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(54) Title: A PROCESS FOR THE PRODUCTION OF A COMPOSITE FISH PRODUCT, AND THE FISH PRODUCT OBTAINED WITH THIS PROCESS (57) Abstract The invention relates to a process for the production of a composite fish product by bringing the pieces of fish after or without an injection with brine or concentrated smoke into a form and by adhering the pieces to each other by means of a protein gel substantially consisting of fibrin. The solution further expediently contains a catalytic amount of thrombin. It is beneficial to incorporate a transaminase and calcium ions into the protein solution. The parts to be joined are brought into the form after wetting with the gel and adhere to each other. The composite product exhibits also after it has been cut into thin slices a good cohesion. Further the keeping qualities have been improved.		

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A process for the production of a composite fish product, and the fish product obtained with this process.

The invention relates to a process for the production of a composite fish product consisting of pieces of fish that have been adhered to each other, and to a product obtained with this process.

Such a process is known from Dutch Patent Application 85.013333 laid open to public inspection on December 1, 1986 describing a composite meat product wherein the meat parts are raw meat parts adhered to each other by means of a gel mainly consisting of fibrin. The joining of the meat parts is effected by mixing the meat parts, in generally being small meat parts, with a fibrinogen/thrombin solution and quickly (according to the example within five minutes) bringing it into a trunk shaped container, the inclusion of air being prevented as much as possible. The whole being kept in a cooled place (0° to 4°C) overnight to obtain a good gel adherence. The product obtained exhibits a good bonding in the slices obtained there from an can further be processed as a fresh meat product.

Further an example is given of the production of collared beef. After the removal of the pellicle, if any, of the cover of the rump the muscle meat is salted and spiced and subsequently wetted with fibrinogen / thrombin solution, the amount used being 125 of adhering liquid for 2 kg of meat. After an adhering during the night at 0° to 4°C a firmly adhered collared meat is obtained. According to the specification this method can be applied to fish too, however an example or further elucidation is not given.

Preferably a protein with fibrinogen in a concentration of at least 10 mg / ml and a catalytic amount of thrombin is used, Advantageously a transaminase (fibrin stabilising factor) and calcium ions are added.

The fibrinogen concentration of the protein solution is preferably 10 to 80 mg/ml. The protein solution contains at

least 1 NIH-unit of thrombin at each 100 mg fibrinogen.
Preferably a solution containing 3 to 6 NIH-units of thrombin
is used per 100 mg fibrinogen. It is beneficial to use blood
plasm with an fibrinogen concentration that has been increased
5 to at least 10 mg/ml as a protein solution.

A solution in water or in salt water can be used as a protein.
The salt solution contains up to 1 mole of NaCl per liter. It
is also possible to use a buffer solution having a pH-value of
at least 5 as a salt solution. The buffer solution has
10 advantageously a pH-value of 7.0 to 8.0. According to this
publication the process is performed at a temperature of 0° to
55°C.

Thrombin and fibrinogen are well known products. The
15 preparation of these products has been described in the
literature.

U.S. Patent 4,363,822 teaches a process for the production of
restructured meat products, wherein raw meat pieces are
20 comminuted by machine and then mixed with a protein solution
and are then given the desired shape. Herein small pieces of
raw meat together with the exudate obtained there from, are
pressed into a mould and frozen. The product is marketed in
the frozen state.

25 Now a process has been found for the production of a composite
fish product consisting of pieces of fish adhered to each
other, that is characterised by bringing the pieces of fish
after an optional injection with brine and concentrated liquid
30 smoke into a mould and adhering them to each other by means of
a protein gel mainly consisting of fibrin. Although the
aforementioned Dutch Patent Application states that meat also
encompasses fish, it is surprising that this process results
in a composite fish product with a good adherence. This
35 because fish is a very susceptible product, that accepts no
pressure without decay of the structure. The use of the
present process makes it possible to grant the fish species ,

which are often expensive, such a shape that they can be expediently portioned and well in such a way that it is possible to obtain a constant product of a constant quality. It is also possible to process product that has already been treated, for instance has already been treated with brine. Treatments that have not been described in the above mentioned literature place. A cautious laying down of the fish, salmon or holybut for instance, makes it possible to slice in such a way that the characteristic pattern of the fish (salmon) for instance, can be maintained. The objective is thus not to process small parts that would not show such a pattern, although it is of course possible.

It is expedient in the process of the invention to pile up the fish, salmon or holybut, in the form of sides or slices, in a mould. The sides or slices are then sprayed onto the (intended contact areas with fibrinogen and thrombin so that the pieces can adhere to each other by the activity thereof.

It is expedient to keep the fibrinogen in the supply container at minus 2° to plus 2°C, the thrombin being kept at 16° to 20°C, especially at 18°C. It is very surprising that thrombin remains in good condition under these circumstances for at least 24 hours.

It is expedient to spray with a solution according to the method described in Dutch patent application 91.01850, laid open to public inspection June 1, 1993, using two nozzles. sprayed is for instance in a ratio of 1 part of thrombin on 8 to 12 parts of fibrinogen, especially 1 part of thrombin on 10 parts of fibrinogen. The sides of slices of the fish, salmon for instance, are brought in the mould and after that a layer has been sprayed a new layer is brought onto. Then the moulds are not moved and maintained without any movement in a cooling house at ,e.g. 4°C and then maintained in the cooling house for another 48 hours, after what a good adhering is obtained. It is very surprising that with fish, where different from meat

or pork no pressure can be applied a good adherence is obtained without pressing the pieces together. Also the formation of interstices with air does not occur in practice.

- 5 Brine and/or concentrated smoke flavour, or in the liquid or as a powder, can be added by injection (concentrated smoke flavour is commercially available). It is preferred to use a saturated brine having a salt content of 20 to 25 % by weight in order to introduce not to much water into the product.
- 10 Preferably so called liquid smoke is used as a smoke flavour. A concentration of 360 ml of liquid smoke in 800 l of water is expedient. the amounts of brine and liquid smoke applied are adapted in accordance with the desired taste. On many
- 15 occasions the amount of brine applied is such that the ready product has a salt content of 1 to 3 % by weight. dependent on the taste desired sugar and flavours can be contained in the brine too. Too prevent loss of Calor a small amount of nitrite can be taken up in the brine. To this purpose the brine can be prepared starting from a mixture of sodium chloride and sodium
- 20 nitrite containing e.g. 0.2 to 0.6, especially 0.4% by weight, of sodium nitrite. frequently such an amount of liquid smoke is used that the final product contains 2 to 6% by weight of said components. Of course this treatment results in an increased water content of the fish treated. It is
- 25 recommendable to add a drying step to prevent loss of taste and loss of substantiality. This is expediently performed by passing over a stream of dry air at room temperature during 45 minutes, e.g. After such a treatment the water content is 100 to 110% of the original water content. If desired it is
- 30 possible to smoke the product. After this treatment the product can be portioned. Salmon is usually sliced to 0.2 to 0.8 cm slices. By choosing the correct cutting direction the easily recognisable salmon pattern is obtained.
- 35 The product obtained can be packed after or without portioning. If kept cooled in a mixture of nitrogen and carbon dioxide the shelf life of this treated salmon is 14 days

longer than of the untreated salmon stored in the same way. Generally a ratio of nitrogen to carbon dioxide of 40-70 to 20-40% is preferred. However, here a ratio of 30 to 40 % by weight of nitrogen and 60 to 70% by weight of carbon dioxide is preferred.

Example 1

Sides of salmon are injected with brine (200 kg NaCl with 0.4% by weight NaNO_2 and 75 kg of sugar, replenished with water to 800 l) to a salt content of 4 % by weight and with liquid smoke (ARO-SMOKE P-50, a brine soluble viscous emulsion containing 40 to 45 mg of smoke flavour components per ml) up to a content of 4 % by weight in the final product. After the injection the product was dried by blowing air of room temperature until the weight was 110 % of the original weight. Then the sides were cut into pieces of about 1.5 kg. Said pieces were then placed into moulds of 50 x 13 x 8 cm (l x b x h). Said pieces of salmon were cut such that they could be brought into the moulds without a substantial inclusion of air. After each layer spraying was effected with a blood plasm having a fibrinogen concentration of 15 mg/ml and a thrombin solution having a concentration of 4 NIH-units of thrombin per 100 ml. A total weight of said solutions of 1 kg was applied for each 50 kg of salmon.

The solution of blood plasm applied had a temperature of 0°C, The thrombin solution had a temperature of 18°C. For the purpose of spraying both solutions were combined at a short distance before the spraying nozzle. The ratio was adjusted at 1 part of thrombin solution per 10 parts of fibrinogen solution. The filled mould was placed in a cooling house of 4°C kept without movement for 5 hours and then stored for another 48 hours at this temperature.

Slices of 8 x 13 cm of a thickness of 0.2 cm were cut from the product obtained. Said slices showed the structure of fresh salmon filet. The slices further exhibited a strong cohesion. 0.2 cm Thick slices were then placed in synthetic cans for packaging food. In stead of air a mixture of nitrogen and

carbon dioxide in a volume ratio of 35% N₂ and 65% CO₂ was brought into the packages. After closure of the cans they were placed in a cooling house of 4°C. After 30 days the packages were not swollen as yet, the usual sign of degradation of the quality. With salmon not treated according to the invention with thrombin and fibrinogen, however further in the same way, the packages were swollen after 23 days.

Example 2

Example 1 was repeated using a different mixing ratio of thrombin and fibrinogen , viz. 1 to 8. A product of the same quality was obtained.

Example 3

Example 1 was repeated using a different mixing ratio of thrombin and fibrinogen , viz. 1 to 12. A product of the same quality was obtained.

CLAIMS

- 1 A process for the production of a composite fish product
consisting of pieces of fish that have been adhered to each
other, characterised by bringing the pieces of fish after
an optional injection with brine and concentrated liquid
smoke into a mould and adhering them to each other by means
of a protein gel mainly consisting of fibrin.
- 2 The process of claim 1, characterised by applying to the
pieces of fish a protein solution of fibrinogen in a
concentration of at least 10 mg/ml and a catalytic amount
of thrombin and keeping the mixture in the mould until the
raw pieces of fish have adhered to each other.
- 3 The process of claim 2, characterised by using a protein
solution further containing a transaminase (fibrin
stabilising factor) and calcium ions.
- 4 The process of any of claims 1 to 3, characterised by using
a protein solution having a fibrinogen concentration of 10
to 80 mg/ml.
- 5 The process of any of claims 1 to 4, characterised by using
a protein solution with at least 1 NIH-unit of thrombin
per 100 mg of fibrinogen.
- 6 The process of claim 5, characterised by using a protein
solution containing 3 to 6 NIH-units of thrombin per 100 mg
of fibrinogen.
- 7 The process of any of claims 1 to 6, characterised by using
blood plasma of an increased fibrinogen concentration of at
least 10 mg/ml as the protein solution.
- 8 The process of any of claims 2 to , characterised by using
water or a salt solution as the solvent for the protein.
- 9 The process of claim 8, characterised by using a salt
solution containing up to 1 mole of NaCl per liter.
- 10 The process of claim 8, characterised by using a buffer
solution of a pH-value of at least 5 as the salt solution.
- 11 The process of claim 10, characterised by using a buffer
solution of a pH-value of 7.0 to 8.0.
- 12 The process of any of claims 1 to 11, characterised by

performing the process at a temperature of 0 to 55°C.

13 The process of any of claims 1 to 12, characterised by performing the process at a temperature of 0 to 25°C.

5 14 The process of any of claims 1 to 13, characterised by using a brine further containing sugar and / or further flavours.

15 A process for portioning fish characterised by cutting a slice of the desired dimensions from a product produced according to any of claims 1 to 14.

10 16 The process of any of claims 1 to 15, characterised by smoking the product obtained.

17 The product obtained according to any of claims 1 to 16.