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(21) International Application Number: PCT/DK94/00111 (22) International Filing Date: 18 March 1994 (18.03.94) (30) Priority Data: 0313/93 19 March 1993 (19.03.93) DK (71) Applicant (for all designated States except US): NOVO NORDISK A/S [DK/DK]; Novo Allé, DK-2880 Bagsvaerd (DK). (72) Inventors; and (75) Inventors/Applicants (for US only): BUDOLFSEN, Gitte [DK/DK]; Lyøvej 3, 3.tv, DK-2000 Frederiksberg (DK). NIELSEN, Peder Holk [DK/DK]; Toppevadvej 9, DK-3670 Veksø (DK). (74) Common Representative: NOVO NORDISK A/S; Att: Corporate Patents, Novo Allé, DK-2880 Bagsvaerd (DK).		(81) Designated States: AU, CN, JP, US, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE). Published <i>With international search report.</i>
(54) Title: METHOD FOR PRODUCTION OF A SPREAD (57) Abstract The method comprises generating a water phase containing dissolved protein, preferably skim milk powder, which water phase is treated with transglutaminase, treating this transglutaminase treated water phase in different ways, and mixing this treated water phase with a fat phase to form an emulsion. This method is simpler than prior art methods for production of spreads.		

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METHOD FOR PRODUCTION OF A SPREAD

Production of a spread is a well established procedure. Reference can be made to Aage Jart, Kompendium i fedtstofteknologi, III. Nogle fedtholdige levnedsmidler 3. udgave/3. oplag, Den Kgl. Veterinær- og Landbohøjskole, København, 1982, page 240 - 242. From Gunstone, Lipids in Foods Chemistry, Biochemistry and Technology, Pergamon Press, 1983, it appears that the production of spread or shortening usually involves the following steps: (1) preparation of the individual base stocks and hard fats, (2) formulation, (3) solidifying and plasticizing the blend, (4) packaging, and (5) tempering, if needed. Formulation consists merely in mixing the ingredients in preparation for step (3). Solidification and plasticizing are generally accomplished using scraped surface heat exchangers. In this equipment a steel shaft rotates in a tube which is cooled externally by ammonia. Scraper blades on the rotating shaft, moving at high speeds, are pressed against the cooled inner surface by centrifugal force. The high internal pressure and shearing action cause fast nucleation and crystallization during the short residence time of a few seconds. Typically, the melted fat blend, plus optional ingredients, is chilled rapidly from 46-49°C to 16-18°C. The supercooled melt is then pumped to a large diameter tube fitted with stator pins on the cylinder walls and a high speed rotating shaft equipped with rotor pins. This mechanically works the fat as it passes through the unit, the crystals growing and the mass partially solidifying. The "working" extends the plastic range of the product. Inert gas (10-20%) or air may be added here and dispersed in the shortening as small bubbles to improve the whiteness of the product. This may also contribute to creaming ability. The plastic mass is now pumped through a homogenizing valve and finally to package fillers. Containers may range in size from 0.45 kg to 172 kg drums. When tempering is needed, the packaged product is normally held for 24-72 hours in a constant temperature room, usually at 27-32°C. During tempering, crystallization proceeds slowly and the crystal structure is stabilized against changes that might otherwise take place during subsequent temperature variations encountered during normal handling and storage. However, should the product be allowed to be warmed above the melting point of the lowest

melting polymorphic form, the structure is lost and the product must be melted and reprocessed.

It appears that the prior art method for production of spread is rather laborious and time consuming, due to the sensitive crystallization process in the tube
5 cooler.

Thus, the purpose of the invention is the provision of a method for production of a spread which is simpler than the prior art method and which does not involve the sensitive crystallization.

The method according to the invention for production of a spread,
10 wherein a water phase containing a protein containing material is mixed with a fat phase containing an emulsifier and a fat mixture, is characterized by the fact that the method comprises the following steps in the sequence indicated: 1) the water phase, which contains the protein, is treated with transglutaminase, at a temperature, at which transglutaminase is active, 2) the pH-value is adjusted to 4.8 to 5.8, 3) the
15 water phase is tempered to a temperature between 20 and 40°C, and the fat phase is tempered to a temperature between 25 and 45°C, 4) the tempered water phase and the tempered fat phase are mixed until an emulsion is formed, and 5) the formed emulsion is heat treated to a temperature between 45 and 100°C. It can be noted that a gelation takes place during step 5).

20 It is to be understood that the method comprising the fact that step 5) is omitted, and that a similar heat treatment is carried out on the water phase between steps 2) and 3) is an embodiment of the method according to the invention. In this embodiment a gelation of the water phase occurs during the heat treatment of the water phase between steps 2) and 3).

25 Also it is to be understood that the water phase in step 1) can be reconstituted by removal and later addition of water. Thus, if convenient from a production point of view, the water phase can be formed as indicated in step 1), the water can be removed, e.g. by vacuum distillation, the formed dry phase can be stored and/or transported to another factory, and the water phase can be
30 reconstituted by addition of water.

Thus, the method according to the invention does not involve the sensitive crystallization. Furthermore, the addition of transglutaminase makes it

possible to reduce pH without precipitation of protein. pH-reduction is desirable from an organoleptical point of view and for shelf life reasons.

It goes without saying that the heat treatment in step 5) is interrupted after a certain duration, normally 1 minute.

5 Both in relation to prior art methods and to the method according to the invention flavors and colorants can be added to the spread.

From Leatherhead, Research reports, July 1992, No. 695 it appears that spreads can be produced by means of a water phase containing skim milk; however, caseinates, alginates or gelatine or corresponding stabilizers have to be
10 present, too, and the spread is produced by means of the prior art method with its previously indicated technical disadvantages.

Also, it appears from Japanese published patent application 3-160957 that a water phase containing skim milk powder to which transglutaminase has been added is able to form a gel by heating. However, this prior art method does not
15 involve the mixing with a fat phase, reduction of pH, and the subsequent production of a spread.

A preferred embodiment of the method according to the invention is characterized by the fact that the amount of the water phase is at least 15% (w/w) of the total amount of the water phase and the fat phase, and that the amount of the
20 fat phase is at least 5% (w/w) of the total amount of the water phase and the fat phase. In this manner a spread with a good spreadability is generated.

A preferred embodiment of the method according to the invention is characterized by the fact that the protein is skim milk powder from cow milk, caseinate, heat denatured whey protein from milk, or gelatin. Such proteins are
25 easily available starting materials.

A preferred embodiment of the method according to the invention is characterized by the fact that the transglutaminase is of human, of bovine or of microbial origin. These categories of transglutaminase are easily available and perform well in relation to the invention.

30 A preferred embodiment of the method according to the invention is characterized by the fact that in step 2) the pH value is adjusted to 5.0 to 5.2. In this embodiment a satisfactory consistency of the spread is obtained.

The method according to the invention will be illustrated by the following example.

EXAMPLE 1

Step 1

5 Skim milk powder is suspended in water to a protein concentration of 8%, corresponding to 114 g of skim milk powder in 386 g of demineralized water. CaCl_2 is added to a concentration of 5 mM Ca^{++} . 0.16 g of activated factor XIII is added to the skim milk powder suspension, and the temperature is kept at 37°C for 45 minutes. 4.0 g salt is added to the skim milk solution, and the transglutaminase
10 is inactivated by heating to 80°C for 5 minutes in a microwave oven. The total quantity is cooled to 20°C.

Step 2

The pH value is adjusted to 5.0.

Step 3

15 120 g of hardened vegetable fat is mixed with 280 g of soy oil, and the mixture is melted at 47°C. 6.25 g of the emulsifier Dimodan OT (a monoglyceride of a long chain fat acid) is added to 25 ml of the oil mixture, and the temperature is raised to 55°C in order to melt the emulsifier. The emulsifier mixture is mixed into the remaining part of the oil mixture, and the resulting mixture is tempered at 35°C; this
20 is the fat phase. Also, the water phase from step 2) is tempered to 30°C.

Step 4

The fat phase (78.0 g) and the water phase (122 g) from step 3 are mixed by means of a Silverson mixer.

Step 5

The emulsion from step 5 is immediately heat treated in a microwave oven for 32 seconds with an effect of 520 watt.

In this manner a spread with good spreadability and good organoleptic characteristics is produced.

CLAIMS

1. Method for production of a spread, wherein a water phase containing a protein containing material is mixed with a fat phase containing an emulsifier and a fat mixture, characterized by the fact the method comprises the following steps in the sequence indicated: 1) the water phase, which contains the protein, is treated with transglutaminase, at a temperature, at which transglutaminase is active, 2) the pH-value is adjusted to 4.8 to 5.8, 3) the water phase is tempered to a temperature between 20 and 40°C, and the fat phase is tempered to a temperature between 25 and 45°C, 4) the tempered water phase and the tempered fat phase are mixed until an emulsion is formed, and 5) the formed emulsion is heat treated to a temperature between 45 and 100°C.
2. Method according to Claim 1, characterized by the fact that the amount of the water phase is at least 15% (w/w) of the total amount of the water phase and the fat phase, and that the amount of the fat phase is at least 5% (w/w) of the total amount of the water phase and the fat phase.
3. Method according to Claim 1 or 2, characterized by the fact that the protein is skim milk powder from cow milk, caseinate, heat denatured whey protein from milk, or gelatin.
4. Method according to Claims 1 - 3, characterized by the fact that the transglutaminase is of human, of bovine or of microbial origin.
5. Method according to Claims 1 - 4, characterized by the fact that in step 2) the pH value is adjusted to 5.0 to 5.2.

INTERNATIONAL SEARCH REPORT

International application No.

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A. CLASSIFICATION OF SUBJECT MATTER		
IPC : A23D 7/02 According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC : A23D, A23J		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Patent Abstracts of Japan, Vol 14, No 350, C-744, abstract of JP, A, 2-128648 (Ajinomoto Co Inc), 17 May 1990 (17.05.90) --	1-5
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