FI000126703B

(12) **PATENTTIJULKAISU**
PATENTSKRIFT

(10) **FI 126703 B**

(45) Patentti myönnetty - Patent beviljats **13.04.2017**

(51) Kv.lk. - Int.kl.

A23C 9/13 (2006.01)
A23C 9/12 (2006.01)
A23C 9/142 (2006.01)
A23J 1/20 (2006.01)
A23J 3/08 (2006.01)

(21) Patenttihakemus - Patentansökning **20126278**

(22) Saapumispäivä - Ankomstdag **07.12.2012**

(24) Tekemispäivä - Ingivningsdag **07.12.2012**

(41) Tullut julkiseksi - Blivit offentlig **08.06.2014**

SUOMI – FINLAND
(FI)

PATENTTI- JA REKISTERIHALLITUS
PATENT- OCH REGISTERSTYRELSEN

(73) Haltija - Innehavare

1 • Valio Oy, Meijeritie 6, 00370 HELSINKI, SUOMI - FINLAND, (FI)

(72) Keksijä - Uppfinnare

1 • HEINO, Antti, HELSINKI, SUOMI - FINLAND, (FI)
2 • Helle, Ulla, HELSINKI, SUOMI - FINLAND, (FI)
3 • Koponen, Mika, HELSINKI, SUOMI - FINLAND, (FI)

(74) Asiamies - Ombud

Kolster Oy Ab, Salmisaarenaukio 1, 00180 Helsinki

(54) Keksinnön nimitys - Uppfinningens benämning

Hapatettuja maitopohjaisia tuotteita ja menetelmiä niiden valmistamiseksi

Syrade mjölkbaserade produkter och förfaranden för framställning därav

Acidified milk-based products and methods for producing the same

(56) Viitejulkaisut - Anförda publikationer

WO 2012110705 A1, WO 2011051557 A1, WO 2008063089 A1, WO 2011099876 A1, EP 1815747 A1, CA 1170493 A1

(57) Tiivistelmä - Sammandrag

A method for producing an acidified milk base is disclosed, comprising the steps of: providing a milk-based solution of a milk raw material and an ideal whey protein solution; pasteurizing the milk-based solution to provide a pasteurized milk-based solution; cooling the pasteurized milkbased solution to provide a cooled milk-based solution; adding a coagulant to the cooled mixture and ripening to provide the acidified milk-based product. The milk base is used in the production of acidified milk product, such as quark, fresh cheese, yoghurt or viili. The acidified milk products have desirable organoleptic properties, such as fresh taste and soft, velvety texture.

Esitetään menetelmä hapatetun maitopohjan valmistamiseksi, joka menetelmä käsittää vaiheet: aikaansaadaan maitoraaka-aineen ja ideaaliheraproteiiniliuoksen maitopohjainen liuos; pastöroidaan maitopohjainen liuos, jolloin saadaan pastöroitu maitopohjainen liuos; jäähdytetään pastöroitu maitopohjainen liuos, jolloin saadaan jäähdytetty maitopohjainen liuos; lisätään koagulantti jäähdytettyyn seokseen ja kypsytetään, jolloin saadaan hapatettu maitopohjainen tuote. Hapatettua maitopohjaa käytetään hapatetun maitotuotteen, kuten rahkan, tuorejuuston, jogurtin tai viilin valmistamiseksi. Hapatetuilla maitotuotteilla on halutut organoleptiset ominaisuudet, kuten raikas maku ja pehmeä, samettimainen rakenne.

ACIDIFIED MILK-BASED PRODUCTS AND METHODS FOR PRODUCING THE SAME

FIELD OF THE INVENTION

The present invention relates to milk-based products and methods for their preparation. More particularly, the invention relates to acidified milk products.

BACKGROUND OF THE INVENTION

Quark is unripened fresh cheese which is made from pasteurized skim milk by adding an acidifier to the milk. Typically, a small amount of rennet is also added. An acid curd is formed which is separated from the whey by means of various separators. Quark has a smooth texture and mild, acid flavour. Quark can be flavoured or blended with fruits, nuts, etc., and is typically used in cooking, in baking, in confectionery products or as a dessert.

It is still desirable to prepare quark products with increased yields and to improve the organoleptic properties thereof.

BRIEF DESCRIPTION OF THE INVENTION

It was surprisingly found that by means of an ideal whey protein solution acidified milk products with desirable organoleptic properties, such as fresh taste and soft velvety uniform texture, are obtained. It was further surprisingly found that the protein content of the acidified milk products can be increased by means of an ideal whey protein solution without increasing the viscosity which may impede the processability of the acidified milk products. More particularly, quark and yoghurt with increased total solids and yield are achieved without any problems in the production process. Said products have soft and velvety texture and are easily spreadable.

In an aspect, the invention provides a method for producing an acidified milk base, comprising the steps of:

- providing a milk-based solution of a milk raw material and an ideal whey protein solution,
- pasteurizing the milk-based solution to provide a pasteurized milk-based solution,
- cooling the pasteurized milk-based solution to provide a cooled milk-based solution,

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- adding a coagulant to the cooled mixture and ripening to provide the acidified milk base.

In still another aspect, the invention provides a use of the acidified milk base prepared by the method of the invention for the preparation of an acidified milk product.

In another aspect, the invention provides an acidified milk product having a ratio of whey protein to casein in the range from about 21:79 to about 50:50.

In a further aspect, the invention provides a method for producing an acidified milk product, comprising the steps of:

- providing the acidified milk base prepared by the method of the invention,
- sieving the acidified milk base to provide a sieved milk base,
- separating the sieved milk base to provide the acidified milk product.

In a still further aspect, the invention provides a method for producing yoghurt, comprising the steps of:

- providing the acidified milk base prepared by the method of the invention,
- mixing the acidified milk base to provide yoghurt.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates an embodiment of the method of the invention for producing an acidified milk base and its use in the preparation of quark, fresh cheese, yoghurt and viili.

DETAILED DESCRIPTION OF THE INVENTION

In the present invention

the term “an ideal whey protein solution” is used herein to mean a microfiltration (MF) permeate obtained from microfiltration of milk. The term is understood to encompass a concentrated form of the MF permeate which is obtained as an ultrafiltration retentate from ultrafiltration of the MF permeate. The ideal whey protein solution does not contain fat, micellar casein or casein dust or any other by-products from the cheese manufacture. Further, it is free of caseinomacropeptides and thermally formed κ-casein β-lactoglobulin complexes.

the term “milk raw material” is used herein to mean milk as such obtained from an animal, such as cow, sheep, goat, camel, mare, donkey or any other animal that producers milk suitable for human consumption, or pre-processed as desired to adjust protein, fat and/or lactose content to a desired level. The milk raw material can be full-fat (whole) milk, cream, low-fat milk, skim milk, buttermilk, colostrum, low-lactose or lactose-free milk, microfiltered milk, ultrafiltered milk, diafiltered milk, recombined milk from milk powder, organic milk or a combination of these, or a dilution of any of these. In an embodiment, the milk raw material is skim milk. In another embodiment, the milk raw material comprises whole milk and/or cream.

The milk raw material can be subjected to moderate heat treatment in order to improve the microbiological quality of the material.

The lactose content of the milk raw material can be reduced by means of any methods generally used in the art. Lactose can be removed by enzymatic methods by using a lactase enzyme to decompose lactose to monosaccharides. Lactose removal can also be performed by means of membrane techniques. Precipitation of lactose or chromatographic lactose separation are also suitable. If desired, one or more of the methods can be combined in an appropriate manner.

In an aspect, the invention provides a method for producing an acidified milk base. The acidified milk base can be typically described as sour milk. In an embodiment, the acidified milk base is ready-to-use beverage. In a further embodiment, the acidified milk base is further used in the preparation of acidified milk products. The acidified milk products include quark, yoghurt, viili and fresh cheese.

The method for producing the acidified milk base comprises the steps of:

- providing a milk-based solution of a milk raw material and an ideal whey protein solution,
- pasteurizing the milk-based solution to provide a pasteurized milk-based solution,
- cooling the pasteurized milk-based solution to provide a cooled milk-based solution,
- adding a coagulant to the cooled mixture and ripening to provide the acidified milk base.

The ideal whey protein solution is prepared by microfiltration of the milk raw material described above. The ideal whey protein solution is obtained as a microfiltration permeate. Microfiltration of the milk raw material is typically carried out at a temperature of about 2ºC to about 55ºC. In an embodiment, the microfiltration is carried out at about 10ºC.

Microfiltration can be performed by means of diafiltration to enhance the separation of whey proteins from casein included in milk. The concentration factor in the microfiltration can range from about 1 to about 70. In an embodiment, the concentration factor is 3 and no diafiltration is carried out. In another embodiment, the concentration factor is 16.5 with diafiltration.

The size of the microfiltration membrane is typically in the range of about 0.05 to about 0.5 µm. In an embodiment, the size is 0.08 µm (800 kDa).

In an embodiment, the microfiltration permeate is concentrated by ultrafiltration. The ideal whey protein solution is obtained as an ultrafiltration retentate. Ultrafiltration is typically performed at about 5ºC to about 55ºC. In an embodiment, the ultrafiltration is carried at about 10ºC. The concentration factor in the ultrafiltration can range from about 10 to about 115. In an embodiment, the concentration factor is 36. Ultrafiltration can be performed by means of diafiltration.

The protein content of the ideal whey protein solution can range from about 4% to about 25%. In an embodiment, the protein content of the solution is about 9%.

The lactose content of the ideal whey protein solution can be reduced, if desired. The lactose removal can be accomplished with the same methods as described above for the milk raw material.

The ideal whey protein solution is mixed with the milk raw material to provide a milk-based solution. The ideal whey protein solution is added in an amount to provide a ratio of whey protein to casein in the range from about 21:79 to about 50:50 to the milk-based solution. In an embodiment, the ratio is about 30:70.

In an embodiment of the invention, the protein content of the milk-based solution is in the range of about 2% to about 6%. In another embodiment, the protein content is less than about 4.6%.

The milk-based solution comprising the ideal whey protein solution is subsequently pasteurized. Without wishing to be bound by theory, it is hypothesized that in pasteurization, ideal whey protein is denaturated and ad-

hered on casein micelles. It was found that when the pasteurized milk-based solution is used in the production of quark, a substantial portion of the whey proteins are retained in quark mass. Further, beneficial rheological properties differing from those of the similar prior art products are provided to the quark product. The yield of the product is also increased due to the substantial retention of whey proteins in the quark mass. Pasteurization is typically carried out a temperature ranging from about 80ºC to about 95ºC for about 5 to about 15 minutes. In an embodiment, the pasteurization is carried out at about 87ºC for about 7 minutes.

After pasteurization, the pasteurized milk-based solution is cooled to a temperature at which coagulation (curdling), acidification, lactase treatment and ripening are carried out.

The method of the invention comprises a step for adding a coagulant, like rennet, chymosin, lactic acid, citric acid, hydrochloric acid, oxalic acid and/or calcium salt, in order to increase the yield of the acidified milk base product. Coagulation means simultaneous clotting and gel forming which are taken place by chemical or physical means. In the chemical coagulation, an acidifier or a ferment, such as a starter, an acid, an acidogen, for example GDL, lactic acid, citric acid, hydrochloric acid or oxalic acid are included. In the physical coagulation, coagulation is performed by means of a coagulant, such as rennet and chymosin, high pressure treatment or heating. In an embodiment of the invention, the coagulant comprises a starter, chymosin or both.

The temperature at which coagulation, acidification, lactase treatment and ripening are carried out can vary within the range of about 20ºC to about 45ºC, depending on the specific acidifier (starter) and enzyme used in the method. In an embodiment, the solution is cooled to about 29ºC. Typically, a plate heat exchanger is used in cooling. In an embodiment, the coagulant is added to the cooled milk-based solution.

Any acidifier commonly used in the preparation of acidified milk products can be used in the method of the present invention. Also, the acidification conditions, such as temperature, time and heat treatments are those commonly used in the field.

The cooled milk-based solution is acidified by adding a biological acidifier characteristic of each acidified milk product, e.g. a bulk starter or DVS starter (direct to vat starter), a chemical acidifier or organic or inorganic acids. For instance, a mesophilic starter (Lactococcus lactis ssp. cremoris, Lactococ-

cus lactis ssp. lactis, Leuconostoc mesenteroides ssp. cremoris and Lactococcus lactis ssp. diacetylactis) is typically used in the preparation of quark. Examples of suitable organic acids include glucono-delta-lactone and lactic acid. In the production of viili type products, in addition to lactic acid bacteria acidifiers also viili mould is used.

In an embodiment, the method of the invention comprises a lactose hydrolysis step in which lactose is split into monosaccharides, i.e. glucose and galactose. In an embodiment, a lactase enzyme is added to the cooled milk-based solution. The lactose hydrolysis may be carried out using lactase enzymes widely used in the dairy field and by means of conventional methods. There are several different commercially available lactase enzymes ([beta]-D-galactosidases) that are suitable for use in the process of the invention. These include for instance enzymes produced with the *Kluyveromyces fragilis* strain, such as HA lactase (Chr. Hansen A/S, Denmark), or enzymes produced with the *Kluyveromyces lactis* strain, such as Validase (Valley Research Inc., USA), Maxilact L2000 lactase (DSM, Holland) and Godo YNL (Godo Shusei Company, Japan). An example of mould-based lactase preparations is GLL cone, lactase produced by *Aspergillus oryzae* (Biocon Japan Ltd, Japan). The optimal hydrolysis conditions depend on the enzyme in question, and they are available from the manufacturers of commercial enzymes.

The cooled milk-based solution comprising an acidifier and a coagulant and an optional lactase enzyme, is ripened for about 3 to about 25 hours to provide an acidified milk base. The protein content of the acidified milk base is in the range of about 2% to about 6%. In an embodiment, the acidified milk base is sour milk. The acidified milk base had fresh, pure, mildly acidic flavour.

The acidified milk base of the invention can be used for producing of acidified milk products, such as quark, fresh cheese, viili and yoghurt. In another aspect, the invention thus provides a use of the acidified milk base of the invention for the preparation an acidified milk product, such as quark, fresh cheese, viili and yoghurt.

In still another aspect, the invention provides a method for producing an acidified milk product, comprising the steps of:

- providing the acidified milk base prepared by the method of the invention,

- sieving the acidified milk base to provide a sieved milk base,

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- separating the sieved milk base to provide the acidified milk product.

In an embodiment the acidified milk product is quark. The milk raw material used in the production of quark is typically skim milk. However, milk raw materials with higher fat content can also be used.

In another embodiment, the acidified milk product is fresh cheese. In the production of fresh cheese, the milk raw materials having higher fat content as compared to that used in the production of quark are typically used. In an embodiment, whole milk and/or cream are used as a milk raw material in the production of fresh cheese. In an embodiment of the fresh cheese production, the quark is subjected to homogenization.

In an embodiment, the acidified milk base is mixed prior to sieving.

In an embodiment of the invention, the acidified milk base is heat-treated prior to sieving in order to enhance the adhesion of the whey proteins to casein. In an embodiment, the heat treatment is thermisation. Thermisation can be carried out in conditions typically used in the preparation of quark products. Thermisation is typically performed at about 55ºC to about 68ºC for about 5 to about 20 minutes. In an embodiment, the thermisation is carried out at about 62ºC for about 8 minutes.

In cases where the acidified milk base is heat-treated, the heat-treated milk base is cooled to a separation temperature prior to sieving and separation of the milk base.

The sieving of the acidified milk base is conducted in a manner known in the field.

The sieved milk base, optionally heat-treated and cooled, is subsequently subjected to a separation step in which quark mass is separated from an acid whey solution containing milk minerals and optional lactase enzyme. The separation can be effected by a quark separator typically used in the production of quark products. The quark mass can also be separated by ultrafiltration where quark mass is retained in the ultrafiltration retentate and the whey solution is passed through a membrane into a permeate. For example, a plate & frame ultrafiltration apparatus can be used. The separation is carried out under the conditions, such as temperature, commonly used in the preparation of quark.

The quark mass can finally be cooled and packaged to a suitable consumer or food service package.

The total solids of the acidified milk product is about 14% to about 28%.

The final acidified milk product had desirable organoleptic properties, such as fresh, pure, mildly taste and soft velvety uniform texture. Further, the product is in easily spreadable form.

In a further aspect, the invention provides a method for producing yoghurt, comprising the steps of:

- providing the acidified milk base prepared by the method of the invention,
- mixing the acidified milk base to provide yoghurt.

The acidified milk product of the invention may be supplemented with probiotics such as *Lactobacillus LGG*, prebiotics such as galacto-oligosaccharides, amino acids such as taurine, proteins such as lactoferrin, and nucleotides.

Figure 1 illustrates an embodiment of the method of the invention for producing an acidified milk base. The Figure further illustrates a use of the acidified milk base in the production of quark, fresh cheese, yoghurt and viili. Accordingly, an ideal whey protein solution is combined with a milk raw material and then subjected to pasteurization. The pasteurized mixture is cooled. A coagulant and an acidifier and an optional lactase enzyme are added after cooling. The mixture is ripened to provide an acidified milk base.

In the production of quark or fresh cheese, the acidified milk base is mixed prior to sieving. The mixed acidified milk base can be subjected to thermisation. If thermised, the acidified milk base is subsequently cooled to a sieving temperature. The sieved milk base is subjected to separation to provide quark mass. The quark mass is finally cooled.

The acidified milk base can further be processed to yoghurt by mixing the acidified milk base.

The acidified milk base can also be processed to viili by using a suitable viili mould in the production of the acidified milk base.

The following examples are given to further illustrate the invention without, however, restricting the invention thereto.

Examples

Example 1. Preparation of ideal whey protein solution

Skim milk was microfiltered with polymeric microfiltration membranes of 800 kDa (Synder FR-3A-6338) at 10ºC. The microfiltration was per-

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formed with a concentration factor of 16.5.

The microfiltration permeate obtained from the microfiltration was concentrated by ultrafiltration with an ultrafiltration membrane of 10 kDa (Koch HFK-131 6438-VYT) and with a concentration factor of 36 at 10ºC to provide an ideal whey solution as an ultrafiltration retentate. The protein content of the ideal whey solution was 9%.

Example 2. Preparation of an acidified milk base (sour milk)

9 555 L of a milk raw material having a protein content of 3.6% and 445 L of the ideal whey protein solution obtained in Example 1 was mixed to provide 10 000 L of a milk-based solution having a protein content of 3.7%. The milk-based solution was stirred and pasteurized at a temperature of 87ºC for 7 minutes.

After pasteurization, the milk-based solution was cooled to a temperature of about 29ºC. An acidifier (starter culture) and lactase enzyme was added to the cooled solution. The pH of the acidified and lactose hydrolysed milk-based solution decreased to a level of about 4.5 during a period of time about 20 hours to provide an acidified milk base. The acidified milk base was then stirred.

Example 3. Preparation of quark

The acidified milk base prepared in Example 2 was further processed to quark as follows: The acidified milk base was thermised on a plate heat exchanger at a temperature of 63ºC. After thermisation, the acidified milk base was cooled to 43ºC and sieved. Subsequently, the acidified milk base was subjected to separation where quark mass was separated from the acidified milk base by a quark separator. 3 040 L of quark mass was obtained. Whey having a protein content of 0.5%, produced in the separation as a by-product, was discharged. The quark mass having total solids of about 15% was cooled to 13ºC and packaged.

The final quark product had fresh taste and soft and velvety uniform texture and was easily spreadable.

The composition of the quark is shown in Table 1 below.

Table 1

Sample	Total solids (%)	Protein (%)	Lactose (%)	NPN (mg/g)
Pasteurized milk-based solution	9.34	3.72	3.82	0.35

Quark	14.77	10.12	3.02	0.50
Whey	5.96	0.49	3.89	0.58

The essential amino acid composition of the quark was as follows:

Asparagine	8.4 g/kg
Proline	10.0 g/kg
Alanine	3.5 g/kg
Tyrosine	5.4 g/kg
Phenyl alanine	5.1 g/kg
Tryptophan	1.54 g/kg

The amino acid analysis shows that the ideal whey protein solution used in the quark preparation is included in the quark. The ratio of whey protein to casein of the quark is about 30:70.

The rheological properties of the quark are shown in Table 2.

Table 2

	Mean (Pa)	Standard deviation (Pa)	Coefficient of variation (%)	Min (Pa)	Max (Pa)
Quark	2667	497	18.63	2360	3240
Reference (normal quark)	6243	402	6.43	5780	6490

N=3

Example 4. Preparation of an acidified milk base (sour milk)

8 796 L of milk having a protein content of 3.6% and 1 281 L of the ideal whey protein solution prepared in Example 1 was mixed to provide 10 077 L of a milk-based solution having a protein content of 4.6%. The milk-based solution was processed to an acidified milk base in a similar manner as described in Example 2.

Example 5. Preparation of quark

The acidified milk base prepared in Example 4 was further processed to quark by a quark separator in a manner as described in Example 3. 3 197 L of quark mass was obtained. Whey having a protein content of 0.72%,

produced in the separation as a by-product, was discharged. The quark mass was cooled to 13ºC and packaged.

The final quark product had fresh taste and soft and velvety uniform texture and was easily spreadable.

The composition of the quark is shown in Table 3 below.

Table 3

Sample	Total solids (%)	Protein (%)	Lactose (%)	NPN (mg/g)
Pasteurized milk-based solution	9.38	4.63	3.38	0.36
Quark	15.90	10.83	2.78	0.56
Whey	5.91	0.72	3.35	0.57

The essential amino acid composition of the quark was as follows:

Asparagine	9.5 g/kg
Proline	9.9 g/kg
Alanine	3.9 g/kg
Tyrosine	5.5 g/kg
Phenyl alanine	5.2 g/kg
Tryptopfan	1.79 g/kg

The amino acid analysis shows that the ideal whey is included in the quark. The ratio of whey protein to casein of the quark is about 42:58.

The rheological properties of the quark are shown in Table 4.

Table 4

	Mean (Pa)	Standard deviation (Pa)	Coefficient of variation (%)	Min (Pa)	Max (Pa)
Quark	5287	162	3.06	5140	5460
Reference (normal quark)	6243	402	6.43	5780	6490

N=3

Example 6. Preparation of an acidified milk base (sour milk)

7 750 L of milk having a protein content of 3.6% and 2 250 L of the ideal whey protein solution prepared in Example 1 was mixed to provide 10 000 L of a milk-based solution having a protein content of 4.8%. The milk-based solution was processed to an acidified milk base in a similar manner as described in Example 2.

Example 7. Preparation of quark

The acidified milk base prepared in Example 6 was further processed to quark by a quark separator in a manner as described in Example 3. The quark mass was cooled to 13ºC and packaged.

The final quark product had fresh taste and soft velvety uniform texture and was easily spreadable.

Example 8. Preparation of an acidified milk base (sour milk)

852 L of milk having a protein content of 3.6% and 150 L of the ideal whey protein solution prepared in Example 1 was mixed to provide 1 002 L of a milk-based solution having a protein content of 4.4%. The milk-based solution was processed to an acidified milk base in a similar manner as described in Example 2 except that the pasteurization temperature was 86ºC.

Example 9. Preparation of quark

The acidified milk base prepared in Example 8 was further processed to quark as follows: The acidified milk base was thermised on a plate heat exchanger at 62ºC. After thermisation, the acidified milk base was cooled to 50ºC. Subsequently, the acidified milk base was subjected to separation where quark mass was separated from the acidified milk base by a plate & frame ultrafiltration apparatus. The quark mass having total solids of even about 27% was cooled to 13ºC and packaged.

The final quark product had fresh taste and soft and velvety uniform texture and was easily spreadable.

It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. A method for producing an acidified milk base, comprising the steps of:

- providing a milk-based solution of a milk raw material and an ideal whey protein solution, which is a microfiltration permeate obtained from microfiltration of milk,

- pasteurizing the milk-based solution at a temperature from about 80ºC to about 95ºC for about 5 to about 15 minutes to provide a pasteurized milk-based solution,

- cooling the pasteurized milk-based solution to provide a cooled milk-based solution,

- adding a coagulant to the cooled mixture and ripening to provide the acidified milk base.

2. The method of claim 1, wherein the ideal whey protein solution is an ultrafiltration retentate obtained from ultrafiltration of the microfiltration permeate.

3. The method of claim 1 or 2, wherein the microfiltration, ultrafiltration or both are carried out by using diafiltration.

4. The method of any of the preceding claims, wherein the protein content of the ideal whey protein solution is in the range of about 4% to about 25%, specifically about 9%.

5. The method of any of the preceding claims, wherein the milk raw material is skim milk.

6. The method of any of the preceding claims, wherein a ratio of whey protein to casein of the milk-based solution is in the range from about 21:79 to about 50:50, specifically about 30:70.

7. The method of any of the preceding claims, wherein the pasteurization is carried out at about 87ºC for about 7 minutes.

8. The method of any of the preceding claims, wherein the pasteurized mixture is cooled to a temperature from 20ºC to 45ºC, preferably to about 29ºC.

9. The method of any of the preceding claims, wherein the acidified mixture is ripened for about 3 to about 25 hours, preferably about 20 hours.

10. The method of any of the preceding claims, further comprising a lactose hydrolysis step.

11. The method of claim 10, wherein a lactase enzyme is added prior to ripening.

12. The method of any of the preceding claims, wherein a rennet is added prior to ripening.

13. The method of any of the preceding claims, wherein the protein content of the acidified milk base is about 2% to about 6%.

14. A use of the acidified milk base prepared by the method of any of claims 1 to 13 for the preparation of an acidified milk product, such as quark, fresh cheese, viili and yoghurt.

15. An acidified milk product having a ratio of whey protein to casein in the range from about 21:79 to about 50:50, specifically about 30:70, and total solids of about 14% to about 28%, comprising an ideal whey protein solution, which is a microfiltration permeate obtained from microfiltration of milk.

16. The acidified milk product of claim 15, which is quark, fresh cheese, yoghurt or viili.

17. A method for producing an acidified milk product, comprising the steps of:

- providing the acidified milk base prepared by the method of any of claims 1 to 13,
- sieving the acidified milk base to provide a sieved milk base,
- separating the sieved milk base to provide acidified milk product.

18. The method of claim 17, further comprising heat treatment of the acidified milk base.

19. The method of claim 17 or 18, wherein the total solids of the acidified milk product is about 14% to about 28%.

20. A method for producing yoghurt, comprising the steps of:

- providing the acidified milk base prepared by the method of any of claims 1 to 13,
- mixing the acidified milk base to provide yoghurt.

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Patenttivaatimukset

1. Menetelmä hapatetun maitopohjan valmistamiseksi, joka menetelmä käsittää vaiheet:

- aikaansaadaan maitoraaka-aineen ja ideaaliheraproteiiniliuoksen maitopohjainen liuos, joka ideaaliheraproteiiniliuos on maidon mikrosuodatuksesta saatua mikrosuodatuspermeaattia,
- pastöroidaan maitopohjainen liuos noin 80 – noin 95 °C:n lämpötilassa noin 5 minuutin – noin 15 minuutin ajan, jolloin saadaan pastöroitu maitopohjainen liuos,
- jäähdytetään pastöroitu maitopohjainen liuos, jolloin saadaan jäähdytetty maitopohjainen liuos,
- lisätään koagulantti jäähdytettyyn seokseen ja kypsytetään, jolloin saadaan hapatettu maitopohja.

2. Patenttivaatimuksen 1 mukainen menetelmä, jolloin ideaaliheraproteiiniliuos on mikrosuodatuspermeaatin ultrasuodatuksesta saatua ultrasuodatusretentaattia.

3. Patenttivaatimuksen 1 tai 2 mukainen menetelmä, jolloin mikrosuodatus, ultrasuodatus tai molemmat tehdään käyttäen diasuodatusta.

4. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin ideaaliheraproteiiniliuoksen proteiinipitoisuus on alueella noin 4 % - noin 25 %, erityisesti noin 9 %.

5. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin maitoraaka-aine on rasvaton maito.

6. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin maitopohjaisen liuoksen heraproteiini/kaseiini-suhde on noin 21:79 - noin 50:50, erityisesti noin 30:70.

7. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin pastörointi tehdään noin 87 °C:ssa noin 7 minuuttia.

8. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin pastöroitu seos jäähdytetään 20 - 45 °C:n lämpötilaan, edullisesti noin 29 °C:seen.

9. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin hapatettua seosta kypsytetään noin 3 - noin 25 tuntia, edullisesti noin 20 tuntia.

10. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, joka lisäksi käsittää laktoosin hydrolyysivaiheen.

11. Patenttivaatimuksen 10 mukainen menetelmä, jolloin laktaasi-entsyymiä lisätään ennen kypsytystä.

12. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin juoksetetta lisätään ennen kypsytystä.

13. Jonkin edellä olevan patenttivaatimuksen mukainen menetelmä, jolloin hapatetun maitopohjan proteiinipitoisuus on noin 2 % - noin 6 %.

14. Jonkin patenttivaatimuksen 1 - 13 mukaisella menetelmällä valmistetun hapatetun maitopohjan käyttö hapatetun maitotuotteen, kuten rahkan, tuorejuuston, viilin ja jogurtin valmistamiseksi.

15. Hapatettu maitotuote, jonka heraproteiini/ kaseiini-suhde on noin 21:79 - noin 50:50, erityisesti noin 30:70, kiintoainepitoisuus noin 14 % - noin 28 % ja joka sisältää ideaaliheraproteiiniliuosta, joka on maidon mikrosuodatuksesta saatua mikrosuodatuspermeaattia.

16. Patenttivaatimuksen 15 mukainen hapatettu maitotuote, joka on rahka, tuorejuusto, jogurtti tai viili.

17. Menetelmä hapatetun maitotuotteen valmistamiseksi, joka menetelmä käsittää vaiheet:

- otetaan jonkin patenttivaatimuksen 1 - 13 mukaisella menetelmällä valmistettu hapatettu maitopohja,
- siivilöidään hapatettu maitopohja, jolloin saadaan siivilöity maitopohja,
- separoidaan siivilöity maitopohja, jolloin saadaan hapatettu maitotuote.

18. Patenttivaatimuksen 17 mukainen menetelmä, joka käsittää hapatetun maitopohjan lämpökäsittelyn.

19. Patenttivaatimuksen 17 tai 18 mukainen menetelmä, jolloin hapatetun maitotuotteen kiintoainepitoisuus on noin 14 % - noin 28 %.

20. Menetelmä jogurtin valmistamiseksi, joka menetelmä käsittää vaiheet:

- otetaan jonkin patenttivaatimuksen 1 - 13 mukaisella menetelmällä valmistettu hapatettu maitopohja,
- sekoitetaan hapatettua maitopohjaa, jolloin saadaan jogurtti.

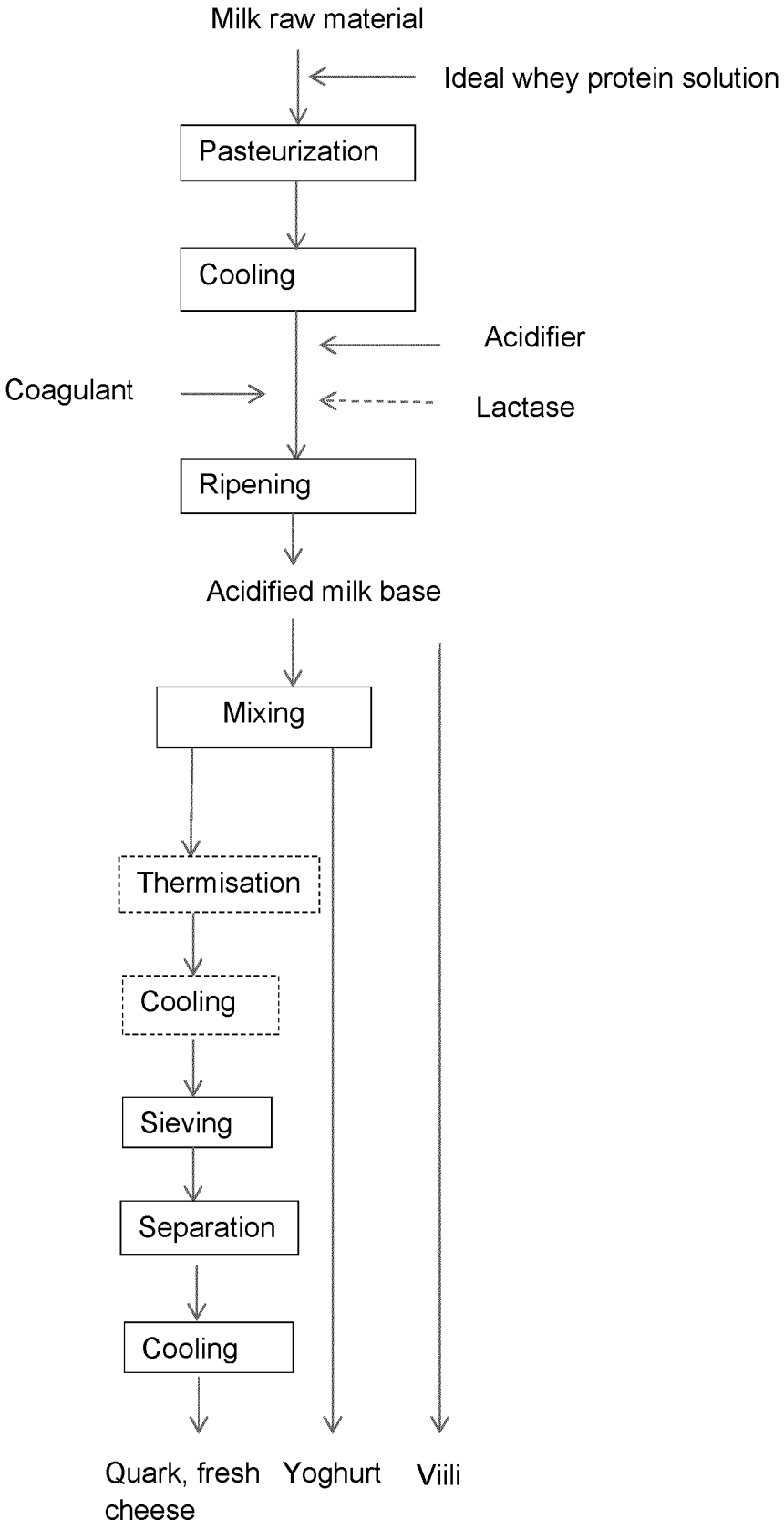

Fig. 1