Abstract

The invention concerns a sweetened dairy product comprising a dairy material, at least one steviol glycoside, at least one additive selected from a polysaccharide of fructose units and a salt.
SWEETENED DAIRY PRODUCT
COMPRISING STEVIOIL GLYCOSIDES AND
FURTHER ADDITIVES

CROSS-REFERENCE TO RELATED
APPLICATIONS


TECHNICAL FIELD

[0002] The invention concerns sweetened dairy products comprising at least one steviol glycoside. The products deliver a sugar-like character.

BACKGROUND

[0003] Stevia extracts, comprising steviol glycosides, are known sweeteners. These are used in various products, including beverages and food. Some sweetened dairy products comprising stevia extracts are available on the market. Various steviol glycosides ingredients, with various compositions, are available on the market as extracts obtained from stevia plants, or as compounds synthesized by microbiological processes. The later are also referred to as “fermentive stevia”. While these ingredients have been designed to efficiently deliver sweetness and attempt to reduce aftertaste, there is still a need for sweetened dairy compositions delivering a sugar-like character (overall character being close to sugar). Indeed one can observe with some sweeteners a high sweetening power but that does not correspond to sugar. A sugar-like character is considered as being more than solely sweetness.

SUMMARY OF INVENTION

[0004] In an embodiment, the present invention is a sweetened dairy product comprising: a fermented dairy composition based on a dairy material, at least one steviol glycoside, and at least one additive selected from the group consisting of: a polysaccharide of fructose units, a salt, and their mixtures or associations.

[0005] In embodiments, the at least one steviol glycoside comprises at least one compound selected from the group consisting of Rebaudioside A, Rebaudioside B, Rebaudioside C, Rebaudioside D, Rebaudioside M and stevioside.

[0006] In embodiments, the at least one steviol glycoside is a steviol glycoside composition comprising Rebaudioside B, at least one of Rebaudioside A, Rebaudioside D and Rebaudioside M, and optionally stevioside.

[0007] In embodiments, the salt comprises a sodium or potassium cation and a chloride anion. In embodiments, the salt is a sodium salt composition.

[0008] In embodiments, the polysaccharide of fructose units is an inulin or a FructOligoSuccharide (FOS). In embodiments, the polysaccharide of fructose units is FructOligoSuccharide (FOS) compound having an average number of Fructose units of from 3 to 5, preferably substantially free of free fructose.

[0009] In embodiments, the sweetened dairy product further comprises a lactase enzyme. In embodiments, the sweetened dairy product further comprises a source of fat. In embodiments, the sweetened dairy product has a fat content of from 0.01% to 8% by weight.

[0010] In embodiments, the sweetened dairy product further comprises a source of protein. In embodiments, the sweetened dairy product has a protein content of from 0.5% to 12% by weight.

[0011] In embodiments, the sweetened dairy product further comprises fruit and/or at least one flavor.

[0012] In embodiments, the dairy material comprises animal milk, preferably cow milk.

[0013] In embodiments, the sweetened dairy product is comprised in a container, preferably a sealed container.

[0014] In embodiments, the sweetened dairy product further comprises an intermediate composition.

[0015] In embodiments, the fermented dairy composition is a strained fermented dairy composition.

[0016] In embodiments, the present invention is a process of making the product detailed in one or more embodiments herein, comprising the steps of: step a) preparing a dairy composition comprising the dairy material, and step b) adding an intermediate composition comprising the at least one steviol glycoside and the at least one additive.

[0017] In embodiments of the process, the dairy material comprises lactose and the dairy composition comprises a lactase enzyme.

[0018] In embodiments of the process, the dairy composition is a fermented dairy composition.

[0019] In embodiments of the process, step a) comprises the following steps: a1) providing a milk composition comprising lactose, a2) adding the enzyme and at least partially hydrolyzing the lactose, a3) inoculating lactic acid bacteria, and a4) allowing fermentation of the milk composition.

[0020] In embodiments of the process, the fermented dairy composition is a strained fermented dairy composition, and wherein step a) further comprises the following subsequent step: a5) separation to obtain a strained fermented dairy composition and an acid whey by-product.

DETAILED DESCRIPTION

[0021] The invention addresses at least one of the needs or problems mentioned above with a sweetened dairy product comprising:

[0022] a fermented dairy composition based on a dairy material,

[0023] at least one steviol glycoside, and

[0024] at least one additive selected from the group consisting of:

[0025] a polysaccharide of fructose units,

[0026] a salt, and

[0027] their mixtures or associations.

[0028] The invention also concerns processes for making such products.

Definitions

[0029] In the present specification, unless otherwise specified, the percentages are percentages by weight.

Product General Features

[0030] The product is a fermented dairy composition based on a dairy material. Such materials are known and
further described below. The dairy material is typically a matrix or substrate wherein other components or ingredients are comprised, for example solubilized, dispersed, emulsified, suspended etc. . . The composition may comprise fruit and/or at least one flavor.

[0031] Other components or ingredients can be introduced via an intermediate preparation, such as a slurry of a fruit preparation. The intermediate composition may comprise some of the ingredients or components, such as the at least one steviol glycoside, the polysaccharide of fructose units, the salt etc. . . . Thus the product may comprise the dairy material and an intermediate preparation, mixed or arranged as layers or discrete inclusions.

[0032] The product comprises a fermented dairy composition. The product can be itself a fermented dairy composition. Such compositions, based on a dairy material are known by the one skilled in the art and are further described below. It is mentioned that the product may comprise a fermented dairy composition and an intermediate preparation, mixed or arranged as layers or discrete inclusions.

[0033] In one embodiment the fermented dairy composition is a strained fermented dairy composition. Such compositions, typically obtained by separation of whey, are known by the one skilled in the art and are further described below. It is mentioned that the product can comprise a strained fermented dairy composition and an intermediate preparation, mixed or arranged as layers or discrete inclusions.

[0034] The ratio by weight between the dairy material or dairy composition and the intermediate preparation can be for example of from 50/50 to 99/1, preferably from 60/40 to 95/5.

[0035] It is mentioned that the dairy product, the dairy material, the fermented dairy composition and/or the strained fermented dairy composition are preferably a heat-treated products or compositions, for example pasteurized or sterilized. Heat-treatments are known by the one skilled in the art. They allow an elimination of parasite micro-organisms. They can be performed in conventional heat exchangers, such as tubes or plate heat exchangers. The heat treatment can be for example performed at a temperature of from 80°C to 90°C, preferably 85°C to 95°C, for example during from 1 minute to 15 minutes.

[0036] The dairy product can comprise a source of fat. The source is typically the dairy material. The dairy product can have for example a fat content of from 0.01% to 8% by weight. The nature, compositions and amounts of ingredients or components in the product, for example of dairy material, as well as the processing steps, particularly straining or separation steps, can be adapted to have these contents. It is believed that the presence of some fat, even low amounts, can contribute in positively compensating, as to sugar-like perception, defaults of the steviol glycoside(s).

[0037] The dairy product typically comprises a source of protein. The source is typically the dairy material. The dairy product can have for example a protein content of from 0.5% to 12% by weight. The nature, compositions and amounts of ingredients or components in the product, for example of dairy material, as well as the processing steps, particularly straining or separation steps, can be adapted to have these contents. It is believed that presence of protein contributes in positively compensating, as to sugar-like perception, defaults of the steviol glycoside(s).

[0038] The product is typically contained in a sealed container such as a packaging. The process can typically involve a step of conditioning the product in a container. The container is then typically sealed, for example with a cap or a lid. The container can be for example a container of 50 ml (or 50 g), to 1 L (or 1 kg), for example a container of 50 ml (or 50 g) to 80 ml (or 80 g), or 80 ml (or 80 g) to 100 ml (or 100 g), or 100 ml (or 100 g) to 125 ml (or 125 g), or 125 ml (or 125 g) to 150 ml (or 150 g), or 150 ml (or 150 g) to 200 ml (or 200 g), or 200 ml (or 200 g) to 250 ml (or 250 g), or 250 ml (or 250 g) to 300 ml (or 300 g), or 300 ml (or 300 g) to 500 ml (or 500 g), or 500 ml (or 500 g) to 750 ml (or 750 g), or 750 ml (or 750 g) to 1 L (or 1 kg). The product can be stored, transported and/or distributed at a chilled temperature of 0°C to 10°C, preferably of 4°C to 10°C.

Further Additives

[0039] The dairy product comprises at least one additive selected from the group consisting of a polysaccharide of fructose units, salts, and their mixtures or associations.

[0040] Herein mixtures or associations refer to addition together as a mixture, or separately, optionally via one or several intermediate preparation. Preferably the further additives are introduced as an association in a single intermediate preparation.

[0041] The salt can comprise a sodium or potassium cation and a chloride anion. The salt is preferably NaCl. The salt is preferably a sea salt composition. It is believed the use of the salt contributes to impart a more sugar-like-profile, especially as to temporal profile, together with the at least one steviol glycoside. Unexacting the salt can act with the sweetening at least one steviol glycoside to provide a better sugar-like temporal profile, with lowering aftertastes such as steviol glycoside(s) linger. It is believed that the salt can induce with the dairy composition a salivation that synergizes with the other components, including the steviol glycoside and/or fat and/or proteins to deliver the temporal profile. Unexpectedly the salt can act with the steviol glycoside composition to provide a better sugar-like temporal profile, with lowering aftertastes and/or improving mouthfeel.

[0042] The salt can be present in an intermediate preparation in an amount of from 0.5% to 5% by weight, for example from 1.0% to 3.0%. The salt can be present in the dairy product in an amount of from 0.04% to 0.40% by weight, from example from 0.08% to 0.30%.

[0043] The polysaccharide of fructose units can be a dimer, oligomer or polymer having several fructose units, for example an inulin or a FructoOligoSaccharide (FOS). Such polysaccharides are known by the one skilled in the art and available on the market. Preferably the FOS has a number-average or weight-average number of Fructose units (Degree of Polymerization DP) of lower than 20, preferably lower 10, for example from 3 to 5. Preferably the FOS is substantially free of free fructose. Examples of suitable ingredients are Frutose® 75 marketed per NCI or Benzo Orafti P95. It is believed the use of such polysaccharides with the at least one steviol glycoside improves the mouthfeel and/or contributes to impart a temporal profile closer to sugar than the profiles obtained with steviol glycosides alone. The polysaccharide of fructose units can be present in the dairy product in an amount of from 0.04% to 0.40% by
weight, from example from 0.5% to 10.0% by weight, for example from 1.0% to 8.0%, for example from 0.5% to 1.0%, or from 1.0% to 2.0%, or from 2.0% to 3.0%, or from 3.0% to 4.0%, or from 4.0% to 5.0%, or from 5.0% to 6.0%, or from 6.0% to 7.0%, or from 7.0% to 8.0%.

[0044] In a preferred embodiment the dairy product comprises both the polysaccharide of fructose units and the salt. For example the dairy product can comprise:

[0045] from 0.04% to 0.40% by weight, preferably from 0.08% to 0.30% of the salt, and

[0046] from 0.5% to 10.0% by weight, preferably from 1.0% to 8.0% of the polysaccharide of fructose units.

Steviol Glycoside(s)

[0047] The dairy product comprises at least one steviol glycoside. Such compounds for example include Reb redistribution A, Rebound B, Reb A, Reb A, and Steviololide. They are available on the market as ingredients, in more or less purified forms, often provided as mixtures. They can be obtained by extraction from stevia, with some optional refining steps and/or blending steps. More recently some microbiological processes have been developed to make such compounds and mixtures from stevia or stevia extracts or from other compounds, with microorganisms such as yeasts or fungi. Steviol glycosides are sweeteners, providing sweetness to the products or compositions, that are thus considered as sweetened.

[0048] In a preferred embodiment the at least one steviol glycoside is a steviol glycoside composition comprising:

[0049] Rebound B,

[0050] at least one of Reb A, Reb A, and Reb A, and

[0051] optionally steviolide.

[0052] The steviol glycoside composition can comprise other steviol glycosides such as Reb and Reb A, Reb A, and Steviololide.

[0053] It is mentioned that the steviol glycosides composition can be provided as a mixture, wherein the compounds are provided together, or as an association wherein the compounds are provided separately, optionally as sub-mixtures.

[0054] Commercial ingredients are typically mixtures of the compounds. One can obtain the desired composition by using commercial ingredients having an appropriate composition, or by mixing or associating at least two commercial ingredients or intermediates having different compositions.

[0055] In a preferred embodiment the at least one steviol glycoside is a steviol glycoside composition comprising:

[0056] Rebound B,

[0057] Reb A, and

[0058] optionally steviolide.

[0059] In a preferred embodiment the at least one steviol glycoside is a steviol glycoside composition comprising:

[0060] Rebound B,

[0061] Reb A, and

[0062] steviolide.

[0063] In a particular embodiment, the at least one steviol glycoside is a steviol glycoside composition comprising:

[0064] Rebound B,

[0065] Reb A, and

[0066] optionally Rebound A.

[0067] In a particular embodiment, the at least one steviol glycoside is a steviol glycoside composition comprising:

[0068] Rebound B,

[0069] Reb A, and

[0070] optionally Rebound A.

[0071] Hereinafter the group consisting of Reb and Reb A, Reb and steviolide is referred to as “group SG 1”. Hereinafter the group consisting of Reb and Reb A, Reb and Reb A, and steviolide is referred to as “group SG 1”.

[0072] In a preferred embodiment the steviol glycoside composition comprises:

[0073] from 50 to 75% by weight of Reb A, Reb A, and Reb A,

[0074] from 5 to 10% by weight of Reb A, Reb A, and Reb A,

[0075] from 20 to 40% by weight of steviolide, with respect to the sum of the amounts of Reb, Reb A, and steviolide.

[0076] In other words, in this embodiment group SG1 has from 50 to 75% by weight of Reb A, Reb A, and Reb A, from 5 to 10% by weight of Reb A, Reb A, and Reb A, and from 20 to 40% by weight of steviolide.

[0077] In a particular embodiment the steviol glycoside composition includes:

[0078] 100 parts by weight of the group SG1

[0079] from 0 to 500 parts by weight, of group SG2, preferably from 0 to 100 parts, for example from 1 to 50 parts.

[0080] It is mentioned that the steviol glycosides ingredients compositions or components can be provided as mixtures with compounds different from steviol glycosides of group SG1 and group SG2, hereinafter referred to as “other compounds”. In a preferred embodiment, such ingredients compositions or components are comprised of the following:

[0081] 100 parts by weight of steviol glycosides of group SG1 and/or group SG2, and

[0082] from 0 to 100 parts by weight, of other compounds, preferably from 0 to 60 parts, for example from 1 to 50 parts.

[0083] The dairy product preferably comprises from 50 to 5000 ppm by weight of the at least one steviol glycoside, preferably from 50 to 2500 ppm, preferably from 100 to 1000 ppm, for example from 100 to 200 ppm, or from 200 to 3000 ppm, or from 300 to 400 ppm, or from 400 to 500 ppm, or from 500 to 600 ppm, or from 600 to 700 ppm, or from 700 to 800 ppm, or from 800 to 900 ppm, or from 900 to 1000 ppm.

[0084] The dairy product preferably comprises from 50 to 5000 ppm by weight of group SG1, preferably from 50 to 2500 ppm, preferably from 100 to 1000 ppm, for example from 100 to 200 ppm, or from 200 to 3000 ppm, or from 300 to 400 ppm, or from 400 to 500 ppm, or from 500 to 600 ppm, or from 600 to 700 ppm, or from 700 to 800 ppm, or from 800 to 900 ppm, or from 900 to 1000 ppm.

[0085] The dairy product preferably comprises:

[0086] from 5 to 500 ppm by weight of Reb A, preferably from 5 to 250 ppm, preferably from 10 to 100 ppm, for example from 10 to 20 ppm, or from 20 to 30 ppm, or from 30 to 40 ppm, or from 40 to 50 ppm, or from 50 to 60 ppm, or from 60 to 70 ppm, or from 70 to 80 ppm, or from 80 to 90 ppm, or from 90 to 100 ppm.

[0087] from 100 to 10000 ppm by weight of Reb A, preferably from 100 to 5000 ppm, preferably from 200 to 2000 ppm, for example from 200 to 400 ppm, or from 400 to 600 ppm, or from 600 to 800 ppm,
or from 500 to 1000 ppm, or from 1000 to 1200 ppm, or from 1200 to 1400 ppm, or from 1400 to 1600 ppm, or from 1600 to 1800 ppm, or from 1800 to 2000 ppm, and

[0088] from 50 to 5000 ppm by weight of stevioside, preferably from 50 to 2500 ppm, preferably from 100 to 1000 ppm, for example from 100 to 200 ppm, or from 200 to 300 ppm, or from 300 to 400 ppm, or from 400 to 500 ppm, or from 500 to 600 ppm, or from 600 to 700 ppm, or from 700 to 800 ppm, or from 800 to 900 ppm, or from 900 to 1000 ppm.

[0089] In an embodiment the dairy product comprises:

[0090] from 5 to 500 ppm by weight of Rebacinioside B, preferably from 5 to 250 ppm, preferably from 10 to 100 ppm, for example from 10 to 20 ppm, or from 20 to 30 ppm, or from 30 to 40 ppm, or from 40 to 50 ppm, or from 50 to 60 ppm, or from 60 to 70 ppm, or from 70 to 80 ppm, or from 80 to 90 ppm, or from 90 to 100 ppm.

[0091] from 100 to 10000 ppm by weight of Rebacinioside D, preferably from 100 to 5000 ppm, preferably from 200 to 2000 ppm, for example from 200 to 400 ppm, or from 400 to 600 ppm, or from 600 to 800 ppm, or from 800 to 1000 ppm, or from 1000 to 1200 ppm, or from 1200 to 1400 ppm, or from 1400 to 1600 ppm, or from 1600 to 1800 ppm, or from 1800 to 2000 ppm, and

[0092] optionally from 50 to 5000 ppm by weight of Rebacinioside A, preferably from 50 to 2500 ppm, preferably from 100 to 1000 ppm, for example from 100 to 200 ppm, or from 200 to 300 ppm, or from 300 to 400 ppm, or from 400 to 500 ppm, or from 500 to 600 ppm, or from 600 to 700 ppm, or from 700 to 800 ppm, or from 800 to 900 ppm, or from 900 to 1000 ppm.

[0093] In an embodiment the dairy product comprises:

[0094] from 5 to 500 ppm by weight of Rebacinioside B, preferably from 5 to 250 ppm, preferably from 10 to 100 ppm, for example from 10 to 20 ppm, or from 20 to 30 ppm, or from 30 to 40 ppm, or from 40 to 50 ppm, or from 50 to 60 ppm, or from 60 to 70 ppm, or from 70 to 80 ppm, or from 80 to 90 ppm, or from 90 to 100 ppm.

[0095] from 100 to 1000 ppm by weight of Rebacinioside M, preferably from 100 to 5000 ppm, preferably from 200 to 2000 ppm, for example from 200 to 400 ppm, or from 400 to 600 ppm, or from 600 to 800 ppm, or from 800 to 1000 ppm, or from 1000 to 1200 ppm, or from 1200 to 1400 ppm, or from 1400 to 1600 ppm, or from 1600 to 1800 ppm, or from 1800 to 2000 ppm, and

[0096] optionally from 50 to 5000 ppm by weight of Rebacinioside A, preferably from 50 to 2500 ppm, preferably from 100 to 1000 ppm, for example from 100 to 200 ppm, or from 200 to 300 ppm, or from 300 to 400 ppm, or from 400 to 500 ppm, or from 500 to 600 ppm, or from 600 to 700 ppm, or from 700 to 800 ppm, or from 800 to 900 ppm, or from 900 to 1000 ppm.

[0097] It is believed that, with the further additives, the at least one steviol glycoside, preferably the specific steviol glycoside compositions as disclosed above provide a better sugar-like taste, especially sugar-like profile. They also allow avoiding or reducing the use of flavor modulators and thus allow more naturality.

Dairy Material

[0098] The dairy material is typically comprised of milk and/or ingredients obtained from milk. It is also referred to as a "milk-based composition". Herein milk encompasses animal milk, such as cow's milk, and also substitutes to animal milk, such as vegetal milk, such as soy milk, rice milk, coconut milk, almond milk etc. . . .

[0099] Milk-based compositions useful in such products and/or processes are known by the one skilled in the art of dairy products, preferably of fermented dairy products.

[0100] Herein a milk-based composition encompasses a composition with milk or milk fractions, for example obtained by mixing several previously separated milk fractions. Some water or some additives can be added to said milk, milk fractions and mixtures. Preferably the milk is an animal milk, for example cow's milk. Some alternative animal milks can be used, such as sheep milk or goat milk.

[0101] The milk-based composition can typically comprise ingredients selected from the group consisting of milk, half skimmed milk, skimmed milk, milk powder, skimmed milk powder, milk concentrate, skim milk concentrate, milk proteins, cream, buttermilk and mixtures thereof. Some water or additives can be mixed therewith. Examples of additives that can be added include sugar, sweeteners different from sugar, fibers, and texture modifiers.

[0102] The milk-based composition can typically have a fat content of from 0.0% to 5.0% by weight, for example of from 0.0% to 1.0% or from 1.0% to 2.0% or from 2.0% to 3.0% or from 3.0% to 4.0% or from 4.0% to 5.0%. The "fat content" of a composition corresponds to the weight of the fat components present in the composition relatively to the total weight of the composition. The fat content is expressed as a weight percentage. The fat content can be measured by the Weibull-Berntorp gravimetric method described in the standard NF ISO 8262-3. Usually the fat content is known for all the ingredients used to prepare the composition, and the fat content of the product can be calculated from these data.

[0103] The milk-based composition can typically have a protein content of from 2.0% to 6.0% by weight, for example of from 2.0% to 3.0% or from 3.0% to 4.0% or from 4.0% to 5.0% or from 5.0% to 6.0%. The "protein content" of a composition corresponds to the weight of the proteins present in the composition relatively to the total weight of the composition. The protein content is expressed as a weight percentage. The protein content can be measured by the Kjeldahl analysis (NF EN ISO 8568-1) as the reference method for the determination of the protein content of dairy products based on measurement of total nitrogen. Nitrogen is multiplied by a factor, typically 6.38, to express the results as total protein. The method is described in both AOAC Method 991.20 (1) and international Dairy Federation Standard (IDF) 209:1993. Usually the total protein content is known for all the ingredients used to prepare the product, and total protein content is calculated from these data.

[0104] The dairy material, also referred to as milk-based composition, can comprise lactose. The amount of lactose can be typically of from 3.80% to 5.00% by weight.

[0105] In one embodiment the dairy material has the following contents (% by weight):

[0106] from 3.0% to 3.5% of milk protein
[0107] from 0.0% to 3.5% of fat
[0108] from 3.80% to 5.00% of lactose.
The pH of the milk can for example be of from 6.60 to 7.00, before optional acidification for example by fermentation. The dry matter of the milk can be for example of from 6.8% to 13.0%. In one embodiment the milk is a low-fat milk comprising less than 2.0% fat by weight, preferably less than 1.0% of fat, preferably less than 0.5% fat, preferably less than 0.1%, for example less than 0.01%. The milk can be for example a skimmed milk.

The ingredients of the milk-based composition and/or the amounts thereof can be selected to have the amounts of proteins and/or fat and/or lactose mentioned above.

Fermented Dairy Composition

Fermented dairy compositions typically comprise bacteria, preferably lactic acid bacteria, preferably alive.

Fermented dairy compositions are typically obtained by process involving a fermentation step with at least one lactic acid bacteria. In this step the dairy material is inoculated with the lactic acid bacteria, and the mixture is then allowed to ferment at a fermentation temperature. Such inoculation and fermentation operations are known by the one skilled in the art.

During fermentation, the lactic acid bacteria produce lactic acid and thus cause a pH decrease. With the pH decreasing proteins coagulate to form a curd, typically at a breaking pH.

The fermentation temperature can be of from 30° C. to 45° C., preferably from 35° C. to 40° C., with a pH decrease to a breaking pH at which proteins coagulate to form a curd.

The breaking pH is preferably of from 3.50 to 5.50, preferably of from 4.0 to 5.0, preferably from higher than 4.5 to 5.0.

Bacteria

Appropriate bacteria for fermentation are known by the one skilled in the art. It is mentioned that lactic acid bacteria are often referred to as ferment or cultures or starters. Examples of lactic acid bacteria that can be used for the fermentation include:

Lactobacilli, for example Lactobacillus acidophilus, Lactobacillus casei, Lactobacillus plantarum, Lactobacillus reuteri, Lactobacillus johnsonii, Lactobacillus helveticus, Lactobacillus brevis, Lactobacillus rhamnosus,

Streptococci, for example Streptococcus thermophilus,

Bifidobacteria, for example Bifidobacterium bifidum, Bifidobacterium longum, Bifidobacterium breve, Bifidobacterium animalis,

Lactococci, for example Lactococcus lactis,

Propionibacterium such as Propionibacterium freudenreichii, Propionibacterium freudenreichii ssp. shermanii, Propionibacterium acidipropionici, Propionibacterium shermanii,

mixtures or association thereof.

Lactic acid bacteria preferably comprise, preferably essentially consist of, preferably consist of, Lactobacillus delbrueckii ssp. bulgaricus (i.e. Lactobacillus bulgaricus) and Streptococcus salivarius ssp. thermophilus i.e. (Streptococcus thermophilus) bacteria. The lactic acid bacteria used in the invention typically comprise an association of Streptococcus thermophilus and Lactobacillus bulgaricus bacteria. This association is known and often referred to as a yogurt symbiosis.

In some particular embodiments the lactic acid bacteria might comprise probiotic bacteria. Probiotic bacteria are known by the one skilled in the art. Examples of probiotic bacteria include some Bifidobacteria and Lactobacilli, such as Bifidobacterium breve, Bifidobacterium animalis animalis, Bifidobacterium animalis lactis, Bifidobacterium infantis, Bifidobacterium longum, Lactobacillus helveticus, Lactobacillus casei, Lactobacillus casei paracasei, Lactobacillus acidophilus, Lactobacillus rhamnosus, Lactobacillus plantarum, Lactobacillus reuteri, Lactobacillus delbrueckii subsp. bulgaricus, Lactobacillus delbrueckii subsp. lactis, Lactobacillus brevis and Lactobacillus fermentum.

In one embodiment the lactic acid bacteria do not comprise Bifidobacteria. In one embodiment the lactic acid bacteria do not comprise Lactobacillus acidophilus bacteria. In one embodiment the lactic acid bacteria do not comprise Bifidobacteria and do not comprise Lactobacillus acidophilus bacteria.

The lactic acid bacteria can be introduced in any appropriate form, for example in a spray-dried form or in a frozen form. The introduction of the lactic acid bacteria in the dairy material is also referred to as an inoculation.

Enzymes

The product comprise can comprise an enzyme, preferably a lactase enzyme. This finds particular advantages to reduce lactose and/or energy density of the product. It is believed also that the use of lactase enzymes contributes to impart a more sugar like-profile, especially as to temporal profile, together with the at least one steviol glycoside and to the at least one further additive.

The lactase can be any kind of lactase such as Hu-lactase™ 5200 marketed by Chr Hansen or Maxilact® 1giatan marketed by DSM.

Advantageously the lactase enzyme is introduced in the dairy material such that at least 80%, preferably at least 90%, preferably 95% of lactose of the dairy material is degraded to glucose and galactose, preferably at pH above 5.0 preferably at a fermentation temperature. The lactase can advantageously be added in an amount of from 0.005 wt % to 0.20 wt %, in particular 0.01 wt % to 0.15 wt %, preferably 0.02 wt % to 0.06 wt %, based on the total weight of the dairy material. The lactase can advantageously be added in an amount of 0.005 wt % to 0.20 wt %, in particular 0.01 wt % to 0.15 wt %, preferably 0.02 wt % to 0.06 wt %, based on the total weight of the dairy material. The lactase can for example be used in an amount of from 2000 to 4000 Neutral Lactase Units per Liter of dairy material.

The lactase and the bacteria can be added to the dairy material simultaneously or separately. Advantageously, the lactase is added before or along with the bacteria. Preferably, the lactase is added before the bacteria, notably 10 to 40 min before the bacteria, in particular 20 to 30 min before the culture of bacteria.

Strained Fermented Dairy Product

Strained fermented dairy compositions are typically obtained by a process involving a separation step. In
this step an acid whey composition is separated from the curd resulting from the proteins coagulation. Thus one obtains:

- **0132** A fermented dairy product, typically comprising the proteins coagulum, referred to as a strained fermented dairy composition, and
- **0133** An acid whey by-product.

**0134** Such separation steps are known by the one skilled in art, for example in processes of making "greek yogurts". The separation can for example be carried out by reverse osmosis, ultrafiltration, or centrifugal separation. The separation step can be performed for example at a temperature of from 30°C to 45°C.

**0135** The acid whey by-product can comprise lactose or enzyme degradation products such as glucose and/or galactose, for example as further described below.

**0136** In one embodiment an amount of from 65% to 90% by weight, preferably from 70% to 85%, with reference to the amount of dairy material, of acid-whey by-product is recovered.

**0137** The strained fermented dairy composition is recovered at the separation step. As much water is removed as part of the acid whey by-product, the strained fermented dairy composition comprises high amounts of proteins, especially of casein.

**0138** The strained fermented dairy product comprises lactic acid bacteria, wherein the lactic acid bacteria comprise at least one lactic acid bacteria having a low lactose metabolization capacity. All the features mentioned above about lactic acid bacteria used in the fermentation step apply to the lactic acid bacteria comprised in the strained dairy fermented product.

**0139** The strained fermented dairy composition preferably has the following contents (% by weight):

- **0140** From 5.5% to 11.0% of milk protein,

- **0141** From 0.0% to 8.0% of fat, for example from 0.0% to 3.5% or from 3.5% to 8.0%, and/or

- **0142** From 0.00% to 4.20% of lactose, for example from 2.80% to 4.20%.

**0143** The pH of the strained fermented dairy composition can for example be of from 3.80 to 4.65.

**Intermediate Preparations**

**0144** Intermediate preparations are known by the one skilled in the art. They typically used to modify the taste, the mouthfeel and/or texture of a dairy composition, for example of a fermented dairy composition or a strained fermented composition. They can used also to introduce some additives such as nutrients. They typically comprise sweetening agents, flavors, color modifiers, cereals and/or fruit. Intermediate preparations are for example slurries or fruit preparations. Flavors include for example fruit flavors, vanilla flavors, caramel flavors, coffee flavors, chocolate flavors. The fruit preparations typically comprise fruits. Herein fruits refer to any fruit form, including for example fresh fruits, pieces, purees, concentrates, juices etc. The intermediate preparation typically comprises the at least one steviol glycoside and the at least one additive selected from the group consisting of a polysaccharide of fructose units, salts, and their mixtures or associations. Typically a fruit preparation can be added in an amount of 5-35% by weight with reference to the total amount of product.

**0145** The intermediate preparation or slurry typically comprises a stabilizing system, having at least one stabilizer. The stabilizing system can comprise at least two stabilizers. Such stabilizers are known by the one skilled in the art. They typically help in avoiding phase separation of solids, for example of fruits or fruits extracts and/or in avoiding syneresis. They typically provide some viscosity to the composition, for example a viscosity (Bostwick viscosity at 20°C) of from 1 to 20 cm/min, preferably of from 4 to 12 cm/min.

**0146** The stabilizing system or the stabilizer can for example be a starch, a pectin, a guar, a xanthan, a carrageenan, a locust bean gum, or a mixture thereof. The amount of stabilizing system is typically of from 0.5 to 5% by weight.

**0147** The intermediate preparation can typically comprise organoleptic modifiers. Such ingredients are known by the one skilled in the art.

**0148** The organoleptic modifiers can be for example sweetening agents different from sugar and the at least one steviol glycoside, coloring agents, cereals and/or cereal extracts.

**0149** Examples of sweetening agents are ingredients referred to as High Intensity Sweeteners, such as sucralose, aspartam, saccharine, D-silulose, erythritol, Luo Han Guo.

**0150** The fruits can be for example provided as:

- **0151** frozen fruit cubes, for example 10 mm fruit cubes, for example Individual Quick Frozen fruit cubes, for example strawberry, peach, apricot, mango, apple, pear fruit cubes or mixtures thereof,

- **0152** Aseptic fruit cubes, for example 10 mm fruit cubes, for example strawberry, peach, apricot, mango, apple or pear fruit cubes or mixtures thereof,

- **0153** Fruit purees, for example fruit purees concentrated from 2 to 5 times, preferably 3 times, for example aseptic fruit purees, for example strawberry, peach, apricot, mango, raspberry, blueberry or apple fruit purees or mixtures thereof,

- **0154** single aseptic fruit purees, for example strawberry, raspberry, peach, apricot, blueberry or apple single aseptic fruit purees or mixture thereof,

- **0155** frozen whole fruits, for example Individual Quick Frozen whole fruits, for example blueberry, raspberry or blackberry frozen whole fruits, or mixtures thereof,

- **0156** mixtures thereof.

**0157** The ingredients and/or components of the intermediate preparation and the amounts thereof can be typically such that the composition has a brix degree of from 1 to 65 brix, for example from 1 to 10 brix, or from 10 to 15 brix, or from 15 to 20 brix, or from 20 to 25 brix, or from 25 to 30 brix, or from 30 to 35 brix, or from 35 to 40 brix, or from 40 to 45 brix, or from 45 to 50 brix, or from 50 to 55 brix, or from 55 to 60 brix, or from 60 to 65 brix.

**0158** A fruit preparation can for example comprise fruit in an amount of from 30% to 80% by weight, for example from 50 to 70% by weight.

**0159** The intermediate preparation can comprise water. It is mentioned that a part of the water can come from
ingredients used to prepare the fruit preparation, for example from fruits or fruit extracts or from a phosphoric acid solution.

[0160] The fruit preparation can comprise pH modification agents such as citric acid. The fruit preparation can have a pH of from 2.5 to 5, preferably of from 2.8 to 4.2.

Processes

[0161] The dairy product can be prepared by any appropriate process. The process can depend on the type of product and composition needed. For example fermented dairy compositions will require a fermentation step. Some main steps such as heat treatments, fermentation, and separation or straining have been described above.

[0162] In a particular embodiment the product is prepared by a process comprising the steps of:

step a) preparing a dairy composition comprising the dairy material, and

step b) adding an intermediate composition comprising the at least one steviol glycoside and the at least one additive.

[0163] In a particular embodiment the dairy material comprises lactose and the dairy composition comprises a lactase enzyme.

[0164] In a particular embodiment the dairy composition is a fermented dairy composition. Step a) can comprise the following steps:

a1) providing a milk composition comprising lactose,

a2) adding the enzyme and at least partially hydrolyzing the lactose,

a3) inoculating lactic acid bacteria, and

a4) allowing fermentation of the milk composition.

[0165] In a particular embodiment the fermented dairy composition is a strained fermented dairy composition, and wherein step a) further comprises the following subsequent step:

a5) separation to obtain a strained fermented dairy composition and an acid whey by-product.

[0166] The process can also comprise steps such as:

[0167] homogenization steps, for example before or after the heat treatment step, preferably at a pressure of from 20 bars to 300 bars, in particular from 50 bars to 250 bars,

[0168] cooling steps, for example cooling down from a heat-treatment temperature to a fermentation temperature, or from a fermentation temperature to a storage temperature, for example a chilled storage temperature of from 4°C to 10°C.

[0169] smoothing the fermented dairy composition, typically involving some agitation and/or shear, for example performed by agitation, or by static or dynamic smoothing.

Use of the Final Product or Composition

[0170] The product is typically to be used as a food product. It is typically used by oral administration. One can typically eat or drink the product by processing it from a container to the mouth, optionally with using a spoon or a straw.

[0171] Further details or advantages of the invention might appear in the following non-limitative examples.

EXAMPLES

Example 1

Strained Fermented Dairy Composition

[0172] A strained fermented dairy composition is prepared with the following dairy mix formulation:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier and reference</th>
<th>Quantity %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condensed Milk (34%)</td>
<td></td>
<td>6.42%</td>
</tr>
<tr>
<td>Culture Yo-Mix® 495, Dupont</td>
<td></td>
<td>0.004%</td>
</tr>
<tr>
<td>Lactase Mannaz® LGI 5000, DSM</td>
<td></td>
<td>2850 NU/L</td>
</tr>
<tr>
<td>Skim Milk</td>
<td></td>
<td>To 10%</td>
</tr>
</tbody>
</table>

[0173] The dairy mix has a fat content of 0.1% by weight and a protein content of about 3.4% by weight.

[0174] A strained fermented dairy composition is prepared according to the following procedure:

[0175] homogenization at a temperature of 60°C, at a pressure of 69 bars,

[0176] heat treatment of milk at a temperature of 95°C during 6.5 minutes,

[0177] cooling to 40°C,

[0178] addition of enzyme,

[0179] inoculation of milk at 40°C with culture,

[0180] fermentation at a temperature of 40°C to reach a breaking pH of 4.65,

[0181] separation, at a temperature of 41.5°C, of 72% of whey, with a Westphalia KNA3 pilot scale centrifuge separator, to obtain:

[0182] A strained fermented dairy product, and

[0183] B) an acid whey by-product, and

[0184] dynamic smoothing, performed on the strained fermented dairy product.

The strained fermented dairy composition has a protein content of 10.6% and a fat content of 0.3%.

Example 2

Slurry Intermediate Compositions

[0185] The following slurry intermediate compositions are prepared.

Slurry a)

[0186] Ingredient | Supplier and reference | Quantity % |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Oligofructose</td>
<td>Frutose® B 75, NC3</td>
<td>94.66</td>
</tr>
<tr>
<td>Steviol Glycerides</td>
<td>Blend of steviol glycoside 1*</td>
<td>0.25</td>
</tr>
<tr>
<td>Water</td>
<td>/</td>
<td>0.65</td>
</tr>
<tr>
<td>Fruit and Vegetable</td>
<td>/</td>
<td>0.20</td>
</tr>
<tr>
<td>Juice Concentrate for color</td>
<td>/</td>
<td></td>
</tr>
<tr>
<td>Vanilla Flavor</td>
<td>/</td>
<td>1.25</td>
</tr>
<tr>
<td>Sea Salt</td>
<td>/</td>
<td>0.19</td>
</tr>
<tr>
<td>Sodium Citrate</td>
<td>/</td>
<td>0.10</td>
</tr>
<tr>
<td>Malic Acid</td>
<td>/</td>
<td>0.04</td>
</tr>
</tbody>
</table>

*Blend of steviol glycoside 1: proprietary blend comprising:
88 wt % of compounds selected from Rebldisne A, Rebldisne A, Rebldisne C, Rebldisne T, Stevioside, Rebldisne B, Diketide A, Rebldisne, Stevioside, and Rebldisne M, with a profile of 30% of Rebldisne A, 8.1% stevioside, 3.3% Rebldisne B, and 15 wt % of other compounds.
Slurry b)

[0187]

Ingredient | Supplier and reference | Quantity %
--- | --- | ---
Oligofructose | Beneo Orafti P95 | 58.00
Steviol Glycosides | Blend of steviol glycosides 2** | 0.686
Water | / | Q8
Juice | / | 9.00
Concentrate (for color) | / | 4.00
Steviol and Vegetable Juice Concentrate (for color) | / | 2,444
Caramel Flavor | / | 1.41
Salt | / | 0.10
Sodium Citrate | / | 0.00
Malic Acid | / | 0.00

**Blend of steviol glycosides 2: proprietary blend comprising:
74 wt % of compounds selected from Rebaudioside D, Rebaudioside A, Rebaudioside C, Rebaudioside E, Stevioside, Rehabsudioside B, Dihydro A, Rebaudioside, Stevulose, and Rehabsudioside M, with a profile of 0.2% of Rebaudioside D, 88.5% of Rebaudioside A, 3.1% of Rebaudioside E, 0.7% of Rehabsudioside B, 0.5% of Dihydro A, 0.5% of Rebaudioside, 0.5% of Stevulose, and 26 wt % of other compounds.

Example 3

[0188] Flavored products: The following products are prepared by mixing the strained fermented dairy compositions and the slurries.

<table>
<thead>
<tr>
<th>Product 1</th>
<th>Product 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strained fermented dairy composition</td>
<td>92 wt %</td>
</tr>
<tr>
<td>Slurry</td>
<td>8 wt % slurry a)</td>
</tr>
</tbody>
</table>

[0189] Both products present a good sweetness, with product 2 delivering more sweetness than product 1. Both present with a good sugar-like organoleptic profile, with a temporal profile that is close to profiles obtained with similar formulations including sugar. Both products deliver a creamy texture in mouth, much more so than a non-fat strained yogurt would. Both have a very sugar-like character, with almost no artificial aftertaste, more specifically the aftertaste typically associated with Stevia extracts.

1. A sweetened dairy product comprising:
   a fermented dairy composition based on a dairy material, at least one steviol glycoside, and at least one additive selected from the group consisting of:
   a polysaccharide of fructose units, a salt, and their mixtures or associations.
2. A product according to claim 1, wherein the at least one steviol glycoside comprises at least one compound selected from the group consisting of Rebaudioside A, Rebaudioside B, Rebudoside C, Rebudoside D, Rebaudioside M and stevioside.
3. A product according to claim 1, wherein the at least one steviol glycoside is a steviol glycoside composition comprising Rebaudioside B, at least one of Rebudoside A, Rebudoside D and Rebaudioside M, and optionally stevioside.

4. A product according to claim 1, wherein the salt comprises a sodium or potassium cation and a chloride anion.
5. A product according to claim 1, wherein the salt is a sea salt composition.
6. A product according to claim 1, wherein the polysaccharide of fructose units is an inulin or a FructoOligoSaccharide (FOS).
7. A product according to claim 6, wherein the polysaccharide of fructose units is FructoOligoSaccharide (FOS) compound having an average number of Fructose units of from 3 to 5, preferably substantially free of free fructose.
8. A product according to claim 1, further comprising a lactase enzyme.
9. A product according to claim 1, comprising a source of fat.
10. A product according to claim 9, having a fat content of from 0.01% to 8% by weight.
11. A product according to claim 1, comprising a source of protein.
12. A product according to claim 11, having a protein content of from 0.5% to 12% by weight.
13. A product according to claim 1, further comprising fruit and/or at least one flavor.
14. A product according to claim 1, wherein the dairy material comprises animal milk, preferably cow milk.
15. A product according to claim 1, being comprised in a container, preferably a sealed container.
16. A product according to claim 1, comprising an intermediate composition.
17. A product according to claim 16, wherein the fermented dairy composition is a strained fermented dairy composition.
18. A process of making the product according to claim 1, comprising the steps of:
   step a) preparing a dairy composition comprising the dairy material, and step b) adding an intermediate composition comprising at least one steviol glycoside and the at least one additive.
19. A process according to claim 18, wherein the dairy material comprises lactose and the dairy composition comprises a lactase enzyme.
20. A process according to claim 18, wherein the dairy composition is a fermented dairy composition.
21. A process according to claim 20, wherein step a) comprises the following steps:
   a) providing a milk composition comprising lactose,
   b) adding the enzyme and at least partially hydrolyzing the lactose,
   c) inoculating lactic acid bacteria, and
   d) allowing fermentation of the milk composition.
22. A process according to claim 21 wherein the fermented dairy composition is a strained fermented dairy composition, and wherein step a) further comprises the following subsequent step:
   a) separation to obtain a strained fermented dairy composition and an acid whey by-product.

* * * * *