

A Process for Preparing Soymilk, Soymilk as Prepared and The Use Thereof

TECHNICAL FIELD

[0001] The present invention particularly relates to a process for preparing soymilk, and to the soymilk as prepared and its use in food products, which belongs to the field of food technology.

BACKGROUND

[0002] Generally, the current processes for preparing soymilk include procedures such as soybean selection, washing, soaking, milling, separation, enzyme inactivation, homogenization, and sterilization. Among them, the main purpose of enzyme inactivation is to inactivate anti-nutritional factors such as trypsin inhibitors and rennin contained in soybeans, so as to retain the nutrients in soybeans to a greater extent.

[0003] Currently, the protein content of the soymilk and soymilk-based beverages available on the domestic market is generally much lower than 6%. Moreover, the soymilk and soymilk-based beverages produced by the existing technology also have problems such as heavy beany flavor, poor drinking taste and drinking experience, etc. In addition, the soymilk products produced by the existing technology have many sediments during the shelf life and thus have poor product stability, which affects the product quality.

[0004] Therefore, there is an urgent need for a process for preparing soymilk that can increase the protein content of the product, improve the drinking taste of the product and improve the stability of the product.

SUMMARY

[0005] The soymilk prepared by the process according to the present invention has good taste and little beany flavor. The soymilk product has a high protein content of 6% or more, a low sediment content and high product stability. On this basis, the present invention provides a soymilk product as prepared and its use in food products.

[0006] In a first aspect of the present invention, there is provided a process for preparing soymilk, comprising the steps of:

[0007] (1) subjecting soybeans to a pulp-milling treatment, to obtain a first milled material, wherein water is added to the soybeans prior to or during the pulp-milling treatment;

[0008] (2) subjecting the first milled material to pulp-milling treatment, to obtain a second milled

material;

[0009] (3) subjecting the second milled material to an enzyme-inactivation treatment, to obtain a first enzyme-inactivated product;

[0010] (4) subjecting the first enzyme-inactivated product to a solid-liquid separation, and collecting the liquid phase;

[0011] (5-1) subjecting the liquid phase to an enzyme-inactivation treatment, to obtain a second enzyme-inactivated product; and

[0012] (6) continuously stirring the second enzyme-inactivated product at 2°C to 15°C (e.g., 3°C, 5°C, 7°C, 9°C, 10°C, 11°C, 12°C, 14°C) for 2 to 10 hours (e.g., 4 hours, 5 hours, 7 hours, 8 hours, 9 hours), to obtain the soymilk.

[0013] In some embodiments according to the first aspect of the present invention, in step (6), the stirring is carried out at a speed of 100 to 700 rpm, such as 200 rpm, 300 rpm, 400 rpm, 500 rpm, 600 rpm.

[0014] In some embodiments according to the first aspect of the present invention, in step (1), the pulp-milling treatment is a coarse milling treatment, and the obtained first milled material is a coarse milled material in which the particle size of the particulate matter is not less than 100 mesh.

[0015] In some embodiments according to the first aspect of the present invention, in step (2), the pulp-milling treatment is a fine milling treatment, and the obtained second milled material is a fine milled material in which the particle size of the particulate matter is about 230 to 180 mesh, for example, 220 mesh, 200 mesh, 190 mesh.

[0016] In some embodiments according to the first aspect of the present invention, the process further comprises, prior to step (1), the steps (1') and optional step (1'') of:

[0017] (1') baking the soybeans, and dehulling the baked soybeans, to obtain dehulled soybeans;

[0018] (1'') soaking the dehulled soybeans in water, and draining off the water, to obtain soaked soybeans.

[0019] In some embodiments according to the first aspect of the present invention, the process comprises one or more of the following A to H.

[0020] A. the baking is carried out at a temperature of 95°C to 140°C, such as 100°C, 110°C, 120°C, 130°C;

[0021] B. the baking is carried out for a period of 100 to 200 seconds, such as 120 seconds, 140 seconds, 150 seconds, 160 seconds, 170 seconds, 180 seconds, 190 seconds;

[0022] C. prior to the dehulling, the baked soybeans are cooled; more preferably, the baked soybeans are cooled to 35°C or less, such as 30°C or less, 28°C, 20°C, 15°C, 10°C;

[0023] D. the dehulling is carried out by means of a vacuum vibratory dehuller;

[0024] E. the soaking is carried out at a temperature of 30°C to 65°C, such as 35°C, 40°C, 45°C, 50°C, 55°C, 60°C;

[0025] F. the soaking is carried out for a period of 1 to 30 minutes, such as 5 minutes, 10 minutes, 15 minutes, 20 minutes, 25 minutes;

[0026] G. the weight ratio of dehulled soybeans to water is 1: (1 to 10), such as 1:2, 1:4, 1:5, 1:7, 1:8, 1:9;

[0027] H. in step (1"), the pH of water is 6.5 to 7.5, such as 7.0.

[0028] Preferably, the pH of water is adjusted by adding a dilute solution of sodium bicarbonate (e.g., 0.1 to 0.5 mol/L of a sodium bicarbonate solution).

[0029] In some embodiments according to the first aspect of the present invention, the baking is carried out by using a hot air baking oven.

[0030] In some embodiments according to the first aspect of the present invention, the baked soybeans have a dry surface and a cracked skin.

[0031] In some embodiments according to the first aspect of the present invention, the dehulled soybeans are soybean flakes.

[0032] In some embodiments according to the first aspect of the present invention, the dehulled soybeans or baked soybeans are used for the pulp-milling treatment in step (1).

[0033] In some embodiments according to the first aspect of the present invention, in step (3), the enzyme-inactivation treatment is an enzyme-inactivation treatment by steam, which is carried out at a temperature of 40°C to 65°C (e.g., 45°C, 50°C, 55°C, 60°C) for a period of 110 to 200 seconds (e.g., 120 seconds, 140 seconds, 160 seconds, 170 seconds, 180 seconds, 190 seconds).

[0034] In some embodiments according to the first aspect of the present invention, in step (3), the enzyme-inactivation treatment is carried out at a steam pressure of 0.05 to 0.25 MPa, such as 0.1 MPa, 0.2 MPa.

[0035] In some embodiments according to the first aspect of the present invention, in step (3), the enzyme-inactivation treatment is carried out at a steam pressure of atmospheric pressure.

[0036] In some embodiments according to the first aspect of the present invention, in step (5-1), the enzyme-inactivation treatment is an enzyme-inactivation treatment by steam carried out at a temperature of 100°C to 150°C (e.g., 105°C, 110°C, 115°C, 120°C, 125°C, 130°C, 135°C, 140°C, 145°C) for a period of 40 to 180 seconds (e.g., 50 seconds, 60 seconds, 70 seconds, 80 seconds, 90 seconds, 100 seconds, 120 seconds, 130 seconds, 150 seconds, 160 seconds, 170 seconds).

[0037] In some embodiments according to the first aspect of the present invention, in step (5-1), the enzyme-inactivation treatment is carried out at a steam pressure of 0.3 to 3 MPa, such as 0.4 MPa, 0.6 MPa, 0.8 MPa, 1 MPa, 1.2 MPa, 1.5 MPa, 1.7 MPa, 2 MPa, 2.2 MPa, 2.4 MPa, 2.6 MPa,

2.8 MPa. 2.8 MPa.

[0038] In some embodiments according to the first aspect of the present invention, the process comprises the following (A) and/or (B):

[0039] (A) in step (1), the pulp-milling treatment is carried out at a temperature of 35°C to 65°C, such as 40°C, 45°C, 50°C, 55°C, 60°C;

[0040] (B) in step (2), the pulp-milling treatment is carried out at a temperature of 35°C to 65°C, such as 40°C, 45°C, 50°C, 55°C, 60°C.

[0041] In some embodiments according to the first aspect of the present invention, the process further comprises step (7) of subjecting the soymilk to a sterilization treatment.

[0042] In some embodiments according to the first aspect of the present invention, the soymilk is subjected to a steam-infusion sterilization treatment.

[0043] In some embodiments according to the first aspect of the present invention, the sterilization treatment is carried out at a temperature of 110°C to 150°C, such as 120°C, 130°C, 140°C.

[0044] In some embodiments according to the first aspect of the present invention, the sterilization treatment is carried out for a period of 2 seconds to 1 minute, for example, 5 seconds, 10 seconds, 20 seconds, 30 seconds, 40 seconds, 50 seconds.

[0045] In some embodiments according to the first aspect of the present invention, the process comprises one or more of the following a to g:

[0046] a. in step (1), the particulate matter in the first milled material has a particle size of not less than 100 mesh;

[0047] b. in step (1), the weight ratio of the added water to the soybeans is (1 to 16):1, such as 2:1, 4:1, 6:1, 7:1, 8:1, 10:1, 12:1, 14:1, 15:1;

[0048] c. in step (1), the water is added to the soybeans continuously or in batches during the pulp-milling treatment, preferably water is added to the soybeans continuously and evenly;

[0049] d. in step (1), the pH of water is 6.5 to 7.5, for example, 7.0; preferably, the pH of water is adjusted by adding a dilute solution of sodium bicarbonate (e.g., 0.1 to 0.5 mol/L of a sodium bicarbonate solution);

[0050] e. in step (2), the particulate matter in the second milled material has a particle size of 230 to 180 mesh, for example 220 mesh, 200 mesh;

[0051] f. in step (4), the solid-liquid separation is carried out through a slurry separator;

[0052] g. step (5-2) of degassing the second enzyme-inactivated product to obtain a degassed material is further included between steps (5-1) and (6).

[0053] In some embodiments according to the first aspect of the present invention, in step (5-2),

the second enzyme-inactivated product is degassed until no more air bubbles generated in the second product to obtain the degassed material.

[0054] In some embodiments according to the first aspect of the present invention, in step (5-2), the degassing treatment is carried out at a temperature of 75°C to 95°C, such as 80°C, 85°C, 90°C.

[0055] In some embodiments according to the first aspect of the present invention, in step (5-2), the degassing treatment is carried out at a pressure of -0.5 to -0.1 bar, such as -0.4 bar, -0.3 bar, -0.2 bar.

[0056] In some embodiments according to the first aspect of the present invention, the process further includes, between steps (5-2) and (6), a step (5-3) of homogenizing the degassed material to obtain a homogenized material.

[0057] In some embodiments according to the first aspect of the present invention, in step (5-3), the homogenization treatment is carried out at a temperature of 65°C to 85°C, such as 70°C, 75°C, 80°C.

[0058] In some embodiments according to the first aspect of the present invention, in step (5-3), the homogenization treatment is carried out at a pressure of 300 to 500 bar, such as 350 bar, 400 bar, 450 bar.

[0059] In some embodiments according to the first aspect of the present invention, the degassed material obtained in step (5-2) or the homogenized material obtained in step (5-3) is subjected to the stirring in step (6).

[0060] In a second aspect of the present invention, there is provided a soymilk, prepared by the process described in the first aspect of the present invention.

[0061] In some embodiments according to the second aspect of the present invention, the soymilk has a protein content of not less than 6% by weight, such as not less than 6.1%, not less than 6.2%, not less than 6.3%.

[0062] In some embodiments according to the second aspect of the present invention, the soymilk has a sediment content of not more than 5% by weight, for example not more than 4%, not more than 3%.

[0063] In some embodiments according to the second aspect of the present invention, the soymilk has a shelf life of not less than half a year.

[0064] In a third aspect of the present invention, there is provided a soymilk beverage comprising soymilk as described in the second aspect of the present invention, optionally fat-providing sources, optionally carbohydrate-providing sources, optionally food additives, and optionally water.

[0065] In some embodiments according to the third aspect of the present invention, the fat-providing sources include, but are not limited to, vegetable fats and animal fats.

[0066] In some embodiments according to the third aspect of the present invention, the carbohydrate-providing sources include, but are not limited to, maltodextrin, malt oligosaccharides, sugar, and starch.

[0067] In some embodiments according to the third aspect of the present invention, the food additives include, but are not limited to, preservatives, thickeners, sweeteners, emulsifiers, nutrient supplements, flavoring agents, and perfumes.

[0068] In the present invention, water is selected from distilled water, deionized water, pharmaceutical water, tap water, purified water, and mineral water.

[0069] In the fourth aspect of the present invention, there is provided the use of the soymilk as described in the second aspect of the present invention in the preparation of soymilk beverages.

[0070] In the present invention, if not otherwise specified,

[0071] the term "soymilk", also known as bean milk, is a product made from soybeans as raw materials, processed by steps such as enzyme inactivation, milling, deslagging, deodorization, homogenization, sterilization and the like, wherein food excipients and food additives are generally not added during the process;

[0072] the term "enzyme inactivation by steam" refers to the treatment in which the enzyme is inactivated by spraying hot steam to the sample to be treated or placing the sample to be treated in a hot steam environment;

[0073] the term "steam-infusion sterilization" refers to the treatment in which the sample to be treated is immersed in hot steam for sterilization.

[0074] The present invention can obtain at least one of the following beneficial effects.

[0075] 1. The soymilk prepared by the process according to the present invention has a good taste and little beany flavor.

[0076] 2. The soymilk prepared by the process according to the present invention has a high protein content of 6% or more.

[0077] 3. The soymilk prepared by the process according to the present invention has low sediment content, good product stability and long shelf life.

[0078] 4. The process according to the invention has high stability and stable product quality, and is suitable for continuous industrial production.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0079] Embodiments of the present invention will be clearly and completely described below in connection with the examples, and it is clear that the examples described are only a portion of the embodiments of the invention, rather than all of the embodiments. The following description of at

least one exemplary embodiment is in fact merely illustrative and in no way serves as any limitation on the present invention and its application or use. Based on the embodiments in the present invention, all other embodiments obtained by a person of ordinary skill in the art without creative labor are within the scope of protection of the present invention.

[0080] Water with a pH of 7.0 to 7.5 and water with a pH of 6.5 to 7.0 were obtained by adding a 0.05% (W/W) of sodium bicarbonate solution to distilled water to adjust the pH value.

[0081] Example 1

[0082] (1) 10 kg of soybeans subjected to de-hybridization and screening were baked by a hot air baking oven at a temperature of 110°C for a period of 120 seconds. After cooling to 30°C, the soybeans were dehulled using a vacuum vibratory peeling machine to obtain dehulled soybeans.

[0083] (2) The dehulled soybeans were soaked in water with a pH of 7.0 to 7.5 in a weight ratio of dehulled soybeans to water of 1:4.5, at a temperature of 40°C for a period of 5 minutes. After draining off the water, the soaked dehulled soybeans were obtained.

[0084] (3) The soaked dehulled soybeans were coarsely milled through a first pulp milling machine at 50°C, during which water with a pH of 7.0 to 7.5 was added continuously and evenly, with a total weight of added water 5 times more than the weight of the soaked dehulled soybeans, to obtain coarse milled materials, in which the particulate matter had a particle size of 100 mesh or more.

[0085] (4) Next, the coarse milled materials were finely milled through a second pulp milling machine at 50°C, to obtain fine milled materials, in which the particulate matter had a particle size of about 200 mesh.

[0086] (5) The fine milled materials were subjected to an enzyme-inactivation treatment by steam using a steam enzyme-inactivation machine at a temperature of 50°C and a pressure of 0.1 MPa (atmospheric pressure) for a period of 140 seconds to obtain a first product.

[0087] (6) The first product was separated through a slurry separator to collect the isolated slurry.

[0088] (7) The slurry was subjected to a second enzyme-inactivation treatment by steam using the steam enzyme-inactivation machine at a temperature of 120°C and a pressure of 0.6 MPa for a period of 90 seconds to obtain a second product.

[0089] (8) The second product was degassed at 85°C at a pressure of -0.3 bar, to obtain a degassed material in which no obvious bubbles appeared.

[0090] (9) The degassed material was homogenized at a temperature of 73°C and a pressure of 400 bar, to obtain a homogenized material.

[0091] (10) The homogenized material was stirred at 4°C to 12°C with a speed of 300 rpm for 4

hours, to obtain a cooked material.

[0092] (11) The cooked material was subjected to a steam-infusion sterilization at a temperature of 138°C for a period of 12 seconds, to obtain a soymilk product 1 for subsequent canning and delivery.

[0093] Example 2

[0094] (1) 10 kg of soybeans subjected to de-hybridization and screening were baked by a hot air baking oven, at a temperature of 110°C for a period of 120 seconds. After cooling to 30°C, the soybeans were dehulled using a vacuum vibratory peeling machine to obtain dehulled soybeans.

[0095] (2) The dehulled soybeans were soaked in water with a pH of 6.5 to 7.0 in a weight ratio of dehulled soybeans to water of 1:4.5, at a temperature of 40°C for a period of 5 minutes. After draining off the water, the soaked dehulled soybeans were obtained.

[0096] (3) The soaked dehulled soybeans were coarsely milled through a first pulp milling machine at 50°C, during which water with a pH of 6.5 to 7.0 was added continuously and evenly, with a total weight of added water 5 times more than the weight of the soaked dehulled soybeans, to obtain coarse milled materials, in which the particulate matter had a particle size of 100 mesh or more.

[0097] (4) Next, the coarse milled materials were finely milled through a second pulp milling machine at 50°C, to obtain fine milled materials, in which the particulate matter had a particle size of about 200 mesh.

[0098] (5) The fine milled materials were subjected to an enzyme-inactivation treatment by steam using a steam enzyme-inactivation machine, at a temperature of 50°C and a pressure of 0.1 MPa (atmospheric pressure) for a period of 140 seconds to obtain a first product.

[0099] (6) The first product was separated through a slurry separator to collect the isolated slurry.

[00100] (7) The slurry was subjected to a second enzyme-inactivation treatment by steam using the steam enzyme-inactivation machine at a temperature of 120°C and a pressure of 0.6 MPa for a period of 90 seconds to obtain a second product.

[00101] (8) The second product was degassed at 85°C at a pressure of -0.3 bar, to obtain a degassed material in which no obvious bubbles appeared.

[00102] (9) The degassed material was homogenized at a temperature of 73°C and a pressure of 400 bar, to obtain a homogenized material.

[00103] (10) The homogenized material was stirred at 4°C to 12°C with a speed of 300 rpm for 4 hours to obtain a cooked material.

[00104] (11) The cooked material was subjected to a steam-infusion sterilization at a temperature

of 138°C for a period of 12 seconds, to obtain a soymilk product 2 for subsequent canning and delivery.

[00105] Example 3

[00106] (1) 10 kg of soybeans subjected to de-hybridization and screening were baked by a hot air baking oven, at a temperature of 110°C for a period of 120 seconds. After cooling to 30°C, the soybeans were dehulled using a vacuum vibratory peeling machine to obtain dehulled soybeans.

[00107] (2) The dehulled soybeans were soaked in water with a pH of 7.0 to 7.5 in a weight ratio of dehulled soybeans to water of 1:4.5, at a temperature of 40°C for a period of 5 minutes. After draining off the water, the soaked dehulled soybeans were obtained.

[00108] (3) The soaked dehulled soybeans were coarsely milled through a first pulp milling machine at 50°C, during which water with a pH of 7.0 to 7.5 was added continuously and evenly, with a total weight of added water 5 times more than the weight of the soaked dehulled soybeans, to obtain coarse milled materials, in which the particulate matter had a particle size of 100 mesh or more.

[00109] (4) Next, the coarse milled materials were finely milled through a second pulp milling machine at 50°C, to obtain fine milled materials, in which the particulate matter had a particle size of about 200 mesh.

[00110] (5) The fine milled materials were subjected to enzyme-inactivation treatment by steam using a steam enzyme-inactivation machine, at a temperature of 50°C and a pressure of 0.1 MPa (atmospheric pressure) for a period of 150 seconds to obtain a first product.

[00111] (6) The first product was separated through a slurry separator to collect the isolated slurry.

[00112] (7) The slurry was subjected to a second enzyme-inactivation treatment by steam using the steam enzyme-inactivation machine at a temperature of 120°C and a pressure of 0.6 MPa for a period of 80 seconds to obtain a second product.

[00113] (8) The second product was degassed at 85°C at a pressure of -0.3 bar, to obtain a degassed material in which no obvious bubbles appeared.

[00114] (9) The degassed material was homogenized at a temperature of 73°C and a pressure of 400 bar, to obtain a homogenized material.

[00115] (10) The homogenized material was stirred at 4°C to 12°C with a speed of 300 rpm for 4 hours, to obtain the cooked material.

[00116] (11) The cooked material was subjected to steam-infusion sterilization at a temperature of 138°C for a period of 12 seconds, to obtain a soymilk product 3 for subsequent canning and delivery.

[00117] Comparative Example 1

[00118] The process was carried out in the same manner as those in Example 1, except that the step (10) was omitted and the homogenized material was directly subjected to the steam-infusion sterilization, to obtain a soymilk product A.

[00119] Comparative Example 2

[00120] 10 kg of soybeans subjected to de-hybridization and screening were cleaned by water with a pH of 7.0 to 7.5 at 40°C to 45°C, but not dehulled. Next, the cleaned, non-dehulled soybeans were treated according to steps (2) to (11) in Example 1, to obtain a soymilk product B.

[00121] Comparative Example 3

[00122] The process was carried out in the same manner as those in Example 1, except that the enzyme-inactivation treatment by steam in step (5) was carried out at a temperature adjusted to 75°C to 85°C for a period adjusted to 60 seconds, and the enzyme-inactivation treatment by steam in step (7) was carried out for a period adjusted to 180 seconds, to obtain a soymilk product C.

[00123] Comparative Example 4

[00124] The process was carried out in the same manner as those in Example 1, except that both the coarse milling in step (3) and the fine milling in step (4) were carried out at a temperature adjusted to 85°C, to obtain a soymilk product D.

[00125] Comparative Example 5

[00126] The process was carried out in the same manner as those in Example 1, except that the steam-infusion sterilization in step (11) was replaced by a tubular ultra-high temperature sterilization at the same temperature and period as in Example 1, to obtain a soymilk product E.

[00127] Test Example 1. Measurement of the protein content in products

[00128] The protein contents by weight in soymilk products 1 to 3 and soymilk products A to E were measured by using a milk composition analyzer, and the results are shown in Table 1.

[00129] Table 1

Sample No.	Protein Content, by weight (%)
Soymilk product 1	6.35
Soymilk product 2	6.21

Soymilk product 3	6.36
Soymilk product A	6.35
Soymilk product B	5.68
Soymilk product C	6.12
Soymilk product D	5.56
Soymilk product E	6.35

[00130] As can be seen from Table 1, the protein content in the soymilk products prepared by the process according to the present invention was significantly higher than that in the soymilk products B to D, which indicates that the process according to the present invention may remarkably improve the protein content in soymilk. Meanwhile, the absence of cooking treatment and the use of tubular ultra-high temperature sterilization have no effect on the protein content in the soymilk products.

[00131] Test Example 2. Evaluation of product taste

[00132] 10 trained technicians were invited to taste the soymilk products 1 to 3 and soymilk products A to E, and then provide scores in the two technical indicators of taste preference and beany flavor according to the method in national standard GB12315. Average scores were taken, and the results thereof are shown in Table 2.

[00133] The taste preference has a maximum score of 5. A higher score indicates a high taste preference.

[00134] The beany flavor has a maximum score of 5. A lower score indicates a weak beany flavor, and vice versa.

[00135] Table 2

Sample No.	Taste Preference	Beany Flavor
Soymilk product 1	4.52	2
Soymilk product 2	4.43	2.1
Soymilk product 3	4.45	2.2
Soymilk product A	2.74	4.98
Soymilk product B	2.14	4.99
Soymilk product C	4.33	2.34
Soymilk product D	4.45	2.1

Soymilk product E	4.09	2.6
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[00136] As can be seen from Table 2, compared with the soymilk products A to E, the soymilk products prepared by the process according to the present invention has a more popular taste and a weaker beany flavor. This indicates that the process according to the present invention can significantly improve the product taste and remarkably weaken beany flavor.

[00137] Test Example 3. Evaluation of the process stability

[00138] The operating stability of the sterilization devices in Example 1 and Comparative Example 5 was detected, and the results are shown in Table 3.

[00139] 100 g of soymilk products 1 to 3 and 100 g of soymilk product E were sampled respectively. Then, the samples were centrifuged at a speed of 1500G for 10 minutes to separate a solid phase, which was dried at 80°C for 5 hours, to obtain the weight of dried material, m (g). The sedimentation rate was calculated according to the following equation, and the results are shown in Table 4.

[00140] Sedimentation rate = $100\% \times m / 100$

[00141] Table 3

Operation time (mins)	Measured temperature of the sterilization device in Example 1 (°C)	Measured temperature of the sterilization device in Comparative Example 5 (°C)
0	138.0	138.0
10	138.0	138.0
20	138.0	138.1
30	138.0	138.1
40	138.0	138.4
50	138.1	138.5
60	138.0	138.8
80	138.0	139.4
100	138.0	140.7
120	138.0	141.0
180	138.0	143.1
240	138.1	144.7
300	138.0	146.4
360	138.0	148.7
420	138.0	—

480	138.0	—
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[00142] Table 4

Sample No.	Sedimentation rate (%)
Soymilk product 1	1.3
Soymilk product 2	1.32
Soymilk product 3	1.45
Soymilk product E	11.75

[00143] As can be seen from Tables 3 to 4, the steam infusion sterilization process used in the present invention can stably maintain the operating temperature and has better process stability, as compared with the tubular ultra-high temperature sterilization process in Comparative Example 5. The soymilk product prepared by the process according to the present invention has a lower sedimentation rate than the soymilk product E, which indicates that the process stability of the process according to the present invention is better.

[00144] Test Example 4. Product stability test

[00145] The sealed packaged soymilk products 1 to 3 and soymilk products A to E were left to stand at room temperature for 6 months, and then the stability of the products was evaluated. The results are shown in Table 5.

[00146] Table 5

Sample No.	Evaluation result
Soymilk product 1	Good stability
Soymilk product 2	Good stability
Soymilk product 3	Good stability
Soymilk product A	Good stability
Soymilk product B	Poor stability, obvious sediments in the bottom
Soymilk product C	Good stability, minor sediments in the bottom
Soymilk product D	Good stability, minor sediments in the bottom
Soymilk product E	Poor stability, obvious sediments in the bottom

[00147] As can be seen from Table 5, the soymilk products prepared by the process according to the present invention has better stability, as compared with soymilk products B to E, which indicates that the process according to the present invention can significantly improve the stability

of the products.

[00148] Obviously, the above embodiments are only examples made for clear illustration, and are not a limitation of implementation. For a person of ordinary skill in the art, other variations or modifications can be made in different forms based on the above description. It is not necessary or possible to exhaust all embodiments here. The obvious variations or modifications derived therefrom are still within the protection scope created by the present invention.

CLAIMS

1. A process for preparing soymilk, comprising the steps of:

(1) subjecting soybeans to a pulp-milling treatment, to obtain a first milled material, wherein water is added to the soybeans prior to or during the pulp-milling treatment;

(2) subjecting the first milled material to a pulp-milling treatment, to obtain a second milled material;

(3) subjecting the second milled material to an enzyme-inactivation treatment, to obtain a first enzyme-inactivated product;

(4) subjecting the first enzyme-inactivated product to a solid-liquid separation, and collecting the liquid phase;

(5-1) subjecting the liquid phase to an enzyme-inactivation treatment, to obtain a second enzyme-inactivated product; and

(6) continuously stirring the second enzyme-inactivated product at 2°C to 15°C for 2 to 10 hours, to obtain the soymilk.

2. The process according to claim 1, wherein, in step (6), the stirring is carried out at a speed of 100 to 700 rpm.

3. The process according to claim 1, further comprising, prior to step (1), steps (1') and optional step (1'') of:

(1') baking the soybeans, and dehulling the baked soybeans, to obtain dehulled soybeans;

(1'') soaking the dehulled soybeans in water, and draining off the water, to obtain soaked soybeans.

4. The process according to claim 3, characterized by one or more of the following A to H:

A. the baking is carried out at a temperature of 95°C to 140°C;

B. the baking is carried out for a period of 100 to 200 seconds;

C. prior to the dehulling, the baked soybeans are cooled;

D. the dehulling is carried out by means of a vacuum vibratory dehuller;

E. the soaking is carried out at a temperature of 30°C to 65°C;

F. the soaking is carried out for a period of 1 to 30 minutes;

- G. the weight ratio of dehulled soybeans to water is 1: (1 to 10);
- H. in step (1"), the pH of water is 6.5 to 7.5.
5. The process according to claim 4, wherein, in C, the baked soybeans are cooled to 35°C or less.
6. The process according to claim 4, wherein, in H, the pH of water is adjusted by adding a dilute solution of sodium bicarbonate.
7. The process according to claim 1, wherein, in step (3), the enzyme-inactivation treatment is an enzyme-inactivation treatment by steam, which is carried out at a temperature of 40°C to 65°C for a period of 110 to 200 seconds.
8. The process according to claim 7, wherein, in step (3), the enzyme-inactivation treatment is carried out at a steam pressure of 0.05 to 0.25 MPa.
9. The process according to claim 1, wherein, in step (5-1), the enzyme-inactivation treatment is an enzyme-inactivation treatment by steam, which is carried out at a temperature of 100°C to 150°C for a period of 40 to 180 seconds.
10. The process according to claim 9, wherein, in step (5-1), the enzyme-inactivation treatment is carried out at a steam pressure of 0.3 to 3 MPa.
11. The process according to claim 1, characterized by the following (A) and/or (B):
- (A) in step (1), the pulp-milling treatment is carried out at a temperature of 35°C to 65°C;
- (B) in step (2), the pulp-milling treatment is carried out at a temperature of 35°C to 65°C.
12. The process according to claim 1, further comprising step (7) of subjecting the soymilk to a sterilization treatment.
13. The process according to claim 12, wherein the soymilk is subjected to a steam-infusion sterilization treatment.
14. The process according to claim 12, wherein the sterilization treatment is carried out at a temperature of 110°C to 150°C.
15. The process according to claim 12, wherein the sterilization treatment is carried out for a period of 2 seconds to 1 minute.
16. The process according to any one of claims 1 to 15, comprising one or more of the following a to g:

- a. in step (1), the particulate matter in the first milled material has a particle size of not less than 100 mesh;
- b. in step (1), the weight ratio of the added water to the soybeans is (1 to 16):1;
- c. in step (1), the water is added to the soybeans continuously or in batches during the pulp-milling treatment;
- d. in step (1), the pH of water is 6.5 to 7.5;
- e. in step (2), the particulate matter in the second milled material has a particle size of 230 to 180 mesh;
- f. in step (4), the solid-liquid separation is carried out through a slurry separator;
- g. a step (5-2) of degassing the second enzyme-inactivated product to obtain a degassed material is further included between steps (5-1) and (6).

17. The process according to claim 16, wherein, in d, the pH of water is adjusted by adding a dilute solution of sodium bicarbonate.

18. The process according to claim 16, wherein, in step (5-2), the degassing treatment is carried out at a temperature of 75°C to 95°C.

19. The process according to claim 16, wherein, in step (5-2), the degassing treatment is carried out at a pressure of -0.5 to -0.1 bar.

20. The process according to claim 16, wherein, in g, a step (5-3) of homogenizing the degassed material to obtain a homogenized material is further included between steps (5-2) and (6).

21. The process according to claim 16, wherein, in step (5-3), the homogenization treatment is carried out at a temperature of 65°C to 85°C.

22. The process according to claim 16, wherein, in step (5-3), the homogenization treatment is carried out at a pressure of 300 to 500 bar.

23. A soymilk, prepared by the process according to any one of claims 1 to 22.

24. The soymilk according to claim 23, having a protein content of not less than 6% by weight.

25. The soymilk according to claim 23, having a sediment content of not more than 5% by weight.

26. The soymilk according to claim 23, having a shelf life of not less than half a year.

27. A soymilk beverage comprising soymilk according to any one of claims 23 to 26, optionally fat-providing sources, optionally carbohydrate-providing sources, optionally food additives, and optionally water.

28. Use of the soymilk according to any one of claims 23 to 26 in the preparation of soymilk beverages.