

Ready-to-drink plant-based beverages with improved stability

Field of the invention

5 The present invention relates to the field of shelf-stable ready-to-drink (RTD) plant-based beverage compositions which are free from dairy ingredient and which comprise a plant-based ingredient, a high methoxyl pectin and an emulsifier. The invention also relates to a method for producing shelf-stable ready-to-drink (RTD) plant-based beverage compositions comprising a plant-based ingredient, a high methoxyl pectin and an emulsifier.

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Background of the invention

Nowadays, consumers may wish to consume less milk or do not want to consume milk at all for varied reasons: its animal origin, a lactose intolerance, dairy allergies etc. To meet
15 this growing consumers' demand, food companies propose dairy products analogues on the market worldwide. These dairy products analogues are free from dairy ingredients and are prepared with alternative ingredients such as plant ingredients e.g. plant based proteins.

Among plant ingredient options, cereals are a substantial source of micro and macronutrients. Their consumption brings several nutritional and health benefits. Hence,
20 food companies show great interest in using cereals as main ingredients for the preparation of dairy products analogues.

Furthermore, consumers are more health conscious and are looking to improve or at least to maintain their health with healthier eating habits and therefore healthier food products but
25 without compromising the product taste and texture.

RTD dairy products exist with reduced in fat and in sugar and also enriched in vitamins, in minerals and/or probiotics to allow them to claim health's benefits.

For example, there are commercially available milk RTD containing plant sterols which have been shown to lower blood cholesterol by blocking cholesterol absorption into the
30 bloodstream.

However, for the reasons above mentioned, consumers wish thus to consume plant-based products, especially wish to consume plant-based products with health benefits. In addition, consumers are looking for plant-based products with a good mouthfeel, also denoted as richness, texture or creaminess, of the beverages, and which have health benefits, such as
5 lowering blood cholesterol.

There is thus a need to provide a plant-based RTD drink that have an excellent nutritional value with a pleasant taste profile and have a health benefit, such as lowering blood cholesterol.

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The replacement of milk by plant protein sources, such as cereals proteins, may be perceived as bitter and/or astringent with slimy which impact the sensory experience.

The taste and texture in the plant-based product are linked to the presence of beta-glucans in high concentration. Indeed, cereals contain high concentrations of polysaccharides, including fibers such as beta-glucans. In particular, some cereals such as oat or barley
15 comprise beta-glucans, i.e specific soluble fibers, in a substantial quantity.

However, beta-glucans are key macronutrients associated with health and nutritional benefits and have a benefit on digestive health.

20 There is thus a need to provide plant-based RTD beverages that have an excellent nutritional value with a pleasant taste and texture profile and further have benefits on health, such as lowering blood cholesterol while maintaining a good digestive health.

In addition, other main characteristics of the RTD beverages may need to be shelf-stable
25 during storage without phase separation, creaming, gelation and sedimentation, and to retain a constant viscosity during shelf-life .

To increase their shelf life during the storage at ambient temperature, the RTD beverages are subjected to a heat treatment involving high temperature such as a Ultra High Temperature (UHT) treatment, a High Temperature Short Time (HTST) treatment, a
30 pasteurization, a batch pasteurization, or a hot fill.

However, such type of heat treatment cannot be applied to plant-based beverages due to their high concentration in plant proteins. In fact, plant proteins are very sensitive to temperature and in high temperature conditions, plant proteins are denatured and thus coagulate easily together to form large protein agglomerates. The formation of large protein agglomerates may be undesirable in the plant-based product : firstly due to possible leads to a phase separation in the plant-based product due to the sedimentation of the larger coagulated proteins and secondly it decreases the nutritional profile of the plant-based product and thus it removes the claims benefits on health.

Thus, there is a further need to provide plant-based RTD beverages that have all the benefits mentioned above, and which are shelf-stable and retain their viscosity during storage, especially storage at ambient temperature.

Furthermore, it also may desirable to have products manufactured with less energy.

There is thus a further need to provide plant-based RTD beverages that have all the benefits mentioned above, and which are environmentally friendly, i.e. produced with less energy than state of art RTD.

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Summary of the Invention

In a first aspect, the invention relates to a shelf-stable RTD plant-based beverage composition comprising:

- 25 - at least one plant-based ingredient selected from the group consisting of hydrolyzed plant protein, hydrolyzed cereal bran and combinations thereof,
- high methoxyl pectin, and
- at least one emulsifier,

wherein the beverage is free from dairy ingredient and has a pH below 5.5, preferably ranging from 3.5 to 4.5 and has a viscosity ranging from 20 to 50 cP measured at 25°C at shear rate 50 sec⁻¹, preferably from 20 to 40 cP.

In a second aspect, the invention relates to a method for producing a shelf-stable RTD plant-based beverage composition comprising the steps of:

- a) providing a composition with at least one plant-based ingredient,
- b) providing a composition comprising a high methoxyl pectin and at least one emulsifier,
- 5 c) mixing together the compositions obtained at step a) and at step b) at a temperature ranging from 4°C to 70°C for 5 to 30 minutes,
- d) heat-treating the mixture obtained at step c) at a temperature ranging from 75°C to 121°C for 20 second to 15 minutes with upstream or/and downstream homogenization with 100 to 300 bars to obtain a RTD plant-based beverage composition,
- 10 e) filling the RTD plant-based beverage composition obtained at step d) in containers.

The present inventors have shown that the composition of the present invention achieves the objective of the present invention and – in particular - that a shelf-stable RTD plant-based beverage composition free from dairy ingredient, a pH below 5.5 and comprising at
15 least one plant-based ingredient, high methoxyl pectin, and at least one emulsifier achieves the objective of the present invention. The composition of the present invention was found to have a surprisingly pleasant taste and texture profiles despite containing plant-based ingredient in high content. The composition of the present invention was further found to be surprisingly shelf-stable during storage and to retain its viscosity during storage, even
20 without being subjected to high heat treatment and also to have benefits on health, such as lowering blood cholesterol while maintaining a good digestive health.

Brief Description of the Drawings

25 Figure 1 shows two transparent containers both comprising a RTD plant-based beverage composition according to the invention and obtained according to Example 1 that have been stored under ambient conditions for 3 weeks. No phase separation is observed.

Figure 2 shows three transparent containers comprising a RTD plant-based beverage
30 composition according to the invention and obtained according to Example 2. These three containers have been stored respectively at 4°C (container A.), at 20°C (container B.) and

at 30°C (container C.) for 3 weeks. No phase separation is observed regardless the temperature conditions in which the containers have been stored.

Figure 3 shows two transparent containers comprising a RTD plant-based beverage composition not according to the invention and obtained respectively according to Example 3 (container D.) and Example 4 (container E.). A phase separation is immediately observed for these two containers that are stored at ambient conditions.

Detailed Description of the Invention

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As used in this specification, the words “comprises”, “comprising”, and similar words, are not to be interpreted in an exclusive or exhaustive sense. In other words, they are intended to mean “including, but not limited to”.

15 The expressions “comprised between X and Y” and “from X to Y” include boundaries, unless explicitly stated otherwise. These expressions mean that the target range includes the X and Y values, and all values from X to Y.

The present invention relates to a shelf-stable RTD plant-based beverage composition comprising:

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- at least one plant-based ingredient selected from the group consisting of hydrolyzed plant protein, hydrolyzed cereal bran and combinations thereof,
- high methoxyl pectin, and
- at least one emulsifier,

25 wherein the beverage is free from dairy ingredient and has a pH below 5.5, preferably ranging from 3.5 to 4.5 and has a viscosity ranging from 20 to 50 cP measured at 25°C at shear rate 50 sec⁻¹, preferably from 20 to 40 cP.

The term “plant based” shall be understood for the purpose of the present invention to comprise parts of plants that are consumed by humans or other animals as food, for example cereals, fruits and/or vegetables.

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The term “ready-to-drink beverage” or “RTD beverage,” as used herein, refers to a beverage in liquid form ready to be consumed without further addition of liquid.

- 5 By “dairy ingredient”, it is understood ingredients which are originated from non-human mammal milk, such as cow milk, goat milk, ewe milk, camel milk, donkey milk. For example, the dairy ingredient can be liquid milk, milk fat, milk powder, milk proteins, dairy curd, cream, buttermilk, butter, condensed milk and combinations thereof.
- 10 The composition according to the invention is shelf-stable during storage and retains its viscosity during storage.
- Furthermore, the composition according to the invention has proven to be particularly shelf-stable, both when chilled as well as when kept at room temperature for consumption.
- The term “shelf-stable” means that the composition according to the invention does not
- 15 exhibit any phase separation, creaming, gelation and sedimentation during storage, i.e under chilled conditions or under ambient conditions.
- For example, the composition according to the invention is shelf-stable for at least 6 months at 8°C or alternatively is shelf-stable for at least 6 months at 20°C, or for at least 4 months at 30°C.
- 20 In one embodiment, the composition has a viscosity ranging from 20 to 50 cP measured at 25°C at shear rate 50 sec⁻¹, preferably from 20 to 40 cP.
- In another embodiment, the composition has a viscosity ranging from 10 to 40 cP measured at 4°C at shear rate 50 sec⁻¹, preferably from 10 to 30 cP.
- 25 The viscosity of the composition according to the invention is measured by a concentric cylinder with sample conditioning (4 °C and 25 °C) and shear rate 1-100 1/s.
- The viscosity of the composition according to the invention is suitable for a RTD application and is maintained during storage either under chilled conditions or ambient conditions, for example is maintained for at least 4 months.
- 30 The composition according to the invention is defined as an acidic RTD plant-based beverage composition due to its low pH, i.e below 5.

In one embodiment, the composition has a pH below 5, preferably ranging from 3.5 to 4.5. The pH of said composition is due to the presence of natural juice concentrate and can further be lowered to reach the desired pH by addition of an acidifier.

It has been found that due to its low pH, the composition according to the invention doesn't
5 need to be heat treated with high temperatures which leads to produce RTD beverage composition with lower energy consumption.

In one embodiment, the composition comprises from 0.5 to 15% by weight of juice concentrate as compared to the total weight of the composition, preferably from 2 to 10%.

10 Examples of fruit concentrate that may be used in accordance with the present invention include, but are not limited to apple, grape, pear, blueberry, strawberry, cherry and citrus fruits in general.

The presence of fruit concentrate in the composition according to the invention improves the taste of the RTD plant-based beverage composition without adding food coloring and/or
15 food flavoring ingredients and also gives to the RTD plant-based beverage composition an appealing visual, i.e a natural visual. In addition, the presence of fruit concentrate in specific amount in the composition according to the invention allows to reach a low pH.

The advantages of having a RTD plant-based beverage composition with a low pH are that such composition doesn't exhibit the development of unwanted micro-organisms during
20 storage, such as bacteria or moulds, that may affect negatively the organoleptic properties of the composition, or that may be pathogenic, and consequently doesn't need to be subjected to a high heat treatment during its process of preparation.

In another embodiment, the composition further comprises from 0.01 to 2% by weight of
25 an acidifier as compared to the total weight of the composition, preferably from 0.01 to 1%.

In one embodiment, the acidifier is selected from the group consisting of plant concentrate, vegetable concentrate, fruit concentrate, lactic acid, ascorbic acid, citric acid and combinations thereof.

Examples of vegetable concentrate that may be used in accordance with the present
30 invention include, but are not limited to tomato, carrot, sweet potato, and radish in general.

In a preferred embodiment, the composition comprises:

- from 10 to 30% of at least one plant-based ingredient, preferably from 10 to 20%,
- from 0.1 to 1% of high methoxyl pectin, preferably from 0.5 to 0.8%, and
- from 0.01 to 0.3% of at least one emulsifier, preferably from 0.04 to 0.2%,

5 the percentages being defined by weight of component as compared to the total weight of the composition.

Advantageously, the composition comprises:

- from 10 to 30% of a plant-based ingredient, preferably from 10 to 20%,
- from 0.1 to 1% of high methoxyl pectin, preferably from 0.5 to 0.8%, and
- 10 - from 0.01 to 0.3% of an emulsifier, preferably from 0.04 to 0.2%,

the percentages being defined by weight of component as compared to the total weight of the composition.

In one embodiment, the composition comprises a total water content ranging from 60 to
15 90% by weight as compared to the total weight of the composition, preferably from 70 to 90%.

The term “total water content” refers to the content of water of the composition resulting from the addition of any water present in each ingredient/component of the composition.

20 In one embodiment, the composition comprises a total solid content ranging from 10 to 30% by weight as compared to the total weight of the composition, preferably from 15 to 25%.

In one embodiment, the composition comprises a total fat content ranging from 0.5 to 3% by weight as compared to the total weight of the composition, preferably from 0.8 to 2%.

25 The term “total fat content” refers to the content of fat of the composition resulting from the addition of any fat present in each ingredient/component of the composition.

In one embodiment, the composition comprises a total sugar content ranging from 3 to 8% by weight as compared to the total weight of the composition, preferably from 4 to 5%.

30 The term “total sugar content” refers to the content of sugar of the composition resulting from the addition of any sugar present in each ingredient/component of the composition.

The composition according to the invention comprises a plant-based ingredient selected from the group consisting of hydrolyzed plant protein, hydrolyzed cereal bran and combinations thereof.

5 Preferably, the plant-based ingredient is hydrolyzed cereal bran.

In one embodiment, the cereal bran is selected from the group consisting of wheat bran, corn bran, rice bran, oat bran, sorghum bran, millet bran, barley bran, and mixtures thereof, preferably is oat bran.

10 In one preferred embodiment, the plant-based ingredient is hydrolyzed cereal bran, more preferably is hydrolyzed oat bran.

The hydrolyzed cereal bran is produced by a process comprising subjecting the cereal bran-based material to an enzymatic composition under specific hydrolysis conditions. The purpose of the hydrolysis is to transform starch contained in the cereal bran into lower molecular carbohydrates and sugars, such as e.g. glucose, fructose, maltose and maltotriose
15 but minimize the hydrolysis of beta-glucans. Such process is described in WO 2022/253474.

In one embodiment, the plant protein is selected from the group consisting of soy presscake, vegetable protein, soy protein, and combinations thereof.

20 In one embodiment, the hydrolyzed cereal bran comprises from 0.5% to 2% by weight of beta-glucan as compared to the total weight of the hydrolyzed cereal bran, preferably from 0.6% to 1.5%, more preferably from 0.7% to 1.2%.

In another embodiment, the composition comprises beta-glucan in an amount of 0.3 to 2 g/100 g of the composition, preferably in an amount of 0.5 to 1 g/100 g of the composition.

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In one embodiment, the beta-glucan has an average molecular weight between 10 kDa and 1000 kDa.

It has been surprisingly found that the use of hydrolyzed cereal bran in the composition, especially hydrolysed oat bran, obtained from enzymatic hydrolysis of cereal bran-based
30 materials improves the taste and texture profiles, whilst maintaining a high content of beta-

glucan allowing said composition to have health properties, such as to maintain a good digestive health.

Furthermore, it has been surprisingly found that the composition according to the invention has a viscosity suitable for the RTD application despite comprising a substantial content of
5 beta-glucans. It has been found that the beta-glucans present in the composition according to the invention have an improved solubility due to the specific hydrolysis of starches and proteins contained in the cereal bran, especially in the oat bran.

The composition according to the invention also comprises a high methoxyl pectin.

10 It has been surprisingly found that a RTD plant-based beverage composition in which high methoxyl pectin has been fully replaced by gellan gum or fully replaced by low methoxyl pectin, is subjected to an immediate phase separation at ambient temperature.

In one embodiment, the high methoxyl pectin has a degree of esterification of at least 50%,
15 preferably 58% from 79%, more preferably from 70% to 74%.

In another embodiment, the high methoxyl pectin is hydrolyzed high methoxyl pectin. Such hydrolyzed high methoxyl pectin are commercially available for example from Cargill.

In one embodiment, the composition is free from gellan gum.
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In another embodiment, the composition further comprises at least one ingredient selected from the group consisting of gellan gum, guar gum, locust bean gum, acacia gum, low methoxyl pectin and combinations thereof.

Preferably, the composition comprises from 1 to 30% of at least one ingredient selected
25 from the group consisting of gellan gum, guar gum, locust bean gum, acacia gum, low methoxyl pectin and combinations thereof by weight as compared to the total weight of high methoxyl pectin, more preferably from 5 to 20%.

For example, the composition comprises from 1 to 30% of gellan gum by weight as compared to the total weight of high methoxyl pectin, more preferably from 5 to 20%.

Another example, the composition comprises from 1 to 30% of low methoxyl pectin by weight as compared to the total weight of high methoxyl pectin, more preferably from 5 to 20%.

In a preferred embodiment, the composition further comprises a mixture of gellan gum and
5 low methoxyl pectin.

Advantageously, the composition comprises from 1 to 30% of a mixture of gellan gum and low methoxyl pectin by weight as compared to the total weight of high methoxyl pectin, more preferably from 5 to 20%.

10 In one embodiment, the emulsifier is selected from the group consisting of mono- and diglycerides (MDGs), stearyl lactylates, sorbitan esters, polyglycerol esters, sucrose esters, lecithin and combinations thereof, preferably is lecithin.

Advantageously, the lecithin is hydrolyzed lecithin.

For example, lecithin is originated from a plant material, especially oil seeds, such as soy,
15 sunflower, cotton seed and combinations thereof.

Advantageously, the lecithin is a soy lecithin.

In one embodiment, the composition comprises high methoxyl pectin and emulsifier in a weight ratio of 1/1 to 25/1, preferably 1/1 to 10/1, more preferably 3/1 to 4/1.

20 It has surprisingly been found that the combination of high methoxyl pectin with an emulsifier selected from the group consisting of mono- and diglycerides (MDGs), stearyl lactylates, sorbitan esters, polyglycerol esters, sucrose esters, lecithin and combinations thereof at specific ranges and/or weight ratios significantly improves the physico-chemical stability of RTD plant-based beverage compositions. For example, the specific
25 combinations of these components provide shelf-stable RTD plant-based beverage compositions with a consistently viscosity without phase separation during different storage conditions over an extended period of time. Advantageously, the unique combination of high methoxyl pectin with a lecithin as emulsifier was unexpectedly found to provide a resulting RTD beverage composition having an improved texture with a good mouthfeel, a
30 smooth texture and a consistently viscosity without phase separation during different storage conditions over an extended period of time.

In one embodiment, the composition comprises at least one plant sterol.

In another embodiment, the composition comprises from 0.5 to 3% of plant sterol as compared to the total weight of the composition, preferably from 1 to 2%.

- 5 In one preferred embodiment, the plant sterol is one or more types selected from the group consisting of 13-sitosterol, campesterol, stigmasterol, brassicasterol, sitostanol, campestanol, and ester salts thereof.

The terms “plant sterol” and “plant sterol ester” refer to plant sterol having at least 60%, preferably at least 85% of the plant sterol in an esterified form and include all possible
10 mixtures of named sterols as well as any individual sterol.

The composition according to the invention comprising the combination of a plant-based ingredient, especially a cereal bran, with plant sterol in specific amounts has a double action on the consumer’s health because it allows to lower blood cholesterol whilst maintaining a good digestive health.

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In one embodiment, the composition further comprises at least one additional ingredient selected from the group consisting of sugar, fiber, vegetable or nut oil, flavor ingredient, fortification ingredient and combinations thereof.

- 20 In another embodiment, the composition comprises from 1 to 20% of additional ingredient as compared to the total weight of the composition, preferably from 5 to 15%, more preferably from 6 to 10%.

Many sugars can be used for this purpose. Preferably, the sugar is from sugar cane or beet.

- For example, the fortification ingredient is selected from the group consisting of vitamin A, vitamin B1, vitamin B2, vitamin E, vitamin K, vitamin C, vitamin D, folic acid, inositol,
25 niacin, biotin, pantothenic acid, choline, calcium, sodium, phosphorous, iodine, magnesium, copper, zinc, iron, manganese, chloride, potassium, selenium, chromium, molybdenum, taurine and L-carnitine.

For example, the vegetable or nut oil is selected from the group consisting of soybean oil, sunflower oil, peanut oil, flaxseed oil, olive oil, coconut oil and combinations thereof.

- 30 For example, the fiber is selected from the group consisting of inulin, fibersol, dextrose, cellulose and combinations thereof.

The presence and amount of the specific fortification ingredient(s) may vary depending on the intended fortification and the targeted consumer. In any case, fortification levels should respect the applicable regulation.

- 5 In an embodiment, the composition is administered in a single serving having a nutritional profile selected from the group consisting of: (i) 50%-200% of the Daily Value (DV) of one or more of fortification ingredient.

In an embodiment, a single serving of the composition has a volume from about 4 fl oz (about 118 ml) to about 12 fl oz (about 355 ml).

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A second aspect of the invention relates to a method for producing a shelf-stable RTD plant-based beverage composition comprising the steps of:

- a) providing a composition with at least one plant-based ingredient,
b) providing a composition comprising a high methoxyl pectin and at least one emulsifier,
15 c) mixing together the compositions obtained at step a) and at step b) at a temperature ranging from 4°C to 70°C for 5 to 30 minutes,
d) heat-treating the mixture obtained at step c) at a temperature ranging from 75°C to 121°C for 20 second to 15 minutes with upstream or/and downstream homogenization with 100 to 300 bars to obtain a RTD plant-based beverage composition,
20 e) filling the RTD plant-based beverage composition obtained at step d) in containers.

- It has been found that subjecting the mixture comprising the plant-based ingredient, the high methoxyl pectin and the emulsifier to a controlled heat treatment for a specific time allows avoiding plant proteins denaturation and therefore phase sedimentation. It has been
25 advantageously found that subjecting the mixture comprising the plant-based ingredient, the high methoxyl pectin and the emulsifier to a controlled heat treatment for a specific time allows having a RTD plant-based beverage composition with a unique smooth and creamy texture that improves the taste and texture profiles of said RTD plant-based beverage composition. In addition, it has also surprisingly found that the heat treatment at lower
30 temperatures allows to keep the natural color of the RTD beverage composition according to the invention obtained by addition of natural fruit juice concentrate and therefore makes

the RTD beverage composition visually more appealing to the consumers. Indeed, after the heat treatment, the color of the RTD according to the invention obtained by addition of natural fruit juice doesn't fade or doesn't turn brownish.

It has also been found that the combination of the plant-based ingredient, the high methoxyl pectin and the emulsifier with the following process parameters such as the pH, specific
5 heat treatment and holding time results in a product with smooth, creamy texture and superior shelf-life stability.

In one embodiment, the step a) is carried out at a temperature ranging from 35°C to 95°C,
10 more preferably from 50°C to 80°C.

In one embodiment, the step b) is carried out at a temperature ranging from 50°C to 80°C, more preferably from 60°C to 75°C.

15 In one embodiment, the method further comprises an additional step of acidifying the RTD plant-based beverage composition obtained at step c).

It has been found that acidifying the composition with an acidifier before the heat treatment at step d) allows to obtain a stable RTD composition which has a viscosity suitable for RTD application. In addition, it has been found that implementing the step of acidifying the
20 composition after the heat treatment step allows to maintain the natural color of the RTD plant-based beverage obtained by the addition of the juice concentrate.

In one embodiment, the step e) is done under aseptic conditions.

25 In one embodiment, the method further comprises an additional step of homogenizing the composition.

Preferably, the step of homogenizing is carried out before step e).

In this specific embodiment, the step of homogenizing is carried out at a temperature ranging from 60°C to 80°C, more preferably from 65°C to 75°C.

30 In this specific embodiment, the step of homogenizing is carried out at a pressure ranging from 100 to 300 bars, preferably from 200 to 250 bars.

A third aspect of the invention relates to a use of a shelf-stable RTD plant-based beverage composition for reducing blood cholesterol in humans.

In one embodiment, the use of a shelf-stable RTD plant-based beverage composition further maintains a digestive health.

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The technical features of the shelf-stable RTD beverage composition as above described can be applied to the second and the third aspects of the invention.

Examples

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The present invention is illustrated further herein by the following non-limiting examples.

General method to prepare a shelf-stable RTD plant-based beverage composition according to the invention

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- providing a composition with at least one plant-based ingredient,
- providing a composition comprising a high methoxyl pectin and at least one emulsifier,
- mixing together the two compositions prepared previously at a temperature ranging from 4°C to 70°C for 5 to 30 minutes,
- acidifying the mixture to a pH below 5.5,
- heat-treating said mixture at a temperature ranging from 75°C to 121°C for 20 second to 15 minutes with upstream or/and downstream homogenization with 100 to 300 bars,
- filling the RTD plant-based beverage composition obtained previously in containers.

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25 The following examples were prepared according to the general method above described.

Example 1 : RTD plant-based beverage composition according to the invention

A RTD beverage composition was prepared using 181kg of hydrolyzed oat bran slurry, 5.86kg of juice concentrate, 3.4kg of plant sterol, 4kg of inulin, 1.5kg of sugar, 1kg of high methoxyl pectin, 0.97kg of dicalcium phosphate, 400g of monk fruit juice concentrate, 320g

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of soy lecithin, 280g of vitamin premix, 240g of natural color extracted from plant and vegetables, 180g of flavor, 120g of citric acid, 20g of tocopherol, and water necessary to reach 200 kg of the final beverage.

- Samples were incubated at 4°C for 1-7 days before moving back to ambient. Emulsion was stable for prolonged time. Partial crystallization of fat and minor aggregation was observed compared with fresh sample.

Example 2 : RTD plant-based beverage composition according to the invention

- A RTD beverage composition was prepared using 9.1kg of hydrolyzed oat bran slurry, 290g of juice concentrate, 228g of inulin, 168g of plant sterol, 100g of sugar, 40g of dicalcium phosphate, 80g of high methoxyl pectin, 20g of monk fruit juice concentrate, 9g of flavor, 4g of soy lecithin, 3g of vitamin premix, 0.2g of tocopherol, and water necessary to reach 10 kg of the final beverage.
- Beverage physico-chemical properties were evaluated, and sensory characteristics were judged by trained sensory panelists. Emulsion was stable for prolonged time but with thicker mouthfeel.

Example 3 : RTD plant-based beverage composition not according to the invention

- A RTD beverage composition was prepared using 7.5kg of hydrolyzed oat bran slurry, 283g of juice concentrate, 190g of inulin, 168g of plant sterol, 100g of sugar, 33g of dicalcium phosphate, 2.5 to 10g of gellan gum, 7.5g of flavor, 3.3g of soy lecithin, 0.2g of tocopherol, and water necessary to reach 8.4 kg of the final beverage.
- Immediate separation was observed after the heat treatment step.

Example 4 : RTD plant-based beverage composition not according to the invention

- A RTD beverage composition was prepared using 7.5kg of hydrolyzed oat bran slurry, 243g of juice concentrate, 190g of inulin, 168g of plant sterol, 100g of sugar, 33g of dicalcium

phosphate, 16.7g of low methoxyl pectin, 7.5g of flavor, 3.3g of soy lecithin, 0.2g of tocopherol, and water necessary to reach 8.4 kg of the final beverage.

Immediate separation was observed after heat treatment.

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Claims

1. A shelf-stable RTD plant-based beverage composition comprising:
 - at least one plant-based ingredient selected from the group consisting of hydrolyzed plant
 - 5 protein, hydrolyzed cereal bran and combinations thereof,
 - high methoxyl pectin, and
 - at least one emulsifier,wherein the beverage is free from dairy ingredient and has a pH below 5.5, preferably ranging from 3.5 to 4.5 and has a viscosity ranging from 20 to 50 cP measured at 25°C at
10 shear rate 50 sec⁻¹, preferably from 20 to 40 cP.
2. Composition according to claim 1 comprising:
 - from 10 to 30% of at least one plant-based ingredient, preferably from 10 to 20%,
 - from 0.1 to 1% of high methoxyl pectin, preferably from 0.5 to 0.8%, and
 - 15 - from 0.01 to 0.3% of at least one emulsifier, preferably from 0.04 to 0.2%,the percentages being defined by weight of component as compared to the total weight of the composition.
3. Composition according to claim 1 or 2, wherein the cereal bran is selected from the group
20 consisting of wheat bran, corn bran, rice bran, oat bran, sorghum bran, millet bran, barley bran, and combinations thereof, preferably is oat bran.
4. Composition according to any one of claims 1 to 3, wherein the high methoxyl pectin has a degree of esterification of at least 50%, preferably 58% from 79%, more preferably from
25 70% to 74%.
5. Composition according to any one of claims 1 to 4, wherein the high methoxyl pectin is hydrolyzed high methoxyl pectin.

6. Composition according to any one of claims 1 to 5, wherein the composition comprises high methoxyl pectin and emulsifier in a weight ratio of 1/1 to 25/1, preferably 1/1 to 10/1, more preferably 3/1 to 4/1.
- 5 7. Composition according to any one of claims 1 to 6, wherein the hydrolyzed cereal bran is a hydrolyzed oat bran.
8. Composition according to any one of claims 1 to 7, wherein the composition comprises from 0.5 to 15% by weight of juice concentrate as compared to the total weight of the
10 composition, preferably from 2 to 10%.
9. Composition according to any one of claims 1 to 8, wherein the composition further comprises from 0.01 to 2% by weight of an acidifier as compared to the total weight of the
15 composition, preferably from 0.01 to 1%.
10. Composition according to any one of claims 1 to 9, wherein the acidifier is selected from the group consisting of plant concentrate, vegetable concentrate, fruit concentrate, lactic acid, ascorbic acid, citric acid and combinations thereof.
- 20 11. Composition according to any one of claims 1 to 10, wherein the composition further comprises at least one additional ingredient selected from the group consisting of sugar, fiber, vegetable or nut oil, flavor ingredient, fortification ingredient and combinations thereof.
- 25 12. Composition according to any one of claims 1 to 11, wherein the composition comprises at least one plant sterol.
13. Composition according to any one of claims 1 to 12, wherein the composition comprises from 0.5 to 3% of plant sterol as compared to the total weight of the composition, preferably
30 from 1 to 2%.

14. Composition according to any one of claims 1 to 13, wherein the emulsifier is selected from the group consisting of mono- and diglycerides (MDGs), stearyl lactylates, sorbitan esters, polyglycerol esters, sucrose esters, lecithin and combinations thereof, preferably is lecithin.
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15. Composition according to any one of claims 1 to 14, wherein the composition is free from gellan gum.
16. A method for producing a shelf-stable RTD plant-based beverage composition according to any of claims 1 to 15 comprising the steps of:
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- a) providing a composition with at least one plant-based ingredient,
 - b) providing a composition comprising a high methoxyl pectin and at least one emulsifier,
 - c) mixing together the compositions obtained at step a) and at step b) at a temperature ranging from 4°C to 70°C for 5 to 30 minutes,
 - 15 d) heat-treating the mixture obtained at step c) at a temperature ranging from 75°C to 121°C for 20 second to 15 minutes with upstream or/and downstream homogenization with 100 to 300 bars to obtain a RTD plant-based beverage composition,
 - e) filing the RTD plant-based beverage composition obtained at step d) in containers.
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17. A method according to claim 16, wherein the filing in step e) is done under aseptic conditions.
18. A method according to claim 16 or 17, wherein the process further comprises an additional step of acidifying the RTD plant-based beverage composition obtained at step c).
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19. Use of a composition according to any one of claims 1 to 15 for reducing blood cholesterol in humans.
20. Use of a composition according to claim 19 for reducing blood cholesterol in humans whilst maintaining a digestive health.
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