (sujikamaboko), which was a steamed fish cake.

[0078]

Comparative Example 2

The product was produced in the same manner as in Comparative Example 1, except that the deep-fried fish cake in Comparative Example 1 was changed to a gristly fish cake, which was a steamed fish cake.

[0079]

Example 3

The product was produced in the same manner as in Example 1, except that the deep-fried fish cake in Example 1 was changed to a bamboo-leaf-shaped fish cake, which was a grilled fish cake.

[0080]

Comparative Example 3

The product was produced in the same manner as in Comparative Example 1, except that the deep-fried fish cake in Comparative Example 1 was changed to a bamboo-leaf-shaped fish cake, which was a grilled fish cake.

[0081]

Example 4

The product was produced in the same manner as in Example 1, except that the deep-fried fish cake in Example 1 was changed to a fish ball, which was a boiled fish cake.

[0082]

Comparative Example 4

The product was produced in the same manner as in Comparative Example 1, except that the deep-fried fish cake in Comparative Example 1 was changed to a fish ball (tsumire), which was a boiled fish cake.

[0083]

[Table 1]

	Bacteriological examination after 90 days				Bacteriological examination after 120 days			
	Viabale bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)	Viabale bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)
Example 1	300 or less	-	-	-	300 or less	-	-	-
Example 2	300 or less	-	-	-	300 or less	-	-	-
Example 3	300 or less	-	-	-	300 or less	-	-	-
Example 4	300 or less	-	-	-	300 or less	-	-	-
Comparative Example 1-4	Putrefaction	X	X	X	Putrefaction	X	X	X
Comparative Example 2-4	Putrefaction	X	X	X	Putrefaction	X	X	X
Comparative Example 3-4	Putrefaction	X	X	X	Putrefaction	X	X	X
Comparative Example 4-4	Putrefaction	X	X	X	Putrefaction	X	X	X
Comparative Example 1-5	100,000 or more	-	-	-	Putrefaction	X	X	X
Comparative Example 2-5	100,000 or more	-	-	-	Putrefaction	X	X	X
Comparative Example 3-5	100,000 or more	-	-	-	Putrefaction	X	X	X
Comparative Example 4-5	100,000 or more	-	-	-	Putrefaction	X	X	X
	Bacteriological examination after 240 days							
	Viabale bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)				
Example 1	300 or less	-	-	-				
Example 2	300 or less	-	-	-				
Example 3	300 or less	-	-	-				
Example 4	300 or less	-	-	-				
Comparative Example 1-4	Putrefaction	X	X	X				
Comparative Example 2-4	Putrefaction	X	X	X				
Comparative Example 3-4	Putrefaction	X	X	X				
Comparative Example 4-4	Putrefaction	X	X	X				
Comparative Example 1-5	Putrefaction	X	X	X				
Comparative Example 2-5	Putrefaction	X	X	X				
Comparative Example 3-5	Putrefaction	X	X	X				
Comparative Example 4-5	Putrefaction	X	X	X				

Ten samples for each product were subjected to the bacteriological examination and the evaluation results are shown in Table 1. For viable bacterial count, an average value or average status was entered, and, for other bacteria, the case where all 10 samples tested negative was represented by

the symbol "-" and the case where the samples were untestable due to putrefaction was represented by the symbol "X".

[0084]

Examples satisfied the aseptic conditions sufficient for storage at a normal temperature for a long time, but Comparative Examples did not.

[0085]

[Table 2]

	Retort odor	Taste	Texture
Example 1	4.7	4.5	4.3
Comparative Example 1-1	4.0	3.7	3.5
Comparative Example 1-2	3.2	3.0	2.8
Comparative Example 1-3	2.2	1.8	1.7
Example 2	4.6	4.6	4.4
Comparative Example 2-1	4.0	3.6	3.5
Comparative Example 2-2	3.0	3.2	3.0
Comparative Example 2-3	2.1	1.7	1.9
Example 3	4.5	4.6	4.4
Comparative Example 3-1	3.9	3.7	3.5
Comparative Example 3-2	3.1	3.0	2.8
Comparative Example 3-3	2.0	1.9	1.7
Example 4	4.7	4.6	4.2
Comparative Example 4-1	3.8	3.5	3.7
Comparative Example 4-2	3.3	2.8	3.0
Comparative Example 4-3	2.2	1.7	1.8

[0086]

Examples were superior to Comparative Examples in terms of the retort odor, the taste, and the texture between Example 1 and Comparative Example 1, Example 2 and Comparative Example 2, and Example 3 and Comparative Example 3 with a statistical

significance at a 0.1% risk rate.

[0087]

Then, the products were produced in the same manner as in Examples 1 to 4, except that the heat sterilization treatment was changed to a heat sterilization treatment at 90°C for 120 minutes, at 105°C for 40 minutes, or at 95°C for 95 minutes. The products were evaluated for the aseptic conditions and functionality. The results are shown in Tables 3 and 4.

[0088]

[Table 3]

	Bacteriological examination after 90 days			
	Viable bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)
Example 1-1 (Example 1 & 90°C, 120 min)	300 or less	Negative	Negative	Negative
Example 1-2 (Example 1 & 105°C, 40 min)	300 or less	Negative	Negative	Negative
Example 1-3 (Example 1 & 95°C, 95 min)	300 or less	Negative	Negative	Negative
Example 2-1 (Example 2 & 90°C, 120 min)	300 or less	Negative	Negative	Negative
Example 2-2 (Example 1 & 105°C, 40 min)	300 or less	Negative	Negative	Negative
Example 3-1 (Example 3 & 90°C, 120 min)	300 or less	Negative	Negative	Negative
Example 3-2 (Example 3 & 105°C, 40 min)	300 or less	Negative	Negative	Negative
Example 3-3 (Example 3 & 95°C, 95 min)	300 or less	Negative	Negative	Negative
Example 4-1 (Example 4 & 90°C, 120 min)	300 or less	Negative	Negative	Negative
Example 4-2 (Example 4 & 105°C, 40 min)	300 or less	Negative	Negative	Negative
Example 4-3 (Example 4 & 95°C, 95 min)	300 or less	Negative	Negative	Negative

Ten samples for each product were subjected to the bacteriological examination and the evaluation results are shown in Table 3. For viable bacterial count, an average value or average status was entered, and, for other bacteria, the case where one or more samples tested positive was represented

by "Positive" and the case where all 10 samples tested negative was represented by "Negative".

[0089]

[Table 4]

	Retort odor	Taste	Texture
Example 1-1 (Example 1 & 90°C, 120 min)	5.0	4.6	4.5
Example 1-2 (Example 1 & 105°C, 40 min)	4.5	4.5	4.2
Example 1-3 (Example 1 & 95°C, 95 min)	4.7	4.5	4.3
Example 2-1 (Example 2 & 90°C, 120 min)	4.9	4.6	4.6
Example 2-2 (Example 1 & 105°C, 40 min)	4.4	4.5	4.4
Example 3-1 (Example 3 & 90°C, 120 min)	4.9	4.3	4.5
Example 3-2 (Example 3 & 105°C, 40 min)	4.3	4.8	4.4
Example 3-3 (Example 3 & 95°C, 95 min)	4.7	4.5	4.5
Example 4-1 (Example 4 & 90°C, 120 min)	5.0	4.6	4.5
Example 4-2 (Example 4 & 105°C, 40 min)	4.6	4.4	4.1
Example 4-3 (Example 4 & 95°C, 95 min)	4.6	4.6	4.5

[0090]

As shown in Tables 3 and 4, it was confirmed that both sterility sufficient for storage at a normal temperature for a long time and excellent texture, taste, and flavor were able to be achieved, as long as the heat sterilization treatment was performed under conditions located between 90°C for 120 minutes and 105°C for 40 minutes, not exclusively 90°C for 100 minutes.

[0091]

Furthermore, the products were produced in the same manner as in Example 2, except that the heat sterilization condition was replaced by the value corresponding to each of the coordinates shown in Figure 1. The products were evaluated for the aseptic conditions. The results are shown in Table 5.

[0092]

[Table 5]

	Bacteriological examination after 90 days			
	Viable bacteria count (CFU/g)	Coliforms (CFU/0.1g)	Escherichia coli (CFU/0.1g)	Staphylococcus aureus (CFU/0.1g)
Example 2-3 (95°C, 95 min)	300 or less	Negative	Negative	Negative
Example 2-4 (98°C, 78 min)	300 or less	Negative	Negative	Negative
Example 2-5 (100°C, 67 min)	300 or less	Negative	Negative	Negative
Example 2-6 (102°C, 55 min)	300 or less	Negative	Negative	Negative
Comparative Example 2-4 (90°C, 60 min)	1,000,000 or more	Negative	Negative	Positive
Comparative Example 2-5 (100°C, 60 min)	100,000 or more	Negative	Negative	Negative
Comparative Example 2-6 (100°C, 30 min)	1,000,000 or more	Negative	Negative	Positive

Ten samples for each product were subjected to the bacteriological examination and the evaluation results are shown in Table 5. For viable bacterial count, an average value or average status was entered, and, for other bacteria, the case where one or more samples tested positive was represented by "Positive" and the case where all 10 samples tested negative was represented by "Negative".

[0093]

As shown in Figure 1, all of Examples in which the heat

sterilization treatments were performed under the conditions in the vicinity of the virtual line connecting the coordinates corresponding to Examples 2-1 and 2-2 satisfied the aseptic conditions sufficient for storage at a normal temperature for a long time. On the other hand, all of the Examples in which the heat sterilization treatments were performed under the conditions located below the vicinity of the virtual line in the graph of Figure 1 did not satisfy the aseptic conditions sufficient for storage at a normal temperature for a long time.

CLAIMS

1. A product comprising:

a fish meat paste food; and
a vacuum package,

the fish meat paste food being contained in the vacuum package,

the product having been heat-sterilized, the fish meat paste food having no retort odor and being for storing at a normal temperature,

when tested after storage in the vacuum package at $30 \pm 2^{\circ}\text{C}$ for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),

the fish meat paste food satisfying aseptic conditions where

a viable bacterial count is less than 300 CFU/g as tested on a standard agar medium;

the food is tested negative for coliforms on an XM-G agar medium;

the food is tested negative for *Escherichia coli* on an XM-G agar medium; and

the food is tested negative for *Staphylococcus aureus* on an egg-yolk mannitol salt agar medium.

2. A product comprising:

a fish meat paste food; and

a vacuum package,

the fish meat paste food being contained in the vacuum package,

the product being a product obtained by putting the fish meat paste food into the vacuum package and then subjecting the vacuum package to a heat sterilization treatment at a temperature of less than 105°C, and

being for storing at a normal temperature,

when tested after storage in the vacuum package at $30 \pm 2^{\circ}\text{C}$ for 90 days in accordance with a method described in Standard methods of analysis in food safety regulation - Microorganism (Revised 2nd edition, 2018),

the fish meat paste food satisfying aseptic conditions where

a viable bacterial count is less than 300 CFU/g as tested on a standard agar medium;

the food is tested negative for coliforms on an XM-G agar medium;

the food is tested negative for *Escherichia coli* on an XM-G agar medium; and

the food is tested negative for *Staphylococcus aureus* on an egg-yolk mannitol salt agar medium.

3. The product according to claim 1 or 2, satisfying the aseptic conditions according to claim 1 or 2 after storage in the vacuum package at $30 \pm 2^{\circ}\text{C}$ for 240 days.

4. The product according to any one of claims 1 to 3, wherein the fish meat paste food is in a form selected from the group consisting of a steamed form, a grilled form, a boiled form, and a deep-fried form.