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(54) Title: NUT AND DAIRY BEVERAGE

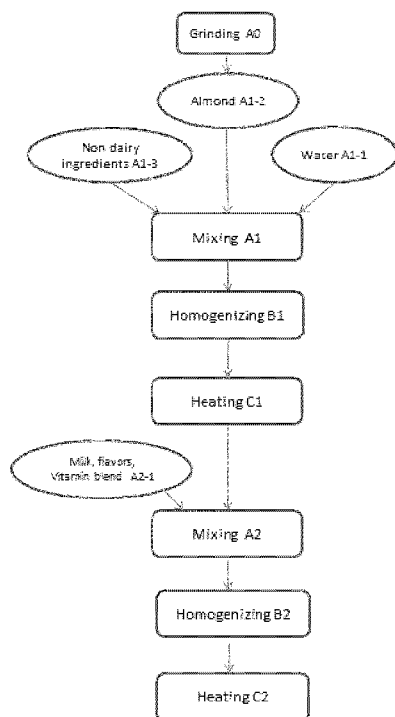


Figure 2.

(57) Abstract: The present disclosure relates to a beverage and method of producing said beverage, comprising nut and dairy products. The beverage comprises between about 0.5-15% w/w protein derived from a dairy product, about 0.01-0.3% w/w calcium derived from a dairy product, about 0.05-3% w/w fiber derived from a nut product, and about 0.05-5% fat, wherein the ratio of unsaturated to saturated fatty acids is at least 5% greater than that of dairy milk alone. The nut product may comprise one or more of : hazelnuts, pistachios, almonds, walnuts, or cashews.



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NUT AND DAIRY BEVERAGE

FIELD OF INVENTION

5 [0001] The present disclosure relates to a beverage. More specifically, the present disclosure relates in part to a beverage that contains nut and dairy products.

BACKGROUND OF THE INVENTION

[0002] A balanced diet, including suitable amounts of protein, fiber, fats and other nutrients, is important for the proper growth and function of the human body.

10 [0003] Animal-derived milk or “dairy milk” is considered a complete source of protein, providing essential amino acids. While dairy milk contains additional useful nutrients such as minerals (*e.g.*, calcium) and vitamins (*e.g.*, B12), dairy milk fat contributes significant amounts of cholesterol and saturated fatty acids to the diet, and has been correlated with increased risk of plaque formation and heart disease. Skim milk, while containing lower
15 amounts of cholesterol and saturated fatty acids, is watery and reported to be less appealing to consumers [1, 9].

[0004] Dairy milk is also not a significant source of fiber and its major source of carbohydrate (lactose) can lead to diarrhea, bloating, flatulence, and other gastrointestinal symptoms in lactose-intolerant people. Furthermore, allergies to dairy milk components
20 (such as alpha S₁ casein) are known [6, 7, 9].

[0005] In recent years, various non-dairy beverages, such as nut beverages (almond milk, cashew milk, *etc.*) have been gaining popularity as alternatives to dairy milk [4].

[0006] Nuts contain complex carbohydrates and fiber not present in dairy milk. In comparison to dairy milk, nut beverages do not contain cholesterol and have a relatively
25 higher ratio of unsaturated to saturated fatty acids. Nuts are also naturally casein- and lactose-free and contain antioxidants and phytosterols [5, 10].

[0007] Nut beverages however have relatively low amounts of protein when compared to dairy products. For example, almond milk contains about 1 gram protein per serving, in comparison to, for example, cow's milk, which contains about 8 grams protein per serving.

[0008] Furthermore, many plant proteins do not provide all of the essential amino acids in amounts suitable for human dietary requirements. Accordingly, while dairy milk proteins (such as whey and casein) are assigned high scores according to the protein digestibility-corrected amino acid score (PDCAAS), a widely recognized and approved method for evaluating protein quality of food proteins, many plant-derived proteins are assigned lower scores. In addition, plant proteins, such as those derived from nuts, are digested at a lower rate than proteins derived from dairy milk, which may reduce their overall nutritional benefits [4].

[0009] Soy milk has been reported to have similar protein content to cow's milk, however soy protein has a different amino acid profile and slower absorption rate than whey, thus taking the body longer to digest [8, 9, 11].

[0010] In addition, soy has been reported to contain estrogen-like compounds, as well as allergens, and some consumers have expressed dissatisfaction with the taste profile of soy milk.

[0011] Nut beverages may also have lower amounts of calcium, when compared to dairy milk. While cow's milk naturally contains about 300 mg of calcium per serving, many nut-based beverages do not provide significant amounts of calcium. While attempts have been made to address this relative deficiency by fortifying nut beverages to match the calcium content of milk, calcium absorption of fortified beverages has been reported to be less effective. Accordingly, the bioavailability of supplemental calcium in fortified beverages is generally lower than that of calcium naturally found in cow's milk. In addition to its lower bioavailability, supplemental calcium salts are prone to precipitation/settling to the bottom of beverage containers [2, 3].

SUMMARY OF THE INVENTION

[0012] The present disclosure relates, in part, to a beverage that contains nut and dairy products.

[0013] In one aspect, the present disclosure provides a beverage including a nut product and a dairy product, where the beverage includes: about 0.5% w/w to about 15% w/w protein derived from the dairy product; about 0.05 to about 3% w/w fiber derived from the nut product; about 0.01 to about 0.3% w/w calcium derived from the dairy product; and about 0.05 % to about 5.0 % w/w fat, where the fat includes a mixture of unsaturated fatty acids and saturated fatty acids and where the ratio of unsaturated to saturated fatty acids is at least 5.0% greater than that of dairy milk alone.

[0014] In some embodiments, the nut product may include one or more of: hazelnut, pistachio, almond, walnut, or cashew. In alternative embodiments, the nut product may include a fluid, a concentrate, a butter, a cream or a powder. In alternative embodiments, the fluid may be present in an amount of about 2% w/w to about 99% w/w; the concentrate may be present in an amount of about 0.5% w/w to about 80% w/w; the butter or cream may be present in an amount of about 0.5% w/w to about 25% w/w; or the powder may be present in an amount of about 0.5% w/w to about 21% w/w.

[0015] In some embodiments, the dairy product may include one or more of: milk, skim milk, whey, permeate, milk powder (MP), skim milk powder (SMP), whey powder (WP), permeate powder (PP), milk protein isolate (MPI), milk protein concentrate (MPC), whey protein isolate (WPI), whey protein concentrate (WPC), cultured milk, or fermented milk. In alternative embodiments, the milk may be present in an amount of about 5 to about 99% w/w; the whey or permeate may be present in an amount of about 5 to about 99% w/w; the MP may be present in an amount of about 0.5% to about 60% w/w; the WP may be present in an amount of about 0.5% to about 60% w/w; the PP may be present in an amount of about 0.5% to about 60% w/w; the MPI may be present in an amount of about 0.5% to about 20% w/w; the MPC may be present in an amount of about 0.5% to about 40% w/w; the WPI may be present in an amount of about 0.5% to about 20% w/w; or the WPC may be present in an amount of about 0.5% to about 40% w/w.

[0016] In some embodiments, the cultured or fermented dairy milk may include a mesophilic starter culture and/or a thermophilic starter culture. In alternative embodiments, the beverage may include a mesophilic starter culture and/or a thermophilic starter culture.

[0017] In some embodiments, the dairy product may be substantially free of lactose and/or casein.

[0018] In some embodiments, the dairy product may be derived from a cow, goat, buffalo, or sheep.

[0019] In alternative embodiments, the beverage may include an effective amount of a stabilizer and/or emulsifier.

[0020] In alternative embodiments, the beverage may have a pH ranging from about 3.5 to about 8.5 at ambient temperature.

[0021] In alternative embodiments, the beverage may include a sweetener which may be present in an amount of about 0.001% to about 25% w/w.

[0022] In alternative embodiments, the beverage may include a flavouring agent, such as vanilla.

[0023] In alternative embodiments, the beverage may have microbiological, sensory and textural stability over its shelf life.

[0024] In some aspects, the present disclosure provides a process for preparing a nut and dairy beverage as described herein by: providing the nut product; adding a stabilizer and/or emulsifier to the nut product together with a sufficient quantity of water; mixing the nut product and the stabilizer and/or emulsifier at a suitable mixing temperature for a sufficient period of time to suspend the particles in the water to obtain a suspended nut mixture; homogenizing the suspended nut mixture to obtain a homogenized nut mixture; heating the homogenized nut mixture at a suitable pasteurization temperature for a sufficient period of time for pasteurization to obtain a pasteurized nut mixture; adding the dairy product to the pasteurized homogenized nut mixture to obtain a dairy and pasteurized nut mixture; further homogenizing the dairy and pasteurized nut mixture to obtain a homogenized nut and dairy

mixture; and further heating the homogenized nut and dairy mixture at a suitable sterilization temperature for a sufficient period of time.

[0025] In alternative embodiments, the nut product may have a particle size of less than about 300 microns, such as about 30 microns to about 50 microns.

5 [0026] In alternative embodiments, the suitable mixing temperature may be about 15°C to about 80°C.

[0027] In alternative embodiments, the sufficient period of time for obtaining the suspended nut mixture may be about 3 minutes to about 10 minutes.

10 [0028] In alternative embodiments, the suspended nut mixture may be homogenized at about 400 psi to about 4000 psi.

[0029] In alternative embodiments, the pasteurization temperature may be about 73°C to about 75°C.

[0030] In alternative embodiments, the sufficient period of time for pasteurization may be about 16 seconds.

15 [0031] In alternative embodiments, the homogenized nut and dairy mixture may be homogenized using a first stage of about 2000 psi to about 3000 psi and a second stage of about 500 psi to about 1000 psi.

[0032] In alternative embodiments, the homogenized nut and dairy mixture may be heated at about 130°C to about 140°C.

20 [0033] In alternative embodiments, the homogenized nut and dairy mixture may be heated for about 2 seconds to about 5 seconds.

[0034] In alternative embodiments, the homogenized nut and dairy mixture may be heated by direct steam injection.

25 [0035] This summary of the invention does not necessarily describe all features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0036] These and other features of the invention will become more apparent from the following description in which reference is made to the appended drawings wherein:

[0037] **FIGURE 1** is a schematic diagram of a one-step process; and

5 [0038] **FIGURE 2** is a schematic diagram of a two-step process.

DETAILED DESCRIPTION

10 [0039] The present disclosure relates, in part, to a beverage that includes a nut product and a dairy product, and methods of producing the same. Without being bound by any particular theory, such a beverage can provide one or more of increased protein content and/or a more complete amino acid profile and/or increased levels of bioavailable calcium compared to nut beverages; such a beverage can also provide a higher proportion of unsaturated fatty acids and/or higher levels of dietary fiber compared to dairy milk. In some embodiments, at least a portion of the amino acids, calcium, fiber, *etc.* can be more bioavailable than in beverages with added or “fortified” amino acids, calcium, fiber, *etc.*

15 [0040] In some embodiments, the beverage can include about 0.5% w/w to about 15% w/w protein from dairy, about 0.05 to about 3% w/w dietary fiber from nuts, about 0.01 to about 0.30 % w/w calcium from dairy, and about 0.05% to about 5 % w/w fat, where the ratio of unsaturated to saturated fatty acids is at least 5.0% greater than that of dairy milk alone.

20 [0041] In some embodiments, the total amount of protein present in the beverage may be derived from the dairy product. In some embodiments, the dairy product may be present in the beverage in an amount sufficient to provide about 0.5 % w/w to about 15% w/w protein, or any value therebetween, such as 0.5 %, 1%, 1.5%, 2%, 2.5%, 3%, 3.5%, 4%, 4.5%, 5%, 5.5%, 6%, 6.5%, 7%, 7.5%, 8%, 8.5%, 9%, 9.5%, 10%, 10.5%, 11%, 11.5%, 12%, 12.5%, 13%, 13.5%, 14%, 14.5%, 15%, *etc.* In some embodiments, the dairy product may be
25 present in the beverage in an amount sufficient to provide at least 0.5 % w/w protein. In alternative embodiments, the total amount of protein in the nut and dairy beverage may be greater than 15%, for example, due to the protein contribution from the nut product or other

product (such as protein supplements or added protein). It is to be understood that protein may be added to the beverage regardless of the protein content of the nut or dairy source. Accordingly, the portion of protein not present in the dairy product may be supplied separately using nuts and/or an additional suitable protein source, if desired.

5 **[0042]** The dairy product may be one or more of milk, skim milk, whey, permeate, milk powder (MP), skim milk powder (SMP), whey powder (WP), permeate powder (PP), milk protein isolate (MPI), milk protein concentrate (MPC), whey protein isolate (WPI), whey protein concentrate (WPC), cultured milk, fermented milk, *etc.* It is to be understood that any suitable animal or dairy milk product or ingredient may be used. The dairy product may
10 be derived from any dairy animal, such as cow, goat, buffalo, sheep, camel, *etc.*

[0043] In some embodiments, the cultured or fermented dairy milk may include mesophilic (such as: *Lactococcus lactis* subsp. *cremoris*, *L. delbrueckii* subsp. *Lactis*, *Leuconostoc mesenteroides* subsp. *cremoris*, *etc.*) and/or thermophilic (such as: *Streptococcus salivarius* subsp. *thermophiles*, *Lactobacillus delbrueckii* subsp. *bulgaricus*, *L. delbrueckii* subsp. *lactis*, *etc.*) starter cultures, added within a suitable inoculum size. In alternative
15 embodiments, the beverage may include mesophilic and/or thermophilic starter culture(s) *i.e.*, the starter cultures may be provided independently of the dairy product. The mesophilic and/or thermophilic starter culture(s) may be live cultures or may be inactivated or deactivated cultures.

20 **[0044]** In some embodiments, the dairy product may be present in the beverage within the range of about 5 to about 99% w/w for fluid/liquid derivatives (such as milk, whey, permeates, *etc.*) or any value therebetween, such as about 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95% or 99%; about 0.5 to about 60 % w/w for powder and fluid concentrate derivatives (such as MPC, WPC,
25 MP, WP, PP, MPI, WPI, *etc.*) or any value therebetween, such as about 0.5 %, 1%, 1.5%, 2%, 2.5%, 3%, 3.5%, 4%, 4.5%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, or 60%.

[0045] In some embodiments, the dairy product may be substantially free of lactose. In some embodiments, by “substantially free of lactose” is meant a beverage containing less

than about 0.01% w/w to about 0.5% w/w lactose, or any value therebetween, such as about 0.01%, 0.05%, 0.1%, 0.15%, 0.2%, 0.25%, 0.3%, 0.35%, 0.4%, 0.45%, 0.5% w/w lactose. In alternative embodiments, by “substantially free of lactose” is meant a beverage that does not contain detectable levels of lactose, using standard analytical methods.

5 **[0046]** In some embodiments, the dairy product may be “lactose-reduced,” *i.e.* the natural amount of the lactose in the dairy product may be reduced by 25% or more.

[0047] In some embodiments, the dairy product may be substantially free of casein. For example, the dairy product may be a whey or permeate product (such as whey, WP, WPI, PP, etc.) or a whey or permeate derivative, or any dairy product that does not generally
10 contain substantial amounts of casein.

[0048] In some embodiments, the total amount of dietary fiber present in the beverage may be derived from the nut product. In some embodiments, the nut product may be present in the beverage in an amount sufficient to provide dietary fiber from about 0.05% w/w to about 3% w/w, or any value therebetween, such as about 0.05%, 0.1%, 0.5%, 1.0%, 1.5%, 2.0%,
15 2.5%, 3.0% w/w dietary fiber. In alternative embodiments, fiber supplements, as described herein or known in the art, may be used to further increase the fiber content, *e.g.*, oat fiber, acacia gum, inulin, *etc.* It is to be understood that fiber may be added to the beverage regardless of the fiber content of the nut source. Accordingly, the portion of fiber not present in the nut product may be supplied separately using an additional suitable fiber
20 source.

[0049] In some embodiments, the nut product may include without limitation one or more of a nut (such as walnut, hazelnut, pistachio, almond, cashew, *etc.*), including any derivative thereof, such as a milk, cream, concentrate, butter, powder, *etc.* and/or can be raw, ground, dried, blanched, roasted, *etc.* It is to be understood that any suitable nut product or ingredient
25 may be used.

[0050] The nut product may be present in the beverage within the range or about 2% w/w to about 99% w/w for fluid/liquid derivatives, or any value therebetween, such as about 2%, 3%, 4%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%,

75%, 80%, 85%, 90%, 95%, 99% w/w; about 0.5% w/w to about 80 % w/w for concentrates, or any value therebetween, such as about 0.5%, 1%, 1.5%, 2%, 3%, 4%, 5%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, or 80%; about 0.5 w/w to about 25 % w/w for creams or butters, or any value therebetween, such as
5 about 0.5%, 1%, 1.5%, 2%, 3%, 4%, 5%, 10%, 15%, 20%, or 25%; about 0.5% to about 21 % w/w for powders, or any value therebetween, such as about 0.5%, 1%, 1.5%, 2%, 3%, 4%, 5%, 7%, 10%, 15%, 13%, 17%, 20%, or 21%, *etc.*

[0051] In some embodiments, the total amount of calcium present in the beverage may be derived from the dairy product. In some embodiments, the dairy product may be present in
10 the beverage in an amount sufficient to provide about 0.01% w/w to about 0.3% w/w calcium, or any value therebetween, such as about 0.01%, 0.05%, 0.1%, 0.15%, 0.2%, 0.25%, or 0.3% w/w calcium. In some embodiments, the beverage may include calcium in an amount sufficient to provide over about 10% to at least about 70% of the Daily Value, as established, for example, by Health Canada, or any value therebetween, such as about 10%,
15 15%, 20%, 25%, 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, or 70% or more. In alternative embodiments, the beverage product may include at least or greater than 1.25 milligrams calcium per mL to about 2.5 milligrams calcium per mL, where at least a portion of the calcium is present in the dairy product (*i.e.*, at least or greater than 312 milligrams calcium per 250 mL serving to about 625 milligrams calcium per 250 mL serving). The
20 portion of the calcium not present in the dairy product may be supplied separately using an additional calcium source, such as tricalcium phosphate. In some embodiments, the calcium present in the dairy product may be more bioavailable than the calcium from the additional source.

[0052] In some embodiments, the fat content may be provided from the dairy product, the
25 nut product and/or from fat supplements, such as palm oil, coconut oil, canola oil, sunflower oil, olive oil, *etc.* In some embodiments, the beverage may have at least a 5% increase in the ratio of unsaturated to saturated fatty acids, compared to dairy milk. In some embodiments, about 60 to about 90% of the total fat content of the beverage may be unsaturated fatty acids from nut and/or other plant sources. For example, in an almond and milk beverage, as

described herein in Example 1, mono and polyunsaturated fatty acids provide 85% of total fat content and saturated fatty acids are 88% less than that of milk (2% fat).

[0053] Table 1 shows saturated fatty acids (SFA) and unsaturated fatty acids (UFA), as well as the ratio of unsaturated to saturated fatty acids, in various dairy milks as well as in an exemplary beverage according to the present disclosure, Example 1. Table 1 also shows exemplary ratios of saturated to unsaturated fatty acids using different dairy milks in a nut and dairy beverage according to the present disclosure. Accordingly, in some embodiments, the ratio of unsaturated to saturated fatty acids in a beverage according to the present disclosure may range from about 0.45 to about 12, such as about 0.5 to about 10, or any value therebetween.

Table 1: Ratio of Unsaturated to Saturated Fatty Acids in Dairy Milk

Average	Cow	Goat	Sheep	Buffalo	Camel	Milk USDA
SFA%	2.91	2.87	4.56	5.09	2.56	0.7
UFA%	1.18	1.21	1.87	2.24	1.23	0.4
Ratio of UFA /SFA	0.41	0.42	0.41	0.44	0.48	0.57
	Cow+Nuts	Goat+Nuts	Sheep+Nuts	Buffalo+Nuts	Camel+Nuts	milk+Nuts
Ratio of UFA /SFA (range)	0.49 – 9	0.51 – 9.5	0.5 – 9	0.53 – 10	0.55 – 10.5	0.7 – 6

[0054] In some embodiments, the beverage includes a total solids content of about 2% w/w to about 25% w/w. The total solids may come from the nut and/or dairy ingredients and/or any other ingredient provided in the beverage.

[0055] In some embodiments, the beverage may further include an added natural or artificial sweetener. The sweetener may be present in the beverage in the range of about 0.001% to about 25% w/w or any value therebetween.

[0056] Natural sweeteners may include, for example, cane sugar, lactose, fructose, maltodextrin, glucose, corn syrup solids, brown rice syrup, brazzein, curculin, luo han guo (monk fruit), miraculin, monellin, pentadin, stevia, stevioside, thaumatin, agave syrup,

barley malt syrup, blackstrap molasses, cane juice, coconut palm sugar, honey, maple syrup, palm sugar, sorghum syrup, yacon syrup *etc.*

[0057] Artificial sweeteners may include, for example, saccharides, cyclamates, aspartamine, aspartame, acesulfame K, erythritol, xylitol, lactitol, maltitol, neohesperidine dihydrochalcone, thaumatin, alitame, sucralose, isomalt, cyclamate, aspartame, acesulfame potassium, glycerol, mannitol, sorbitol, *etc.*

[0058] In some embodiments, the beverage may include one or more suitable additives, such as a vitamin supplement, a mineral supplement, a fiber supplement, a fatty acid supplement, an energy supplement, fatty acid supplements (*e.g.*, omega-3, DHA, EPA, *etc.*), energy supplements, a satiety support, immune-enhancing agent, antioxidant, probiotics and/or prebiotics, *etc.*

[0059] A vitamin supplement may include one or more of vitamin A (*e.g.*, vitamin A palmitate), vitamin D, vitamin B12, riboflavin, ascorbic acid, niacin, pantothenate, vitamin B6, thiamine, folacin, *etc.*

[0060] A mineral supplement may include zinc (such as zinc gluconate), magnesium (such as magnesium phosphate), calcium (such as tricalcium phosphate, calcium carbonate), potassium (such as potassium citrate, dipotassium phosphate) phosphate (such as tricalcium phosphate, magnesium phosphate, or dipotassium phosphate), *etc.*

[0061] A fiber supplement may include dietary fiber (soluble and insoluble) from different sources; such as inulin, maltodextrin, oat fiber, oat flour, polydextrose, *etc.*

[0062] In some embodiments, the beverage may include probiotics, such as, without limitation, *Bifidobacterium* spp, *Lactobacillus casei*, *Lactobacillus acidophilus*, *etc.* Suitable strains may be selected based on the final product conditions. The inoculum (CFU/mL) may be defined to present the determined level of probiotics in the product and fulfill the “probiotic claim” until the end of shelf life, as determined by regulatory authorities. For example, in some embodiments, and based on Health Canada regulations, 1.0×10^9 cfu of one or more of the eligible microorganism(s) should be present, as the minimum level, in a serving of stated size of a product.

[0063] In some embodiments, the beverage may include one or more suitable non-nutritional additives, such as flavoring agents, coloring agents, stabilizers, thickeners, emulsifiers, antimicrobials and preservatives, and/or any other additives.

[0064] In some embodiments, a flavouring agent may include flavours such as vanilla, coffee, cinnamon, nutmeg, turmeric, mint, licorice, ginger, chocolate, and/or fruit flavours such as strawberry, banana, apple, pear, cherry, blueberry, pomegranate, orange, *etc.* and/or coconut, nut and seed flavors such as pistachio, cashew, almond, walnut, peanut, hazelnut, *etc.* In some embodiments, spices and herbs (cinnamon, Eggnog, mint, *etc.*) may be added for their flavouring effect. In some embodiments, the flavouring agent may be added to mask undesirable flavours and/or to render a milder flavor. The flavouring agent may be present in the beverage product in the range of about 0% to about 5.0 % w/w or any value therebetween. In some embodiments, a flavouring agent may be a fruit or vegetable concentrate, a fruit or vegetable extract, a fruit product, *etc.*

[0065] In some embodiments, suitable stabilizers and/or thickeners may include, without limitation, polysaccharides (starches) such as arrowroot, cornstarch, katakuri starch, potato starch, sago, tapioca, *etc.* and their starch derivatives; plant based gums, such as alginin, gellan gum, guar gum, locust bean gum, xanthan gum, pectin, *etc.*; proteins, such as collagen, egg whites, furcellaran, gelatin, *etc.*; hydrocolloids, such as agar, carrageenan, *etc.*; sodium pyrophosphate; flours from wheat, maize, rice, oat, *etc.* or any combination thereof. In some embodiments, the beverage product includes at least about 0.01 % w/w to about 5.0% w/w of a stabilizer and/or thickener, or any value therebetween, such as about 0.01%, 0.05%, 0.1%, 0.15%, 0.2%, 0.25%, 0.3%, 0.5%, 0.7%, 1%, 2%, 3%, 4%, or 5% w/w. In some embodiments, the stabilizer includes a combination of two or more different stabilizers in a defined ratio. In some embodiments, one stabilizer may be used in a certain amount. In some embodiments, the stabilizer includes a combination of gellan gum and carrageenan. In some embodiments, the combination of gellan gum and carrageenan is used at a 2.7:1 ratio.

[0066] Emulsifiers may include, for example, glycerol esters, monoacylglycerols and esters thereof, sodium stearyl-2-lactylate, fatty acid monoesters of ethylene or propylene glycol, sorbitan fatty acid esters, phospholipids- lecithin (such as canola lecithin, sunflower lecithin,

soy lecithin), water-soluble gums (such as gellan gum, agar, pectin, arabic gum, etc) and /or various proteins with emulsifying properties.

5 [0067] In some embodiments, the stabilizer, emulsifier and/or thickener may be added to the product in an amount sufficient to prevent separation and precipitation of solids and create a stable, homogeneous texture in the final product. In some low fat products, hydrocolloids and stabilizers are used to create a fuller, creamier mouth feel. In some embodiments, the beverage product includes at least about 0.01 % w/w to about 5.0% w/w of a stabilizer, emulsifier and/or thickener, or any value therebetween, such as about 0.01%, 0.05%, 0.1%, 0.15%, 0.2%, 0.25%, 0.3%, 0.5%, 0.7%, 1%, 2%, 3%, 4%, or 5% w/w.

10 [0068] In some embodiments, stabilizers and/or emulsifiers may be used to promote suspension of the nut ingredient, for example, where the nut ingredient or product may contain high amounts of fiber and solids. In some embodiments, emulsifiers may be used to stabilize the nut ingredient in the beverage, for example, where the nut ingredient or product is enriched in naturally-occurring fats.

15 [0069] In some embodiments, a coloring agent can include, for example, natural coloring agents (such as β -carotene, saffron, or caramel) and/or synthetic coloring agents (such as erythrosine or titanium dioxide).

20 [0070] In some embodiments, a preservative can include, for example, potassium sorbate, sodium sorbate, potassium benzoate, sodium benzoate or calcium disodium EDTA. In some embodiments, an antimicrobial agent includes a natural antimicrobial agent, such as bacteriocin, rosemary extract, *etc.* The antimicrobial agent may be added to the final product to extend shelf life. In some embodiments, the beverage may be substantially free of preservatives *i.e.*, not contain any added preservative.

25 [0071] In some embodiments the beverage does not contain (*i.e.*, is substantially free of) a soy product. In alternative embodiments, the beverage does not contain (*i.e.*, is substantially free of) one or more of the following allergens: sesame, eggs, fish, shellfish and molluscs (for example, snails, clams, mussels, oysters, cockle and scallops), crustaceans (for example,

crab, crayfish, lobster, prawn and shrimp), sulphites (for example, greater than 10 ppm), mustard, wheat, *etc.* or any derivatives thereof.

[0072] In some embodiments, the pH of the beverage can be between about 3.5 to about 8.5, or any value therebetween, such as about 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, or 8.5.

5 Monopotassium phosphate or sodium bicarbonate and other pH regulators may be used to achieve the desired pH. In some embodiments, pH regulators do not include the use of an ammonia salt.

Methods of Preparation

10 [0073] The beverage may be prepared by, for example, by mixing dry and wet ingredients, followed by homogenization and heat treatment, after which the beverage can be packed into the desired container.

[0074] In some embodiments, the beverage may be prepared by mixing and suspending nut and nut ingredients, dairy and dairy ingredients, stabilizers and/or emulsifiers and other
15 ingredients in water, followed by homogenizing and heat treating the fluid to create a beverage with desirable characteristics such as high stability, pleasant taste, and/or improved nutrition.

[0075] An exemplary single step preparation process is shown in **Fig. 1**, which includes blending/mixing (A), homogenizing (B), and heat processing retention (C).

20 [0076] The process can be adjusted in various sequences, and different process flows may be implemented. In some embodiments, the heating step may precede the homogenization step. In some embodiments, the mixing, homogenizing and/or heating steps may be performed more than once. For example, in an almond and milk process such as that shown in **Fig. 2**, two mixing procedures, two homogenizing procedures and two heat treatments are
25 used.

[0077] In some embodiments, selected dry or liquid ingredients may be pre-treated. Depending on the selected ingredient(s) and their characteristics, pre-treatments may be

designed and applied in order to maintain and/or create technical, microbiological and/or nutritional value for the ingredient. Deodorisation and enzyme deactivation may be used in some embodiments.

[0078] In general, an ingredient with small particle size, substantially free from lumps and with preserved nutritional value, is desirable. In some embodiments, dry ingredients (for example, fresh, grind single ingredient or pre-mix) may be passed through a shear/miller and/or grinder to reduce particle size and promote suspension. In some embodiments, in order to remove larger particles, grinding may be followed by clarification/filtration to facilitate suspension and yield a more stable finished product. In some embodiments, the nut product may have a particle size of about 30 microns to about 300 microns, or any value therebetween, such as about 30, 40, 50, 60, 70, 80, 90, 100, 150, 200, 250 or 300 microns. In some embodiments, the nut product may have a maximum particle size of about 300 microns. In some embodiments, the nut product may have a particle size of about 30 to about 50 microns.

[0079] In some embodiments, enzyme treatment may be used to liquefy carbohydrates present in the nut product or other ingredients. For example, microbial enzymes such as alpha- and beta-amylase, glucoamylase, pullulanase and other suitable enzymes can be used for this pre-treatment.

[0080] In some embodiments, heat-sensitive liquids and/or suspensions (such as colors, flavors, probiotics, Omega 3, vitamins, *etc.*), may be pre-sterilized or passed through in-line sterile filtration prior to addition into the final heat treated product. In some embodiments, thermophilic and mesophilic starter cultures may be added to the final heat-treated product.

[0081] In some embodiments, the dairy ingredient or product may be pre-fermented. For example, thermophilic and/or mesophilic starter culture (probiotic or non-probiotic) may be used in suitable amounts and incubation may be carried out at a pre-determined temperature for a selected period of time.

[0082] After pre-treatment (if conducted), selected ingredients, for example, nut ingredients, dairy ingredients, *etc.* are mixed and added to water. Mixing, stirring, blending,

liquefying, shearing or any other suitable method may be applied to facilitate emulsification, particle size reduction, and dispersion of ingredients. A mixer can be used in one or more phases. In some embodiments, all the ingredients are added in the first step of the process (a one phase mixer). In other embodiments, selected ingredients may be added in the first
5 phase of mixing and after passing through one and/or two other processing steps (such as homogenizer and/or heat treatment); the remaining ingredients may be added and followed by other processing steps.

[0083] In some embodiments, mixing may be performed in a liquefier and through a shear pump. In some embodiments, a high speed mixer may be used for dispersing the particles
10 (e.g. a homomixer at about 500 to 4000 rpm, or about 2,000 to 3500 rpm, or any value therebetween, such as about 500, 600, 700, 800, 900, 1000, 1200, 1500, 1700, 2000, 2200, 2500, 2700, 3000, 3200, or 3500 rpm).

[0084] In some embodiments, a dosing system may be used in some embodiments for adding sterilized and/or heat-sensitive ingredients to the heat-treated product. In some
15 embodiments, the beverage may be inoculated with selected mesophilic and/or thermophilic starter cultures. Incubation may be carried out for appropriate amount of time (such as about 1 to about 5 hours, or any value therebetween) at defined temperatures (such as about 30°C to about 50°C, or any value therebetween).

[0085] In some embodiments, the temperature of mixing may be between about 15°C to about 80°C or about 50°C to about 60°C, or any value therebetween, such as about 15°C,
20 20°C, 25°C, 30°C, 35°C, 40°C, 45°C, 50°C, 55°C, 60°C, 65°C, 70°C, 75°C, or 80°C and, after a suitable period of time (for example, for about 3 minutes to about 10 minutes, or any value therebetween, such as about 5 minutes), such that the ingredients are sufficiently suspended in water. The mixture may be then discharged into a homogenizer.

[0086] Homogenization may be used to, reduce sedimentation, prevent separation, increase
25 viscosity and/or improve texture, color and/or appearance. Any suitable homogenization technique (such as high or low pressure homogenizer, miller, ultra-sonication or other means) may be used to reduce particle size distribution and/or facilitate the formation of a stable emulsion. Homogenization may be used after each mixing step, and can be upstream

or downstream of the heat processing system at about 500 to 4000 psi, or any value therebetween such as about 500, 1000, 1500, 2000, 2500, 3000, 3500 or 4000 psi. In some embodiments, the first phase of homogenization may take place after suspending non-dairy ingredients in water, for example, to reduce naturally occurring fats, fiber and/or protein particle size and promote emulsification between aqueous and lipid phases. The second phase may be performed after adding dairy ingredients to the homogenized fluid, for example, to create a uniform texture in the final product.

[0087] In a two-step process, the first phase of homogenization may be carried out at about 2000 psi to about 3000 psi or any value therebetween. The homogenized mixture may then be subjected to indirect heating for a suitable period of time, such as about 73°C to about 75°C for about 16 sec. The dairy product, and optionally natural flavors, vitamins, etc. may be added into the heat-treated (pasteurized) mixture and homogenized by a two stage homogenizer at about 2000 psi to about 3000 psi or any value therebetween and about 500 psi to about 1000 psi pressure, or any value therebetween, in the first and the second stages, respectively.

[0088] Heat treatment (or other suitable methods such as high pressure processing (HPP), *etc.*) may be used to remove and/or inactivate pathogenic and spoilage bacteria, destroy enzymes, improve mouthfeel while protecting flavor, nutrient and organoleptic characteristics as well as extending shelf life of the product. The processing parameters may be defined to achieve optimal microbiological, nutritional and organoleptic quality in the finished product for an extended period of time while retaining stability. The time-temperature parameters may be selected according to High Temperature/Short Time (HTST), Higher Heat/Shorter time (HHST), Extended Shelf Life (ESL), Ultra High Temperature (UHT), or other suitable methods. The thermal process may be indirect (tubular heat exchanger, plate heat exchanger, *etc.*) or direct (steam injection or infusion). Heat treatment conditions are selected based on product specific properties. The product may be heat treated based on a pre-determined temperature/time profile (*e.g.*, 72–74° C/ 16 sec, 88–100° C/0.01–1 sec, 135–150° C/4–15 sec, *etc.*). In some embodiments, a final heat treatment may be carried out in direct steam injection system at about 130°C to about 140 °C for about 2 seconds to about 5 seconds.

[0089] Heat treatment or its alternatives may be applied in one or more phases, resulting in various process flows. In some embodiments, heating may be applied once at the final step of the process and before packaging. In some other embodiments, heat treatment may be applied at two or more stages during the process. Based on the characteristics of the selected ingredient(s), heat treatment may be performed so as to minimize thermal damage and development of cooked off-flavours in the final product. This can be achieved by, for example, optimizing the time and temperature profiles to avoid over- or under-processing and inhibit temperature fluctuations during the process. In some embodiments, a nut and dairy product with a high tendency for precipitation and burn on, during heat treatment, may be treated by direct steam processing to minimize these effects. Different steps can be added, changed or removed, as desired.

[0090] Shelf life refers to length of time a food, beverage or other perishable item can be stored before it becomes unsuitable for use or consumption. Factors which limit shelf life include microbial spoilage, development of off-colours and -flavours, as well as destabilization resulting in suspension and sedimentation.

[0091] An extended shelf life product is one that will not undergo significant physico-chemical, microbiological or sensory changes over an extended period of time. An unstable product will have a very short shelf life, whereas a stable product will have a longer shelf life. In some embodiments, a beverage according to the present disclosure retains microbiological, sensory and textural stability over its shelf life. In some embodiments, a beverage as disclosed herein does not exhibit substantial precipitation over its shelf life.

[0092] In some embodiments, a beverage as disclosed herein is stable for at least 2 months at refrigeration temperatures (such as temperatures ranging from about 0°C to about 10°C, or any value therebetween, such as 0°C, 1°C, 2°C, 3°C, 4°C, 5°C, 6°C, 7°C, 8°C, 9°C or 10°C). In alternative embodiments, a beverage as disclosed herein is shelf stable for at least 6 months at ambient temperatures (such as temperatures ranging from about 20°C to about 30°C, or any value therebetween, such as 20°C, 21°C, 22°C, 23°C, 24°C, 25°C, 26°C, 27°C, 28°C, 29°C, or 30°C).

[0093] The finished product can be filled and packed by aseptic and non-aseptic methods in bottles, jars, cans, cartons, gable top, or any appropriate container. The container may be made of any suitable material, such as plastic, laminate, *etc.* It is to be understood that the stability of the beverage may depend on the process used and/or packaging of the final product.

[0094] Fig. 2 shows an exemplary two-step process for preparing an almond and milk beverage. In this process, the almond ingredient may be stabilized in water before adding the dairy product. Thus, non-dairy ingredients, such as almond and stabilizers, are added at the first mixing step (A1) followed by homogenizing (B1) and heating (C1). Dairy ingredients may be added at the second mixing step (A2) and again homogenization (B2) and heat treatment (C2) may be carried out to yield the final product.

[0095] More specifically, almond kernels (A1-2) are passed through a grinder as a pre-treatment (A0) to reduce particle size which may be no more than 250 microns (more particularly not more than 30 – 50 microns). The ingredients are weighed and the sugar, salts, stabilizers, emulsifiers, buffering agents, fortifying agents (except vitamins) (A1-3) are combined with the almond and a desirable amount of water (A1-1). Mixing is performed in a liquefier and through a shear pump. High speed mixing may be used for dispersing the particles (e.g. homomixer at 2,000 rpm). The temperature may be adjusted to 50 – 60°C and after laps of time (3-10 min, more particularly 5 min), when all the ingredients are suspended in water the mixture is discharged into a homogenizer.

[0096] The first phase of homogenization (B1) may be carried out at approximately 2000 – 3000 psi. The homogenized mixture is then subjected to an indirect heating system (C1) at 73 – 75 °C for 16 sec. Milk, natural flavors and vitamins are added (A2) into the pasteurized mixture and further homogenized in a two stage homogenizer (B2) with approximately 2000 – 3000 and 500 – 1000 psi pressure in the first and the second stages, respectively. Final heat treatment (C2) is carried out in a direct steam injection system at 130 – 140 °C for 3 – 5 sec.

[0097] The steps illustrated in Fig. 2 can be combined, modified, or deleted where appropriate, and additional steps can also be added to those shown. Additionally, the steps

can be performed in any suitable order without departing from the scope of the present disclosure.

[0098] The present invention will be further illustrated in the following examples.

EXAMPLES

Example 1

[0099] An exemplary nut and dairy beverage was prepared by combining:
 5% w/w of a dairy product containing calcium
 4% w/w of almond butter
 Supplemental calcium
 0.1% w/w of stabilizers
 about 88 % w/w water

[00100] The dairy component was a modified milk ingredient, containing skim milk powder, with the following physical/chemical properties.

Protein (N x 6.38, % as is)	30.5%
Milk Fat (%)	0.8%
Lactose (% by difference)	58.0%
Ash (%)	6.9%
Moisture (%)	3.8%
pH (10% w/v solution)	6.5 – 6.6

[00101] The nut source was almond in the form of roasted almond butter.

Free Fatty Acids	1.0% Maximum
Moisture	1.4 – 2.6% Maximum
Aflatoxin	<15ppb

[00102] The stabilizers included gellan gum and lambda carrageenan in a 2.7:1 ratio.

[00103] The pH of the beverage was in the range of 6.5 – 7.3 and the density was 1.038 kg/L. The total solids were present at $11.5 \pm 0.3\%$. The specific gravity was 1.04 and the viscosity was 5 cp at 10°C and 1.1 cP at 72°C.

[00104] The beverage also contained cane sugar, tricalcium phosphate, canola lecithin and/or sunflower lecithin, salt, natural flavour, sodium bicarbonate, vitamin A palmitate, zinc gluconate, riboflavin, vitamin D, and vitamin B12.

[00105] Supplemental calcium was added to the beverage in an amount sufficient to provide 45% of the Daily Value in the beverage.

[00106] The beverage was stable for at least 2 months at refrigeration temperatures and had the following nutritional profile.

5 Table 2. Nutritional facts for Example 1.

Nutrition Facts		
Serving size – 250 mL	Amount	% Daily Value
Calories	120 kcal	
Fat	3.5 g	5%
Saturated	0.4 g	
Polyunsaturated	0.9 g	
Monounsaturated	2.0 g	
Trans	0.0 g	
Cholesterol	3.5 mg	
Carbohydrate	16 g	5%
Fibre	1.0 g	
Sugars	15 g	
Protein	7.0 g	
Vitamins		
Vitamin A		10%
Vitamin C		2%
Vitamin D		40%
Vitamin E		15%
Riboflavin		25%
Vitamin B12		50%
Biotin		15%
Minerals		
Calcium		45%
Sodium		7%
Phosphorus		15%
Potassium		9%
Iron		2%
Magnesium		6%
Zinc		15%

Example 2

[00107] An exemplary flavoured nut and dairy beverage was prepared by combining:

5% w/w of a dairy product containing calcium

3.5% w/w of almond butter

0.5% vanilla flavouring

Supplemental calcium

0.1% w/w of stabilizers

about 87% w/w water

[00108] The dairy component was a modified milk ingredient, containing skim milk powder and lactose, with the following physical/chemical properties.

Protein (N x 6.38, % as is)	30.5%
Milk Fat (%)	0.8%
Lactose (% by difference)	58.0%
Ash (%)	6.9%
Moisture (%)	3.8%
pH (10% w/v solution)	6.5 – 6.6

[00109] The almond butter had the following properties.

Free Fatty Acids	1.0% Maximum
Moisture	1.4 – 2.6% Maximum
Aflatoxin	<15ppb

[00110] The stabilizers included gellan gum and lambda carrageenan in a 2.7:1 ratio.

[00111] The vanilla flavouring was an extract of vanilla beans, water and natural grain alcohol, with the following physical/chemical properties.

Specific Gravity @ 25°C	0.9700 – 0.9900
Refractive Index @ 20°C	1.35701 – 1.3640
Alcohol Content %	35.00% – 39.00%
Flashpoint	29.4°C (85°F)

[00112] The pH of the beverage was in the range of 6.5 – 7.3 and the density was 1.038 kg/L. The total solids were present at $12 \pm 0.3\%$. The specific gravity was 1.04 and the viscosity was 5 cP at 10°C and 1.1 cP at 72°C.

[00113] The beverage also contained cane sugar, tricalcium phosphate, canola lecithin and/or sunflower lecithin, salt, natural flavour, sodium bicarbonate, vitamin A palmitate, zinc gluconate, riboflavin, vitamin D, and vitamin B12.

[00114] Supplemental calcium was added to the beverage in an amount sufficient to provide 45% of the Daily Value in the beverage.

[00115] The beverage was stable for at least 2 months at refrigeration temperatures and had the following nutritional profile.

Table 3. Nutritional facts for Example 2.

Nutrition Facts		
Serving size – 250 mL	Amount	% Daily Value
Calories	120 kcal	
Fat	3.5 g	5%
Saturated	0.4 g	
Polyunsaturated	0.9 g	
Monounsaturated	2.0 g	
Trans	0.0 g	
Cholesterol	3.5 mg	
Carbohydrate	17 g	5%
Fibre	1.0 g	
Sugars	16 g	
Protein	7.0 g	
Vitamins		
Vitamin A		10%
Vitamin C		2%
Vitamin D		40%
Vitamin E		15%
Riboflavin		25%
Vitamin B12		50%
Biotin		15%
Minerals		
Calcium		45%
Sodium		7%
Phosphorus		15%
Potassium		9%
Iron		2%
Magnesium		6%
Zinc		15%

Example 3

[00116] An exemplary lactose-free nut and dairy beverage is prepared by combining:

- 5 5% w/w of a lactose-free dairy product containing calcium
 4% w/w of almond butter
 Supplemental calcium
 0.1% w/w of stabilizers
 about 88% w/w water

10

[00117] The dairy component is a modified milk ingredient, containing lactose-free skim milk powder with the following physical/chemical properties.

- 15 Protein (N × 6.38, % as is) 34.5%
 Milk Fat (%) 1.5%
 Ash (%) 14.2%
 Moisture (%) 3.8%
 pH (10% w/v solution) 6.5 – 6.8

[00118] The almond butter has the following properties.

Free Fatty Acids 1.0% Maximum
 Moisture 1.4 – 2.6% Maximum
 Aflatoxin <15ppb

[00119] The stabilizers include gellan gum and lambda carrageenan in a 2.7:1 ratio.

[00120] The pH of the beverage is in the range of 6.5 – 7.3 and the density is 1.038 kg/L. The total solids are present at $10.5 \pm 0.3\%$. The specific gravity is 1.04.

[00121] The beverage also contains cane sugar, tricalcium phosphate, canola lecithin and/or sunflower lecithin, salt, natural flavour, sodium bicarbonate, vitamin A palmitate, zinc gluconate, riboflavin, vitamin D, and vitamin B12.

[00122] Supplemental calcium is added to the beverage in an amount sufficient to provide 45% of the Daily Value in the beverage.

[00123] The beverage is shelf stable for at least 6 months at ambient temperatures and has the following nutritional profile.

Table 4. Nutritional facts for Example 3.

Nutrition Facts		
Serving size – 250 mL	Amount	% Daily Value
Calories	90 kcal	
Fat	5.0 g	5%
Saturated	1.5 g	
Polyunsaturated	0.9 g	
Monounsaturated	2.5 g	
Trans	0.1 g	
Cholesterol	5.0 mg	
Carbohydrate	5.0 g	5%
Fibre	1.0 g	
Sugars	4.0 g	
Protein	7.0 g	
Vitamins		
Vitamin A		10%
Vitamin C		4%
Vitamin D		45%
Vitamin E		15%
Riboflavin		30%
Vitamin B12		60%
Biotin		15%
Minerals		
Calcium		45%

Sodium	5%
Phosphorus	15%
Potassium	1%
Iron	4%
Magnesium	8%
Zinc	10%

Example 4 (Partly skimmed milk + Almond butter)

[00124] An exemplary nut and dairy beverage is prepared by combining:

- 5 70% w/w of fluid cow's milk (2% fat)
 3% w/w of almond butter
 0.1% w/w of stabilizers
 about 24% w/w water

10 **[00125]** The dairy component is fluid cow's milk, with the following physical/chemical properties:

Protein (N x 6.38, % as is) ~ 3.5%
 Milk Fat (%) ~ 2.0%
 Moisture (%) ~ 89%
 pH 6.8 – 7.0

[00126] The almond butter consists of blanched almonds:

Free Fatty Acids 1.0% Maximum
 Moisture 1.4 – 2.6% Maximum
 Aflatoxin <15 ppb

15 **[00127]** The stabilizers include gellan gum and lambda carrageenan in a 2.7:1 ratio.

[00128] The pH of the beverage is in the range of 6.5 – 7.5, and the density is 1.04 kg/L. The total solids are present at 10.5 ± 0.3%.

20 **[00129]** The beverage also contains cane sugar, calcium carbonate, canola lecithin and/or sunflower lecithin, salt, natural flavour, sodium bicarbonate, vitamin A palmitate, zinc gluconate, riboflavin, vitamin D, and vitamin B12.

[00130] Supplemental calcium is added to the beverage in an amount sufficient to provide at least 300 mg of calcium per 250 mL serving.

[00131] The beverage is shelf stable for at least 6 months at ambient temperatures and has the following nutritional profile:

[00132] Nutritional facts for Example 4.

Nutrition Facts	
Serving size – 250 mL	Amount
Calories	160 kcal
Fat	8.0 g
Saturated	2.5 g
Polyunsaturated	1.0 g
Monounsaturated	3.5 g
Trans	0.2 g
Cholesterol	14.5 mg
Carbohydrate	15 g
Fibre	1.0 g
Sugars	14 g
Protein	8.0 g
Calcium	336mg

5 **Example 5** (Skim milk product + Whey protein Isolate + Cashew butter)

[00133] An exemplary nut and dairy beverage is prepared by combining:

4% w/w of skim milk product containing calcium
 5% w/w of whey protein isolate
 5% w/w of cashew butter
 0.1% w/w of stabilizers
 about 86% w/w water

10

[00134] The dairy components are a skim milk product and whey protein isolate (WPI) with the following physical/chemical properties:

	Skim milk product	Whey protein isolate
Protein (N x 6.38, % as is)	~ 34.5%	~ 58%
Milk Fat (%)	~ 1.5%	~ 1.16%
Moisture (%)	~ 3.8%	~ 0.86%
pH (10% w/v solution)	6.8 – 7.0	6.0 – 6.5

[00135] The cashew butter consists of blanched cashews:

15

Fat	~ 50%
Protein	~ 17%
Carbohydrate	~ 30%

[00136] The stabilizers include gellan gum and lambda carrageenan in a 2.7:1 ratio.

[00137] The pH of the beverage is in the range of 6.5 –7.3 and the density is 1.05 kg/L. The total solids are present at $13.5 \pm 0.3\%$.

5 [00138] The beverage also contains cane sugar, calcium carbonate, canola lecithin and/or sunflower lecithin, salt, natural flavour, sodium bicarbonate, vitamin A palmitate, zinc gluconate, riboflavin, vitamin D, and vitamin B12.

[00139] Supplemental calcium is added to the beverage in an amount sufficient to provide at least 350 mg of calcium per 250 mL serving.

10 [00140] The beverage is shelf stable for at least 6 months at ambient temperatures and has the following nutritional profile:

[00141] Nutritional facts for Example 5.

Nutrition Facts	
Serving size – 250 mL	Amount
Calories	160 kcal
Fat	7.0 g
Saturated	1.5 g
Polyunsaturated	0.2 g
Monounsaturated	0.1 g
Trans	0 g
Cholesterol	3.6 mg
Carbohydrate	14 g
Fibre	1 g
Sugars	6 g
Protein	13.0 g
Calcium	315 mg

[00142] All citations are hereby incorporated by reference.

15 [00143] The present invention has been described with regard to one or more embodiments. However, it will be apparent to persons skilled in the art that a number of variations and modifications can be made without departing from the scope of the invention as defined in the claims.

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WHAT IS CLAIMED IS:

1. A beverage comprising a nut product and a dairy product, wherein the beverage comprises:

a) about 0.5% w/w to about 15% w/w protein derived from the dairy product;

5 b) about 0.05 to about 3% w/w fiber derived from the nut product;

c) about 0.01 to about 0.3% w/w calcium derived from the dairy product; and

d) about 0.05% to about 5.0 % w/w fat, wherein the fat comprises a mixture of unsaturated fatty acids and saturated fatty acids and wherein the ratio of unsaturated to saturated fatty acids is at least 5.0% greater than that of dairy milk alone.

10 2. The beverage of claim 1 wherein the nut product comprises one or more of: hazelnut, pistachio, almond, walnut, or cashew.

3. The beverage of claim 1 or 2 wherein the nut product comprises: a fluid, a concentrate, a butter, a cream or a powder.

4. The beverage of claim 3 wherein:

15 (i) the fluid is present in an amount of about 2% w/w to about 99% w/w;

(ii) the concentrate is present in an amount of about 0.5% w/w to about 80% w/w;

(iii) the butter or cream is present in an amount of about 0.5% w/w to about 25% w/w; or

(iv) the powder is present in an amount of about 0.5% w/w to about 21% w/w.

20 5. The beverage of any one of claims 1 to 4 wherein the dairy product comprises one or more of: milk, skim milk, whey, permeate, milk powder (MP), skim milk powder (SMP), whey powder (WP), permeate powder (PP), milk protein isolate (MPI), milk protein concentrate (MPC), whey protein isolate (WPI), whey protein concentrate (WPC), cultured milk, or fermented milk.

6. The beverage of claim 5, wherein:

(i) the milk is present in an amount of about 5 to about 99% w/w;

(ii) the whey is present in an amount of about 5 to about 99% w/w;

(iii) the permeate is present in an amount of about 5 to about 99% w/w;

5 (iv) the MP is present in an amount of about 0.5% to about 60% w/w;

(iv) the WP is present in an amount of about 0.5% to about 60% w/w;

(v) the PP is present in an amount of about 0.5% to about 60% w/w;

(vi) the MPI is present in an amount of about 0.5% to about 60% w/w;

(vii) the MPC is present in an amount of about 0.5% to about 60% w/w;

10 (viii) the WPI is present in an amount of about 0.5% to about 60% w/w; or

(ix) the WPC is present in an amount of about 0.5% to about 60% w/w.

7. The beverage of claim 5, wherein the cultured or fermented dairy milk comprises a mesophilic starter culture and/or a thermophilic starter culture.

15 8. The beverage of any one of claims 1 to 7 wherein the dairy product is substantially free of lactose and/or casein.

9. The beverage of any one of claims 1 to 8 wherein the dairy product is derived from a cow, goat, buffalo, or sheep.

10. The beverage of any one of claims 1 to 9 wherein the beverage comprises a mesophilic starter culture and/or a thermophilic starter culture.

20 11. The beverage of any one of claims 1 to 10 wherein the beverage comprises an effective amount of a stabilizer and/or emulsifier.

12. The beverage of any one of claims 1 to 11 wherein the beverage has a pH ranging from about 3.5 to about 8.5.

13. The beverage of any one of claims 1 to 12 further comprising a sweetener.

14. The beverage of claim 13 wherein the sweetener is present in an amount of about
5 0.001% to about 25% w/w.

15. The beverage of any one of claims 1 to 14 further comprising a flavouring agent.

16. The beverage of claim 15 wherein the flavouring agent is vanilla.

17. The beverage of any one of claims 1 to 16 wherein the beverage has microbiological, sensory and textural stability over its shelf life.

10 18. A process for preparing the beverage of any one of claims 1 to 17, comprising:

(i) providing the nut product;

(ii) adding a stabilizer and/or emulsifier to the nut product together with a sufficient quantity of water;

(iii) mixing the nut product and the stabilizer and/or emulsifier at a suitable mixing
15 temperature for a sufficient period of time to suspend the particles in the water to obtain a suspended nut mixture;

(iv) homogenizing the suspended nut mixture to obtain a homogenized nut mixture;

(v) heating the homogenized nut mixture at a suitable pasteurization temperature for a sufficient period of time for pasteurization to obtain a pasteurized nut mixture;

20 (vi) adding the dairy product to the pasteurized homogenized nut mixture and mixing to obtain a dairy and pasteurized nut mixture;

(vii) further homogenizing the dairy and pasteurized nut mixture to obtain a homogenized nut and dairy mixture;

(vii) further heating the homogenized nut and dairy mixture at a suitable sterilization temperature for a sufficient period of time.

19. The process of claim 18 wherein the nut product has a particle size of less than about 300 microns.

5 20. The process of claim 19 wherein the particle size is about 30 microns to about 50 microns.

21. The process of any one of claims 18 to 20 wherein the suitable mixing temperature is about 15°C to about 80°C.

10 22. The process of any one of claims 18 to 21 wherein the sufficient period of time for obtaining the suspended nut mixture is about 3 minutes to about 10 minutes.

23. The process of any one of claims 18 to 22 wherein the suspended nut mixture is homogenized at about 400 psi to about 4000 psi.

24. The process of any one of claims 18 to 23 wherein the pasteurization temperature is about 73°C to about 75°C.

15 25. The process of claim 24 wherein the sufficient period of time for pasteurization is about 16 seconds.

26. The process of any one of claims 18 to 25 wherein the homogenized nut and dairy mixture is homogenized using a first stage of about 2000 psi to about 3000 psi and a second stage of about 500 psi to about 1000 psi.

20 27. The process of any one of claims 18 to 25 wherein the homogenized nut and dairy mixture is heated at about 130°C to about 140°C.

28. The process of claim 27 wherein the homogenized nut and dairy mixture is heated for about 2 seconds to about 5 seconds.

25 29. The process of claim 28 wherein the homogenized nut and dairy mixture is heated by direct steam injection.

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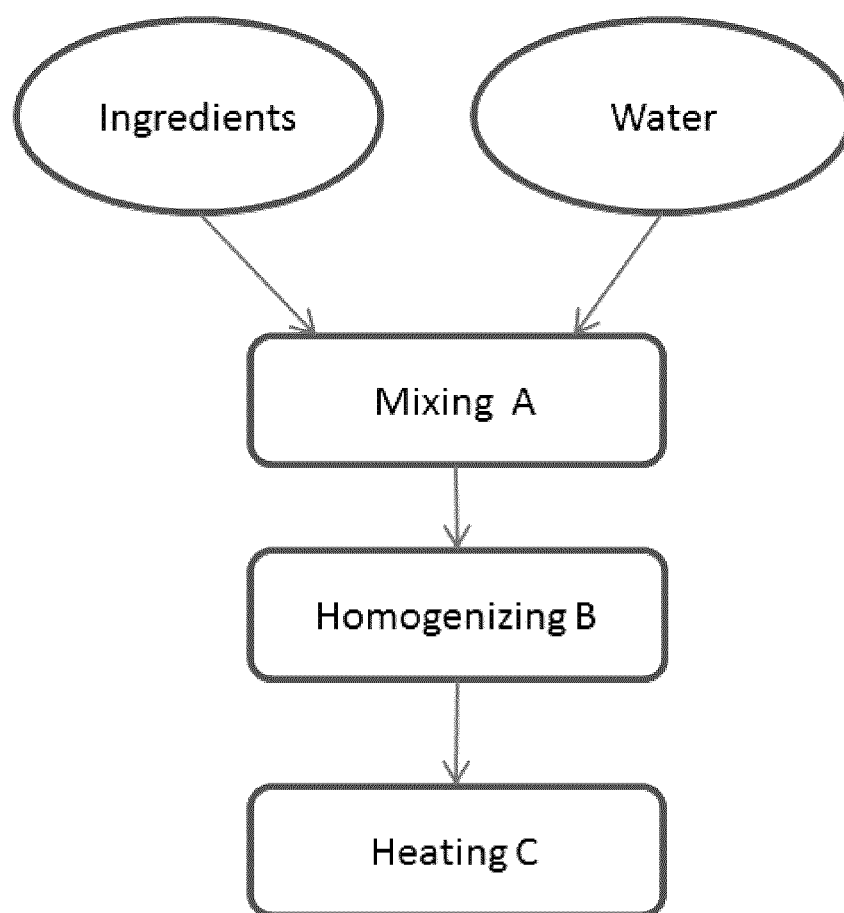


Figure 1.

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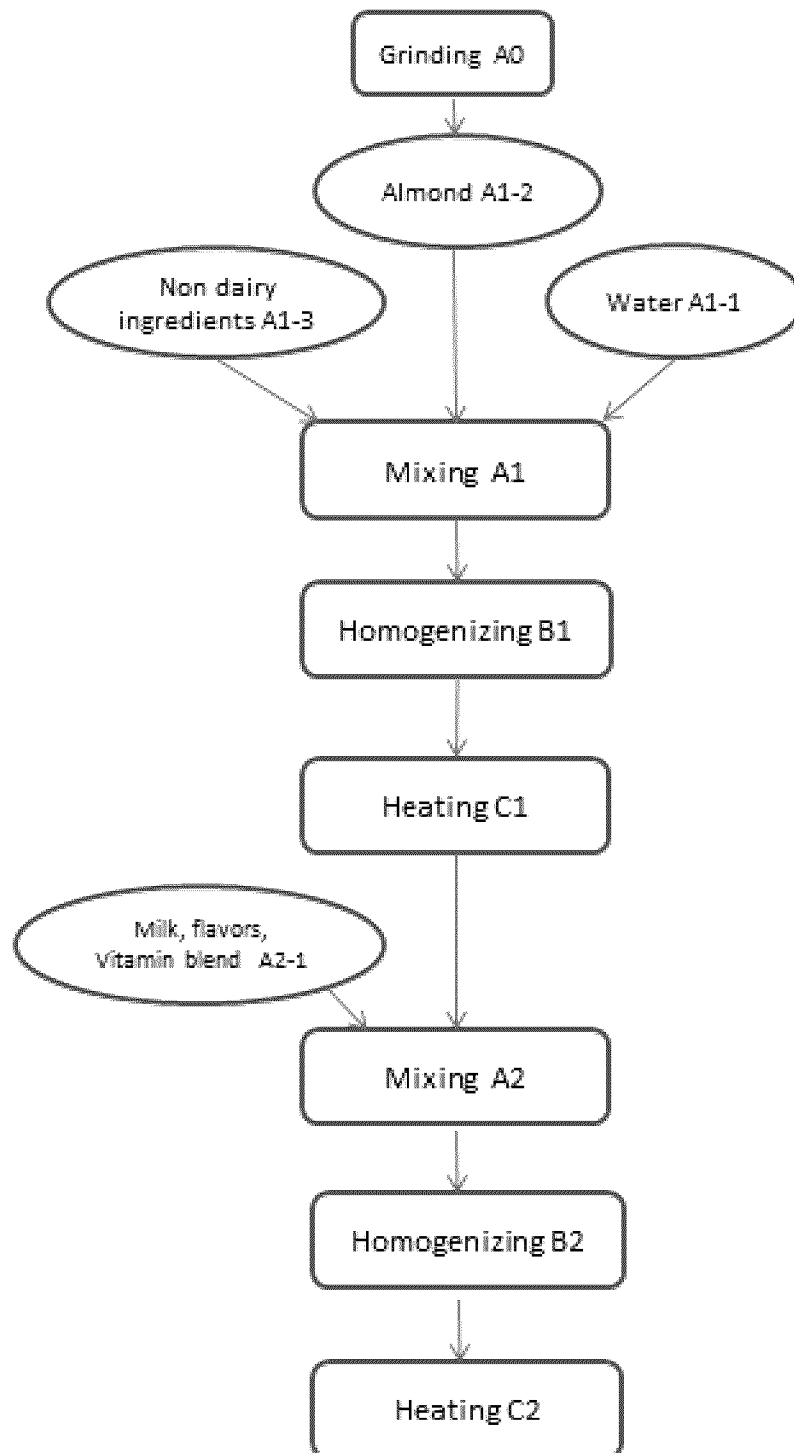


Figure 2.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CA2014/050475

A. CLASSIFICATION OF SUBJECT MATTER

IPC: **A23C 9/156** (2006.01), **A23C 3/02** (2006.01), **A23C 9/13** (2006.01), **A23C 9/152** (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A23C, A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used)

Canadian Patent Database: Intellect

TotalPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2007/106731 A2 (SHERWOOD ET AL) 20 September 2007 (20-09-2007) Abstract Claims 10 and 238 Page 13, lines 13-24	1-29
Y	CA 2 707 931 C (MCCREADY) 11 March 2011 (11-03-2011) Abstract Table 9 Claims	1-29

 Further documents are listed in the continuation of Box C.

 See patent family annex.

* "A" "E" "L" "O" "P"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance earlier application or patent but published on or after the international filing date document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed	"T" "X" "Y" "&"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art document member of the same patent family
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Date of the actual completion of the international search
24 July 2014 (24-07-2014)Date of mailing of the international search report
15 August 2014 (15-08-2014)Name and mailing address of the ISA/CA
Canadian Intellectual Property Office
Place du Portage I, C114 - 1st Floor, Box PCT
50 Victoria Street
Gatineau, Quebec K1A 0C9
Facsimile No.: 001-819-953-2476

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CA2014/050475

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