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(54) Title: STABLE BEVERAGE AND LIQUID FOOD PRODUCTS AND PROCESS FOR MAKING SUCH

(57) Abstract: The invention relates to a stable beverage or liquid food product comprising a stabilisers blend, oil, Arabic gum, water and hydrolysed vegetable protein. In particular, the beverage of the present invention is a non-dairy milk beverage. The invention further relates to a process for making a stable beverage or liquid food product according to the present invention. Further, the invention relates to the use of a stabilising composition comprising stabilisers and further an oil-in-water emulsion stabilized by Arabic gum for stabilizing hydrolysed vegetable protein in beverages or liquid food products, in particular in non-dairy milk beverages.

STABLE BEVERAGE AND LIQUID FOOD PRODUCTS AND PROCESS FOR MAKING SUCH

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of European Application Serial No. 13003289.9 filed 28 June 2013, the disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

[0002] The invention relates to a stable beverage or liquid food product comprising a stabilisers blend, oil, Arabic gum, water and hydrolysed vegetable protein. In particular, the beverage of the present invention is a non-dairy milk beverage. The invention further relates to a process for making a stable beverage or liquid food product according to the present invention.

[0003] Further, the invention relates to the use of a stabilising composition comprising stabilisers and further an oil-in-water emulsion stabilized by Arabic gum for stabilizing hydrolysed vegetable protein in beverages or liquid food products, in particular in non-dairy milk beverages.

BACKGROUND OF THE INVENTION

[0004] Total or partial milk replacement by compositions containing non-dairy proteins is nowadays desirable in the food industry for various reasons: there is an increasing amount of people suffering from lactose intolerance; the industry is willing to broaden the range of products available to the consumer; there is a desire to reduce raw material costs without imparting end product overall quality and the like. Non-dairy proteins commonly used for this typically include vegetable proteins, such as cereal proteins, more particularly wheat proteins.

[0005] However, the use of many vegetable proteins, such as cereal proteins and in particular wheat protein in liquid food systems is limited by their low solubility in aqueous solutions. For wheat gluten, the main protein of wheat, the low solubility is due to the high concentration of non-polar amino acid residues such as proline and leucine and the polar but non ionisable glutamine residues.

[0006] Technology to solubilize vegetable proteins, in particular hydrolysed cereal proteins and extend their utilization in liquid food systems is well known in the art. Such technology includes chemical and/or enzymatic modification. Different qualities and grades of

hydrolysed vegetable proteins are available on the market. They are mainly characterized by their degree of hydrolysis, their solubility and other functional properties.

[0007] Solubility and phase separation are key quality parameters to monitor the stability of beverages and liquid food products. At the moment the use of hydrolysed vegetable proteins and in particular of hydrolysed cereal proteins remain limited in beverages and liquid food products, because there is still a problem of phase separation, marbling, and sedimentation of some of the particles, such as protein particles or cacao powder particles for example. Indeed hydrolysed vegetable proteins, in particular hydrolysed cereal proteins, and even more particularly hydrolysed wheat protein, contain insoluble fractions and processing (heating, High Temperature/Short Time treatment, Ultra High Temperature treatment, storage and the like) can trigger the precipitation of some protein fraction.

[0008] One solution to avoid showing these drawbacks is to pack such beverages or liquid food products in non-transparent packaging such that phase separation, sedimentation, marbling and the like are not visible.

[0009] WO2012/028159 describes how to control these drawbacks by selecting specific ratio of two different tailor made hydrolysed wheat gluten. It describes a wheat protein based vegetable milk composition with improved stability and a process for preparing said composition.

[00010] J. of Agriculture and food Chemistry (1965) p.407-410 describes to prevent phase separation through the use of very high amounts of stabilisers.

[00011] There is thus still a need for a solution to the above mentioned problems. The present invention provides for such a solution.

SUMMARY OF THE INVENTION

[00012] The present invention relates to a beverage or liquid food product comprising:

a) Three stabilisers chosen from the group consisting of carrageenan, xanthan gum, locus bean gum and guar gum, and
b) Oil, and
c) Arabic gum, and
d) Water, and
e) Hydrolysed vegetable protein, and
f) Further beverage or liquid food product ingredients.

[00013] Further, the present invention relates to a process for making the beverage or liquid food product of the present invention.

[00014] Further, the present invention relates to the use of a composition comprising stabilisers and an oil-in-water emulsion stabilized by Arabic gum, to stabilize beverages or liquid food product, in particular beverages. More specifically, the invention relates to the use of said composition to improve the storage stability of hydrolysed vegetable protein in beverages or liquid food products. Also the invention relates to the use of said composition to improve the mouthfeel and flow properties of beverage or liquid food products, in particular beverages.

DETAILED DESCRIPTION

[00015] The present invention relates to a beverage or liquid food product comprising:

a) Three stabilisers chosen from the group consisting of carrageenan, xanthan gum, locus bean gum and guar gum, and
b) Oil, and
c) Arabic gum, and
d) Water, and
e) Hydrolysed vegetable protein, and
f) Further beverage or liquid food product ingredients.

[00016] In particular, the present invention relates to a beverage or liquid food product comprising said stabilisers, an oil-in-water emulsion, stabilized by Arabic gum, hydrolysed vegetable protein and further beverage or liquid food product ingredients. For sake of completeness, said emulsion has been homogenised during the production process of the beverage or liquid food product of the present invention, therefore it is not present as a separate phase, separately from the other ingredients of the beverage or liquid food product, but it is homogenously mixed with these.

Stabilisers

[00017] The term stabiliser refers to a substance used in the food industry having gelling properties and/or thickening properties and/or stabilizing properties (preventing other substances from separating). Numerous stabilisers are used in the food industry and differ in that some have more gelling properties, others have more thickening properties, still others have more stabilizing properties. Preferably the stabilisers for the purpose of the present invention are a blend of three stabilisers (the stabilisers blend), chosen from the group of carrageenan, xanthan

gum, locus bean gum and guar gum. More preferably the stabilisers are carrageenan, xanthan gum and guar gum. The stabilisers blend can be used in an end product such as a beverage or aliquid food product. The presence of the stabilisers and in particular the specific combination of preferred stabilisers provides the right viscosity and the right yield stress to the end product, in particular to the beverage. The stabilisers have the role of stabilizing particles such as hydrolysed cereal proteins within the beverage matrix or liquid food product matrix. Also other particles, such as for example cacao powder are stabilized due to the presence of the stabilisers blend. The stabilisers are preferably present in a ratio of from 30/40/30 to 35/30/35.

[00018] Preferably, the stabilisers are present in a total amount of 0.040 to 0.120 weight/weight% (w/w%), preferably from 0.060 to 0.100 w/w%, more preferably from 0.075 to 0.080 w/w% by weight of the beverage or liquid food product.

Oil

[00019] The term oil refers generally to a mixture of phospholipids that is liquid at room temperature (about 15 to 25°C). For the purpose of the present invention, the oil can be any suitable vegetable oil. The oil may be more or less processed; it may be bleached and/or deodorized and/or otherwise treated to make it suitable for use in the food industry. Preferably, the oil is chosen from the group of sunflower oil, arachid oil, sesame oil, corn oil, rapeseed oil, coconut oil, olive oil and a mixture of two or more thereof.

[00020] Arabic gum is well known in the art. It is a natural gum made of hardened sap taken from species of the acacia tree; *Senegalia senegal* and *Vachellia seyal*. The ratio oil:Arabic gum and/or n-OSA starch is preferably from 2:1 to 1:1.

Hydrolysed vegetable protein

[00021] Hydrolysed vegetable proteins can be acid or enzymatic hydrolysed. Preferably the hydrolysed vegetable proteins are hydrolysed cereal proteins. Preferably the hydrolysed cereal proteins are enzymatic hydrolysed cereal proteins. The cereal protein according to the present invention may be derived from wheat, rye, barley, oats, maize, rice, spelt, millet, sorghum, soy. Preferably the cereal protein is wheat protein, more preferably, the starting material is vital wheat gluten. Enzymatic hydrolysed wheat protein can be obtained for example according to the process described in WO2008/110515 or WO2012/076149.

[00022] Preferably, the hydrolysed vegetable protein has an average degree of hydrolysis of from 4 to 10, preferably from 5 to 6.5, more preferably from 7 to 8.5. Degree of hydrolysis

(DH) is defined as the proportion of cleaved peptide bonds in a protein hydrolysate. Average DH (avDH) represents the numerical average of individual DH and is measured according to OPA method (Schmidt, D.G., Robben, A.J.P.M., VMT, 19, 13-15, 1993). Further preferably, the hydrolysed vegetable protein has a solubility at pH 7 (NSI) of from 60 to 98%, preferably from 80 to 95%, more preferably from 90 to 95%. Solubility is characterized by the Nitrogen Solubility Index (NSI) and is measured according to a slightly modified AACC method 46-23. For the purpose of the present invention, it is measured at pH 7. 1 g of hydrolysed vegetable protein sample is weighed and demineralised water is added up to 100g. The content is mixed using a magnetic stirrer until dispersed. Maintaining the agitation, the pH is adjusted to 7 (pHa) by adding NaOH or HCl. Mixing is continued for 30 minutes using a magnetic stirrer. The dispersion is centrifuged at room temperature, at 4000g for 20 minutes. The nitrogen content is measured in the supernatant, and in the original dispersion. In both cases the nitrogen content is determined according to the Kjeldahl method. NSI at pHa = ((Nitrogen content of supernatant at pHa)*100) / (Nitrogen content of original dispersion). As mentioned above, preferably the hydrolysed vegetable protein is hydrolysed cereal protein, more preferably hydrolysed wheat protein.

Beverage or liquid food product

[00023] The beverage of the present invention can be non-dairy milk beverage, dairy based beverage, protein supplemented beverage, carbonated drink, clear drink, opaque drink, near waters, fruit juice, coffee beverage, beer, liquid beverage mix, tea infusion, sports beverage, soy liquior, soda, frozen beverage mix, infant formula (made for example from a powder infant formula added with water or milk). Preferably, the beverage is a non-dairy milk beverage, even more preferably, a non-dairy milk, cereal based beverage. The liquid food product of the present invention can be yoghurt drink, breakfast drink, smoothie, slushes, and sauces.

[00024] The beverage or liquid food product of the present invention further comprises respectively other typical beverage ingredients or typical liquid food product ingredients.

[00025] Typical beverage or liquid food product ingredients include nutritive sweeteners, carbohydrates, proteins, peptides, amino acids, antioxidants, fats, vitamins, trace elements, electrolytes, intensive sweeteners, edible acids, flavours and/or mixtures thereof.

[00026] A nutritive sweetener is a sweetener contributing significantly to the caloric load of the beverage. For example, the nutritive sweetener can be sucrose, fructose, high fructose corn syrup, glucose, dextrose, white grape juice, deionised apple juice, chicory, honey, invert

sugar, maple syrup, male sugar, brown sugar molasses, sugar beet molasses, sorghum syrup and the like. Preferably the nutritive sweetener is chosen from the group of sucrose, fructose, high fructose corn syrup, glucose, dextrose, white grape juice, deionised apple juice, chicory, honey and mixtures of two or more thereof. Preferably, the nutritive sweetener is sucrose and/or high fructose corn syrup. The nutritive sweetener can be liquid, solid and in particular crystalline.

[00027] Carbohydrates may be selected from monosaccharides, disaccharides, gelling starches, starch hydrolysates, dextrins, fibres, polyols and mixtures thereof.

[00028] The monosaccharides include tetroses, pentoses, hexoses and ketohexoses. Typical disaccharides include sucrose, maltose, trehalulose, trehalose, isomaltulose, melibiose, kojibiose, sophorose, laminaribiose, isomaltose, gentibiose, cellobiose, mannibiose, lactose, leucrose, maltulose, turanose and the like.

[00029] Starch hydrolysates are produced by the controlled acid or enzymatic hydrolysis of starch and can be subdivided into two specific categories, maltodextrins and glucose syrups and are characterized by DE number (Dextrose Equivalent). DE number is a measurement of the percentage of reducing sugars present in the syrup and calculated as dextrose on a dry weight basis. Maltodextrins have a DE number up to 20 whereas glucose syrups have a DE number greater than 20. Dextrins are prepared according to the dextrinisation method. Dextrinisation is a heat treatment of dry starch in the presence or absence of acid.

[00030] The fibres may include polydextrose, arabinogalactan, chitosan, chitin, xanthan, pectin, cellulosics, konjac, Arabic gum, soy fibre, insulin, modified starch, hydrolysed guar, guar gum, beta-glucan, carrageenan, locust bean gum, alginate, polyglycos alginate.

[00031] Polyols can be selected form the group of erythritol, xylitol, arabinitol, sorbitol, mannitol, iditol, galactitol, maltitol, isomaltitol, isomalt, lactitol and mixtures of two or more thereof.

[00032] Intensive sweeteners can be but are not limited to aspartame, acesulfame salts such as acesulfame-K, saccharins, cyclamates, sucralose, alitame, neotam, steviosides, glycyrrhizin, neohesperidin dihydrochalone, monellin, thaumatin, brazzein, and the like, and mixtures of two or more thereof.

[00033] The vitamins may include vitamin A, vitamin D, vitamin C, vitamin E, vitamin B12 and the like.

[00034] The edible acids may be selected from phosphoric acid, citric acid, malic acid, succinic acid, adipic acid, gluconic acid, tartaric acid, fumaric acid and mixtures thereof. Preferably the pH range of the beverage is from 2 to 7.4, more preferably from 6.7 to 7.4.

[00035] The flavours may be selected from brown flavours, fruit flavours, botanical flavours and mixtures thereof. Preferred flavours are chocolate, vanilla, pistachio, almonds, peanuts, chestnut, strawberry, apple, pear, cinnamon, ginger, rootbeer, cola flavour, grape flavours, cherry flavour, apple flavour and citrus flavours such as orange flavours, lemon flavour, lime flavour, fruit punch and mixtures thereof.

[00036] If desired colouring agents may also be added. Any suitable water-soluble colouring agent can be used in the beverage of the present invention. When desired, preservatives such as potassium sorbate and sodium benzoate may be added.

[00037] More preferably, the invention relates to a beverage.

[00038] The beverage preferably comprises cacao powder. The cocoa powder may be from any source and processed according to any methods known in the art (e.g. to improve taste, texture and/or appearance). Advantageously, the cocoa powder will be a tempered cocoa powder. It will typically contain 10 to 12 w/w% cocoa butter but may also be a high-fat cocoa powder or a reduced-fat or fat-free cocoa powder. A reduced-fat cocoa powder is a cocoa powder with a cocoa butter content below 10 w/w%.

[00039] Preferably, the beverage of the present invention is a chocolate non-dairy beverage, thus not containing dairy proteins. More preferably the beverage is a chocolate non-dairy milk beverage. The term milk refers to the aspect of the beverage, being milk-like opaque and to the fact that it is rich in proteins, it qualifies as milk replacer. Further the beverage can contain coconut milk, almond milk for example. More preferably, the beverage is a chocolate non-dairy wheat based milk beverage.

[00040] Preferably further, the beverage comprises calcium salt, vitamin D, a buffering agent, such as Sodium bicarbonate, di or tripotassium phosphate, potassium polyphosphate, and a flavouring agent as described above.

[00041] The beverage of the present invention can be characterized further by several parameters. It preferably has an apparent viscosity in the range of from 20 to 200, more preferably from 20 to 160, even more preferably 30 to 150, yet even more preferably from 40 to 140mPa.s. It further preferably has a yield stress in the range of from 4 to 60Pa, more preferably 7 to 50Pa, even more preferably from 8 to 45Pa. Yield stress represents the capacity of the beverage to prevent at rest the settling/sedimentation of particles, such as cocoa, fibres, insoluble proteins and the like.

[00042] Preferably further, the beverage is characterized by an average droplet size of from 5 to 15μm, more preferably from 5 to 10.5μm, even more preferably from 7 to 9μm.

[00043] Preferably further, the beverage is characterised in that it is stable, i.e. the beverage is characterised by a separation stability index (separation index) of from 0 to 5%, preferably of from 0 to 4%, more preferably of from 0 to 3%, even more preferably from 0 to 2%, yet even more preferably from 0 to 1.5%, most preferably from 0 to 1%.

[00044] Preferably further, the beverage is characterised by a Brix of from 10 to 17, more preferably from 12 to 16.5, even more preferably from 14 to 16.

[00045] Preferably further, the beverage is characterised by a density of from 1.0371 to 1.0667.

[00046] Further, the beverage of the present invention preferably has a total calorie content in the range of from 10 to 100 kcal per 100ml, more preferably from 15 to 80 kcal per 100 ml, even more preferably from 16 to 75.5 kcal per 100 ml. The nutritive sweetener can account for 20 to 50%, preferably for 40 to 50% of the total calorie content of the beverage, the oil and possible other lipidic components preferably account for 10 to 30%, preferably for 20 to 25% of the total calorie content of the beverage, the hydrolysed cereal protein and possible other proteins can account for 15 to 35%, preferably for 20 to 30% of the total calorie content of the beverage. Calorie content is calculated by considering that 1 gram of dry matter protein and carbohydrate accounts for 4 kcal and 1 gram of dry matter of fat accounts for 9 kcal.

[00047] Further preferably the beverage of the present invention is characterised in that the three stabilisers above, are present in a total amount of from 0.04 to 0.12 w/w %, preferably from 0.06 to 0.1 w/w%, more preferably from 0.075 to 0.08 w/w%, based on the total weight of the beverage.

[00048] Further the present invention relates to a process for making the beverage or liquid food product of the present invention. The process comprises:

1) Providing an oil-in-water emulsion stabilised by Arabic gum,
2) Adding stabilisers and hydrolysed vegetable protein to the emulsion obtained in step 1) to obtain a blend,
3) Adding further beverage or liquid food product ingredients, and
4) Optionally adjusting the pH to a desired value, and
5) Optionally heat treating, and
6) Optionally packaging.

[00049] The oil, Arabic gum, stabilisers, hydrolysed vegetable protein are defined as above.

Oil-in-water emulsion

[00050] The Arabic gum stabilises the emulsion.

[00051] Water is preferably present in the emulsion in an amount of from 50 to 80 w/w%, more preferably from 60 to 80 w/w%, even more preferably from 65 to 75 w/w%, yet even more preferably from 68 to 70 w/w% or from 68 to 75 w/w% based on the weight of the emulsion.

[00052] Further, the emulsion preferably has a specific surface area above $8m^2/m^3$, preferably above $9m^2/m^3$, more preferably above $10m^2/m^3$, even more preferably above $11m^2/m^3$. Further preferably, the emulsion has an average droplet size of less than 1μm, preferably from 0.2 to 1μm, more preferably from 0.3 to 0.9μm, even more preferably from 0.4 to 0.8μm, yet even more preferably from 0.5 to 0.7μm.

[00053] Preferably oil is present in an amount of from 5 to 40 weight/weight% (w/w%), more preferably from 10 to 30 w/w%, even more preferably from 10 to 20 w/w%, yet even more preferably from 12 to 18 w/w%, most preferably from 12 to 15 w/w% based on the weight of the emulsion.

[00054] The emulsion can be prepared by following process:

a) Adding Arabic gum and oil in water, and

b) Homogenizing at high pressure.

[00055] Preferably the emulsion is prepared by following process:

a1) Providing a solution of Arabic gum in water, then

a2) Adding oil in the solution of step a1), then

b) Homogenizing at high pressure.

[00056] Providing a solution of Arabic gum in water (step a1)) can be done by adding Arabic gum in water in one go or by adding it in small amounts continuously or not continuously. Arabic gum is soluble in water. Dissolving Arabic gum can be accelerated by means of stirring the water while adding the Arabic gum, this can be done by any suitable means, such as with a static mixer for example. Preferably, after addition of Arabic gum, the solution is de-aired. De-airing can be done by leaving the solution to rest for a certain period of time, such as at least 30 minutes, at least 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 or at least 12 hours. De-airing can also be achieved by using ultrasounds or any other suitable technique known in the art.

[00057] The oil can be added in one go or more suitably can be added slowly, continuously or not continuously. Preferably step a2) is a step of dispersing the oil into the solution obtained in step a1) to obtain a dispersion. This can be achieved for example by stirring

the solution while the oil is added. Stirring can be done by any suitable means such as with a high speed mixer for example. Stirring can be done for at least 1, 5, 10, 15, 20, 25, 30 minutes. The dispersion obtained in step a2) is typically not homogeneous, meaning that although the oil is already dispersed into the solution of step a1), there are still two phases (oil phase and water phase) apparent with the naked eye.

[00058] Homogenizing is done at high pressure (step b)), preferably from 150 to 400, more preferably, from 200 to 350, even more preferably about 250 to 300 bar. Preferably a multiple pass homogenization is done. Multiple pass homogenization can be achieved in several ways, known in the art, such as by operating several homogenizers in series or by recycling back. More preferably, a two pass homogenization is done. The first pass is a homogenization at a pressure of from 10 to 100, preferably from 20 to 80, more preferably from 30 to 70, even more preferably from 40 to 65, most preferably from 50 to 60 bar. The second pass is a homogenization at a pressure of from 100 to 300, preferably from 120 to 280, more preferably from 150 to 260, even more preferably from 200 to 250, most preferably from 230 to 240 bar. Homogenization can be achieved for example by means of a high pressure homogenizer equipment.

[00059] The process of the invention allows making an emulsion that remains stable and can be easily pumped, packed, stored, and/or used to make beverages or liquid food products. Unlike in prior art processes for making beverage that are based on homogenization, where all or most ingredients are homogenized together, the process of the present invention separates the homogenisation of the oil into the Arabic gum solution from other steps of the process. This separation (decoupling) allows to have an end product beverage or liquid food product, in particular beverage, wherein components such as hydrolysed vegetable proteins, cacao powder and the like remain in suspension for a long period of storage, longer than what could be achieved with prior art processes.

[00060] Preferably the beverage or liquid food product of the present invention comprise from 0.5 to 15 w/w%, more preferably from 1 to 10 w/w%, even more preferably from 5 to 10 w/w% of the blend obtained in step 2).

[00061] The blend obtained in step 2) can be a paste or a liquid, preferably it is in the form of a liquid. It has been found surprisingly that the blend obtained in step 2) of the process of the present invention solves the problem caused by sedimentation of ingredients in beverages or liquid food products. In particular, the present composition is very suitable to reduce or prevent sedimentation of ingredients in beverages, thus to stabilize beverages.

[00062] Step 2) of the process can be done by adding the stabilisers and hydrolysed cereal protein to the emulsion obtained in step 1) of the process and mixing. The three stabilisers can be added one after the other in any order or one after addition of a blend of the other two, but are preferably first blended altogether before being added. Thus preferably a dry blend of the stabilisers is used. Preferably, the hydrolysed vegetable protein and the stabilisers are first mixed in water, separately or together, preferably in warm water having a temperature of from 25 to 70°C, more preferably from 30 to 60°C, even more preferably from 40 to 50°C, prior to be added to the emulsion. Mixing in both cases can be achieved with any suitable means, such as with a static mixer.

[00063] The blend obtained in step 2) of the process finds use as a milk protein replacement. It may also find uses as a component in nutritional supplements, sports drinks, beverages or food products or as a base for a taste improver or flavour enhancer as a functioning ingredient or as a fermentation nutrient, or find uses in pharmaceutical and/or cosmetic products. However preferably, as mentioned above, said blend finds use in non-dairy milk beverages containing hydrolysed vegetable proteins.

[00064] Preferably the further beverage or liquid food product ingredients are first mixed with water. Preferably this is done in warm water, at a temperature of from 25 to 70°C, more preferably from 30 to 60°C, even more preferably from 40 to 50°C. Mixing can be achieved with any suitable means, such as with a static mixer for example.

[00065] Step 4) of adjusting the pH can be done by adding Na_2CO_3 or HCL or other, depending on the desired pH to be obtained, which depends on the final beverage or liquid food product to be made. Typically for a chocolate non-dairy milk beverage, the pH is adjusted to a value of from 6.7 to 7.4.

[00066] Heat treatment step 5) can be done by heating at a temperature of from 70 to 150°C, preferably 75 to 125°C for example during a period of from 1 to 20minutes, 1 to 15minutes, 5 to 10 minutes. The heat treatment can be a pasteurization which is typically done by heating at about 90 to 95°C during a time period of 40 to 60 seconds. Alternatively, the heat treatment can be a ultra-high temperature treatment (UHT treatment), which is typically done by heating to 135°C during 4 to 10 seconds. Pasteurization and UHT are techniques well known in the art of making beverages.

[00067] Step 6) can be done aseptically, filling and packaging methods are well known in the art. Suitable types of packaging are also well known in the art. The present invention allows to package beverages in transparent packaging since reduced or no unwanted separation and

sedimentation occurs while prior art beverages are typically packaged in non-transparent packaging to mask separation and sedimentation issues. Also the packaging of prior art beverages typically recommends to shake well before consumption to bring sedimented particles back into suspension.

[00068] Further, the invention relates to the use of a composition comprising stabilisers as defined above and an oil-in-water emulsion stabilised by Arabic gum, as defined above to improve storage stability of beverages or liquid food products as defined above. Improving storage stability principally means decreasing the sedimentation of particles, in particular of hydrolysed vegetable proteins, but also cocoa particles for example, decreasing occurrence of phase separation or syneresis. Also said compositon can be used to optimize the mouthfeel of beverages or liquid food products, preferably of beverages, more preferably of the beverage of the present invention.

[00069] The present invention will be further illustrated in following examples.

Examples

Methods of measurement

[00070] Brix is measured with a digital refractometer: RFM 340 Bellinghan and Stanley Ltd – UK.

[00071] pH is measured with an automatic titrator: Tritine Stat 718-Metrohm-Swiss.

[00072] Density is determined by a oscillating U-tube method using a density meter: DMA 4500 Anton Paar – Austria.

[00073] Visual stability of a beverage or liquid food product is determined from the appearance of the product to a potential consumer. In particular for bottled beverages: Beverage sample is observed for separation into two layers. When a line of demarcation is detected, the ratio of the height of the separated phase to the total height of the beverage is calculated and defined as the separation index. If no separation is observed, the separation index is 0%.

[00074] The average droplet size of beverage is measured with a Malvern Mastersizer MS2000 static laser light-scattering analyser with absorption parameter value of 0.001. It represents the numerical average of the size of the droplets in the beverage.

[00075] Rheological measurements (shear stress, apparent viscosity and yield stress) are performed with a controlled stress rheometer (Paar Physica MCR300) equipped with a coaxial cylinder CC 24 and monitored by a Rheoplus/32 V2, Anton Paar Software. Shear stress values are measured at shear rates from 1 to 100 s-1 with a 120s ramp, holding the sample at 20 0.1°C

with a Peltier temperature controlled system connected to an external thermostated water bath. Measurements are done in triplicate in each sample and 40 data points are collected for each flow curve. Experimental data are fitted to Newton ($\sigma=\eta\gamma$), Ostwald-De-Waele ($\sigma=K\gamma^n$), Bingham ($\sigma=\sigma_0+\eta'\gamma$) and Hershel-Bulkley ($\sigma= \sigma_0+ \eta'\gamma^p$). Apparent viscosity values ($\eta=\sigma/\gamma$) and yield stress are used to characterize the flow behaviour of the beverage samples.

Example 1: Preparation of emulsion

[00076] The ingredients are:

- Arabic gum (Instant gum AA) (Nexira)
- High oleic sunflower oil (HOSO) (Cargill Refined Oils)

[00077] HOSO emulsion is prepared at ambient temperature (20°C). The Arabic gum is dissolved into tap water (30% of total solids) and is left to stand overnight (10 hours) for de-airing. Three emulsions are made having a different oil content: HOSO (5 w/w%, 10 w/w% and 15 w/w%) is dispersed into the Arabic gum solution with a high speed mixer (Silverson™ - UK). Mixing is done for 10 minutes and a pre-emulsion is obtained, tocopherol, ascorbic acid and citric acid are added (see table 1). The pre-emulsion is homogenized with high pressure homogenizer (Niro Soavi™ - Italy) at 300bar in two passes: first pass at 60bar, second pass at 240bar. The emulsion obtained is analysed for droplet size and specific surface area. The results are shown in table 1.

Example 2: preparation of non-dairy milk beverage

[00078] The emulsions made in example 1 (EM1) is used to prepare the beverages. The rest of the ingredients listed in table 1 are dissolved in warm water (65°C).

[00079] Soluble hydrolysed wheat protein (sHWP) is obtained according to example 1 of WO2008/110515.

[00080] Stabilisers blend corresponds to a dry blend of carrageenan, xanthan gum and guar gum in a ratio of 30/40/30.

[00081] C*Dry MD01910 is a maltodextrin from Cargill.

[00082] Other ingredients can be found on the market place.

[00083] The HOSO emulsion is added and the pH adjusted using an aqueous solution of monosodium carbonate.

[00084] The beverages are filled in 0.25l glass bottles. The glass bottles are thermally processed in a temperature controlled autoclave (Lagarde R900, Maltaverne – France) at 75°C

for 10minutes. The beverages are automatically cooled down to room temperature in the autoclave and stored for a period of two months at room temperature (15°- 25°C). The beverages are analysed for viscosity, yield stress, droplet size and separation index as shown in table 2.

Table 1

	EX1	EX2	EX3	EX4	EX5	EX6	EX7	EX8
Emulsion	**EM1 (15% oil)**	**EM1 (15% oil)**	**EM1 (15% oil)**	**EM1 (5% oil)**	**EM1 (10% oil)**	**EM1 (10% oil)**	**EM1 (15% oil)**	**EM1 (10% oil)**
Gum arabic	15	15	15	15	15	15	15	15
Sunflower oil	15	15	15	5	10	10	15	10
Tocopherol	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Ascorbic acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Citric acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
water	69.78	69.78	69.78	79.78	74.78	74.78	69.78	74.78
Performances								
Droplet size (µm)	0.559	-	-	0.516	0.508	-	-	-
Specific surface area (m^2/m^3)	10.7	-	-	11.6	11.8	-	-	-
Chocolate drink	**1.5%oil**	**1.5%oil**	**1.5%oil**	**0.5%oil**	**1.0%oil**	**1.0%oil**	**1.5%oil**	**1.0%oil**
Gerkens Cocoa DP70	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C*Dry MD01910	3	3	3	3	3	3	3	3
Sugar powder	7	7	7	7	7	7	7	7
sHWP	4.7	2.35	2.35	2.35	3.52	2.35	4.7	3.52
Stabilisers blend	0.00	0.10	0.00	0.00	0.05	0.05	0.10	0.00
Emulsion	10	10	10	10	10	10	10	10
Vanilla flavour (Givaudan)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Calcium chloride	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Water	73.48	75.73	75.83	75.83	74.61	75.78	73.38	74.66
Natrium carbonate up to pH	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Performances								
Viscosity (mPa.s)	3.40	119.70	3.35	4.39	44.50	41.94	119.41	5.86
Yield stress (mPa)	1.26	40.10	0.00	0.00	4.39	7.85	42.54	0.00
Droplet size (µm)	5.34	5.58	5.00	9.14	7.16	6.87	5.65	6.27
Separation index (%)	92.80	0.00	87.30	89.30	5.00	7.50	0.00	92.60
Brix	15.40	15.80	16.80	16.20	16.30	16.70	14.30	14.40

Density	1.0562	1.0577	1.0564	1.0614	1.0608	1.0623	1.0561	1.0563

	EX9	EX10	EX11	EX12	EX13	EX14	EX15	EX16
Emulsion	**EM1 (15% oil)**	**EM1 (5% oil)**	**EM1 (5% oil)**	**EM1 (10% oil)**	**EM1 (10% oil)**	**EM1 (5% oil)**	**EM1 (5% oil)**	**EM1 (10% oil)**
Gum arabic	15	15	15	15	15	15	15	15
Sunflower oil	15	5	5	10	10	5	5	10
Tocopherol	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Ascorbic acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Citric acid	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
water	69.78	79.78	79.78	74.78	74.78	79.78	79.78	74.78
Chocolate drink	**1.5%oil**	**0.5%oil**	**0.5%oil**	**1.0%oil**	**1.0%oil**	**0.5%oil**	**0.5%oil**	**1.0%oil**
Gerkens Cocoa DP70	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
C*Dry MD01910	3	3	3	3	3	3	3	3
Sugar powder	7	7	7	7	7	7	7	7
sHWP	3.52	3.52	4.7	3.52	3.52	4.7	2.35	3.52
Stabilisers blend	0.05	0.05	0.00	0.10	0.05	0.10	0.10	0.05
Emulsion	10	10	10	10	10	10	10	10
Vanilla flavour (Givaudan)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Calcium chloride	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12
Water	74.61	74.61	73.48	74.56	74.61	73.38	75.73	74.61
Natrium carbonate up to pH	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Performances								
Viscosity (mPa.s)	38.20	37.70	5.70	135.70	39.20	138.90	103.40	45.00
Yield stress (mPa)	7.94	4.03	0.00	40.50	8.70	32.60	38.80	4.10
Droplet size (µm)	5.53	9.96	9.10	7.47	7.28	10.35	9.80	7.30
Separation index (%)	37.00	5.70	89.30	0.00	0.00	0.00	4.30	3.60
Brix	15.20	16.70	15.80	15.00	16.70	14.80	18.00	15.00
Density	1.0582	1.0620	1.0593	1.0550	1.0610	1.0562	1.0619	1.0539

CLAIMS

1. A beverage or liquid food product comprising :

    g) Three stabilisers chosen from the group consisting of carrageenan, xanthan gum, locus bean gum and guar gum, and
    h) Oil, and
    i) Arabic gum, and
    j) Water, and
    k) Hydrolysed vegetable protein, and
    l) Further beverage or liquid food product ingredients.

2. The beverage or liquid food product of claim 1, wherein the oil is present as an oil-in-water emulsion stabilised by Arabic gum.

3. The beverage or liquid food product of claims 1 or 2, wherein the hydrolysed vegetable protein has an average degree of hydrolysis of from 4 to 10, preferably from 5 to 6.5, more preferably from 7 to 8.5.

4. The beverage or liquid food product of any of the previous claims, wherein the hydrolysed vegetable protein is hydrolysed cereal protein, preferably hydrolysed wheat protein, preferably enzymatically hydrolysed wheat protein.

5. The beverage or liquid food product of any of the previous claims, wherein the hydrolysed cereal protein has a solubility of from 60 to 98%, preferably from 80 to 95%, more preferably from 90 to 95%.

6. The beverage or liquid food product of any of the previous claims, wherein the stabilisers are present in a total amount of 0.040 to 0.120 weight/weight% (w/w%), preferably from 0.060 to 0.100 w/w%, more preferably from 0.075 to 0.080 w/w% by weight of the beverage.

7. The beverage of any of the previous claims, wherein the beverage has a viscosity of from 20 to 200mPa.s and a yield stress of from 4 to 60Pa.

8. The beverage of any one of the previous claims, wherein the beverage is a non-dairy milk beverage.

9. A process to make a beverage or liquid food product comprising:
    a) Providing an oil-in-water emulsion stabilized by Arabic gum, and
    b) Adding stabilisers and hydrolysed vegetable protein to the emulsion obtained in step 1) to obtain a blend, and
    c) Adding further beverage or liquid food product ingredients , and
    d) Optionally adjusting the pH to a desired value, and
    e) Optionally heat treating, and
    f) Optionally packaging.

10. Use of a composition to improve the storage stability of hydrolysed cereal protein in beverages, said composition comprising an oil-in-water emulsion and stabilisers, said stabilisers being carrageenan, xanthan gum, locus bean gum and guar gum in a ratio of from 30/40/30 to 35/30/35.