The invention relates to a porous sachet comprising plant sterol, emulsifier and a particulate material such as tea leaves.
SACHETS COMPRISING PLANT STEROL

FIELD OF THE INVENTION

[0001] The invention relates to a porous sachet comprising plant sterol, an emulsifier, and a particulate component.

BACKGROUND ART

[0002] Today, a variety of products that claim to lower blood cholesterol levels is available from supermarkets. People consume these foods regularly to ingest a daily dosage of plant sterols which are known to lower cholesterol levels in blood. Examples of plant sterols are beta sitosterol and beta sitostanol.

[0003] Plant sterols are known to be difficult to apply in foods because of their poor solubility in fat and in aqueous systems. Researchers have presented various ways to circumvent this problem.

[0004] EP 594612 teaches that the esterification of stanols to fatty acids will lead to increased solubility in fat. Therefore stanol fatty acid esters may be incorporated into fat based food products such as margarines or butter in a relatively high level of around 10 to 20 wt%, such that average daily intake of these products will lead to ingestion of a suitable dosage of stanol ester for cholesterol lowering.

[0005] EP-A-1059851 teaches that inclusion of sterols in suspensions is simplified by including a thickener in the system under ommission of emulsifier. The resulting compositions are claimed to be storage stable.

[0006] WO-A-02/28204 also addresses the problem of including sterols in an aqueous dispersion. This document presents the finding that, when plant sterols and an emulsifier are heated together in the absence of other components, they are brought into homogeneous contact with each other while being fused, to form fine micelles which are as small as nanometers in size, when using subsequent homogenisation or high speed stirring processes. It is also allegedly found that in beverages, nanoscale micelles are superior in bioavailability, having no influence on the characteristic taste and flavor of the beverages, and applicable to almost all beverages such as tea.

[0007] We have found that this process might give suitable products for application of free sterols but certainly for the use of plant sterol fatty acid esters in tea or tea based beverages it is unlikely to lead to suitable products. We found that the general mixing of tea leaves with plant sterol fatty acid esters and emulsifier and inclusion of this mixture in tea results in quick formation of plant sterol ester droplets on the tea-surface. These droplets make a less attractive impression and therefore are preferably avoided or reduced. This phenomenon is also referred to as “creaming” of the plant sterols.

[0008] It is an object of the invention to provide at least a partial solution to the problem of creaming of plant sterols in tea or similar beverages.

SUMMARY OF THE INVENTION

[0009] We have surprisingly found that the inclusion of plant sterols with emulsifiers in a porous tea bag containing tea, significantly delays the formation of plant sterol droplets and also reduces the droplet size of any plant sterol droplets formed, which makes them less visible.

[0010] Therefore the invention relates to a porous sachet comprising plant sterol, an emulsifier, and a particulate component.

DETAILED DESCRIPTION

[0011] Where weight percentages are used they are based on total product weight unless otherwise is indicated.

[0012] The porous sachet comprises plant sterol, emulsifier and a particulate component. Suitable particulate material is such that it can serve as a beverage precursor material. The particulate component is preferably selected from the group comprising tea, coffee, bouillon, fat, herbs or a combination thereof.

[0013] The particulate component is preferably chosen such that by immersing the sachet in an aqueous component such as water, a suitable beverage such as tea, or a soup or a sauce can be made from the composition in the sachet.

[0014] The particulate component may be chosen from components that give a taste and flavour on extraction with hot or cold water or may be a component that dissolves partly or entirely in water. Optionally the sachet is suitable for use in an oily substance such as an emulsion of water and oil, or a cooking oil.

[0015] It is preferred that the particulate component is tea. In the context of the invention, the wording tea covers tea leaves, including crushed and/or otherwise treated tea leaves, tea infusion composition, or any other form of particulate components derived from the tea plant.

[0016] The sachet according to the invention may also be referred to as bag or infusion package or pouch or the like, all suitably referred to as “sachet” in the context of this invention.

[0017] This sachet may have any 3 dimensional form such as round, square, rectangular, triangular.

[0018] The sachet is a porous sachet.

[0019] In the context of the invention porous means that when the sachet is immersed in a liquid, components may diffuse in and out of the sachet through the pores. The material that is used to make the sachet is preferably characterised by a density in gram per square meter (g/m²) of from 10 to 40, preferably 11 to 30, most preferred from 12 to 20 g/m².

[0020] In a preferred embodiment the porosity of the sachet material is such that it shows the desired infusion properties. Porosity in this context may be determined by air permeability and sand fall out tests. Preferably the air permeability in l/m² s is more than 1000, more preferred more than 1500 l/m² s. Preferably the sand fall out at a particle size of from 106 to 150 μm is less than 10%, more preferred less than 0%.

[0021] The sachet is suitably prepared from fibrous material such as cellulose fibres. Optionally if heat sealable properties are desired, plastic fibres may be (partly) used.

[0022] The emulsifier is preferably selected from the group comprising monoglycerides, lecithins, diglycerides, diacetyl tartaric acid esters of mono- and diglycerides, sucrose esters of fatty acids, sodium stearyl lauryl sulfate (SSL), citric acid esters of mono- and diglycerides, polyoxyethylene sorbitan esters, polyglycerol esters, or a combination thereof. Preferred emulsifiers are selected from monoglyceride, lecithin, diglycerides, polyoxyethylene sorbitan esters, or a combination thereof. Even more preferred emulsifiers are selected from monoglycerides, lecithins, diglycerides, polyoxyethylene sorbitan esters, polyglycerol esters, diacetyl tartaric acid esters of monoglyceride, sucrose esters and combinations thereof. The most preferred emulsifier is polyoxyethylene
sorbitan esters. Examples of polyoxyethylene sorbitan esters are Tween®60 and Tween®20.

[0023] In the context of the invention proteins are not included in the term emulsifier.

[0024] The amount of emulsifier is dependent on the type of emulsifier selected, but generally the level of emulsifier is from 1 to 70 wt % more preferred from 5 to 40 wt % on total weight of the composition present in the sachet. It will be appreciated that for each emulsifier there is an optimal amount for its functioning.

[0025] Plant sterols can be classified in three groups, 4-desmethylsterols, 4-monomethyldisterols and 4,4'-dimethyldisterols. In oils they mainly exist as free sterols and sterol esters of fatty acids although sterol glucosides and acylated sterol glucosides are also present. There are three major phytosterols namely beta-sitosterol, stigmastanol and campesterol. Schematic drawings of the components meant are as given in “Influence of Processing on Sterols of Edible Vegetable Oils”, S. P. Kochhar; Prog. Lipid Res. 22: pp. 161-188.

[0026] The respective 5 alpha-saturated derivatives such as stigmasterol, campesterol and ergostenol and their derivatives are also encompassed in the term plant sterol.

[0027] Preferably the plant sterol is selected from the group comprising beta-sitosterol, 5 alpha-sitosterol, campesterol, campestanol, stigmasterol, brassicasterol, brassicastanol or a mixture thereof.

[0028] The sterols in a preferred embodiment are esterified with a fatty acid. It was found that the invention provides the largest effect for esters and a smaller effect for free sterols. In the context of this invention the term plant sterols refers to both the free sterol and the ester of sterol with fatty acids, unless otherwise is specified.

[0029] Preferably the sterols are esterified with one or more C2-22 fatty acids. For the purpose of the invention the term C2-22 fatty acid refers to any molecule comprising a C2-22 main chain and an acid group. Although not preferred within the present context the C18, main chain may be partially substituted or side chains may be present. Preferably the C2-22 fatty acids are linear molecules comprising one or two acid group(s) as end group(s). Most preferred are linear C18-22 fatty acids as occur in natural oils.

[0030] Suitable examples of any such fatty acids are acetic acid, propionic acid, butyric acid, caprylic acid, capric acid, lauric acid, oleic acid, linoleic acid, linolenic acid, myristic acid, palmitic acid, stearic acid, arachidic acid, behenic acid, stearidonic acid, oleic acid, erucic acid, elaidic acid, linoleic acid and linolenic acid.

[0031] When desired a mixture of fatty acids may be used for esterification of the sterol. For example, it is possible to use a naturally occurring fat or oil as a source of the fatty acid and to carry out the esterification via an interesterification reaction.

[0032] The emulsifier is present to ensure that the plant sterol is mostly present in emulsified state, such that the precipitation of plant sterol from the aqueous system is avoided. The ratio plant sterol to emulsifier (determined by dividing the amount of plant sterol in terms of free weight equivalent plant sterol, by the amount of emulsifier) is preferably from 0.05 to 10, more preferably from 0.1 to 1.

[0033] In view of the desired effect on blood cholesterol levels it is preferred that the amount of plant sterol (calculated as equivalent free plant sterol) is from 2 to 80 wt %, more preferably from 5 to 80 wt % on total weight of the particulate component. It will be appreciated that this amount will depend on the type of product and the intake level of this product. In a more preferred embodiment, the amount of plant sterol is from 5 to 40 wt % based on the total weight of the particulate component, especially tea.

[0034] Optionally the sachet further comprises an ingredient selected from sugar, protein, fat, colouring agent, flavouring agent, antioxidant, health benefit agents such as vitamins, minerals, peptides, thickener, or a combination thereof.

[0035] In another alternative embodiment these optional ingredients are included in the aqueous phase or partly in the sachet and partly in the aqueous phase of the final beverage.

[0036] In the preparation of the sachets, it is preferred that the plant sterol or its ester and the emulsifier are melted to a temperature of at least 50 °C before they are included in the sachet. Optionally the composition of plant sterol and emulsifier is cooled before combining it with the other ingredients but this is not required. In a preferred embodiment the plant sterol and emulsifier are melted to a temperature from 50 to 80 °C, preferably from 55 to 70 °C before they are combined with the other components.

[0037] To produce a beverage or other fluid food such as soup, the sachet is infused with water. The water is preferably hot water having a temperature from 60 to 100 °C. The infusion may be done by immersing the sachet in water, heating water wherein the sachet is placed in a microwave, or by any other suitable method.

[0038] In one aspect the invention relates to the use of a sachet according to the invention for the preparation of a beverage, especially tea.

[0039] In an alternative embodiment, the sachet comprises herbs or other taste or flavour components as the particulate component and is immersed in water that is used for cooking rice or noodles or any other composition. The immersing in this water will lead to a release of the herb or flavour components into the product that is cooked, together with a release of the plant sterols.

[0040] In a further alternative embodiment the particulate material is merely a filler material used to provide some weight to the sachet. Examples of such particulate material are fibres, porous material or insoluble salts such as CaCO3.

[0041] Optionally the sachet is sold in combination with a separately packed aqueous phase that optionally comprises further ingredients such as health benefit agents, flavouring composition, colouring agents. Therefore in another aspect the invention relates to a kit of parts comprising a sachet according to the invention and a separate packaging comprising an aqueous composition.

[0042] The invention is illustrated by the following non limiting examples.

EXAMPLES

Comparative Example 1

[0043] 0.47 grams of phytosterol ester (tall oil sterols (primarily beta sitosterol) esterified with sunflower fatty acids) and 1.25 grams of Tween 60® were mixed at 60 °C and allowed to cool to room temperature (20-25 °C). Subsequently 2.0 grams of black tea leaves were added and mixed. 250 ml of hot water (85 °C) was added and stirred with a teaspoon. The tea drink was allowed to cool to room temperature. The tea leaves were not removed during cooling of the drink. The droplet size of the sterol esters was measured at different temperatures during cooling of the tea drink. The method of
static light scattering, using a Malvern Mastersizer 2000™, was used for measuring droplet sizes. Samples were taken with a pipette 3 cm below the surface and directly added to the 130 ml water (20°C) of the cell unit, Hydro 2000SM™.

Visual evaluation showed that sterol ester droplets were formed on the surface of the tea drink. The amount of droplets on the surface increased upon cooling of the tea and was found unacceptable.

The surface weighted mean diameter D[3,2] and volume weighted mean diameter D[4,3] droplet sizes of the sterol esters are given in table 1.

| TABLE 1 |  |
| --- | --- | --- |
| Temp. (°C) | Time (min) | D [3,2] (µm) | D [4,3] (µm) |
| 83.5 | 0 | 0.76 | 28.6 |
| 60.1 | 15 | 0.50 | 11.3 |
| 47.4 | 30 | 0.46 | 8.8 |
| 39.7 | 43 | 0.43 | 8.2 |
| 35.5 | 57 | 0.43 | 8.2 |

Example 1

The tea sterol ester/Tween 60™ mixture was prepared in the same way as described in example 1. The mixture was put into an empty Lipton™ tea bag. The bag was closed. The bag was immersed in hot water (85°C) and moved slowly up and down in the water for several times. The tea drink was allowed to cool at room temperature. The bag was left in the tea drink.

Visual evaluation showed that the amount of sterol ester droplets on the surface was less compared to comparative example 1. Even when the tea was cooled to 35°C C, the total amount of sterol esters on the surface was less compared to the tea of comparative example 1 at 35°C C. The average droplet size of the sterol esters expressed as D[3,2] and D[4,3] are given in table 2 and generally show a reduction of the average sterol ester droplet size compared to comparative example 1.

| TABLE 2 |  |
| --- | --- | --- |
| Temp. (°C) | Time (min) | D [3,2] (µm) | D [4,3] (µm) |
| 84.3 | 0 | 0.51 | 61.1 |
| 59.0 | 14 | 0.19 | 8.0 |
| 46.1 | 29 | 0.17 | 3.9 |
| 40.1 | 43 | 0.17 | 2.9 |
| 34.6 | 57 | 0.18 | 3.2 |

Comparative Example 2

A drink was prepared in the same way as described in comparative example 1, however in this case no tea leaves were added to the mixture of sterol esters and Tween 60™. In this comparative example the sterolester/Tween™ composition was not in a sachet.

Visual evaluation showed the quick formation of an unacceptable amount of sterol ester droplets on the surface.

The average droplet size of the sterol esters expressed as D[3,2] and D[4,3] are given in table 3.

| TABLE 3 |  |
| --- | --- | --- |
| Temp. (°C) | Time (min) | D [3,2] (µm) | D [4,3] (µm) |
| 87.1 | 0 | 7.3 | 47.0 |
| 67.4 | 10 | 1.75 | 20.1 |
| 47.2 | 33 | 1.35 | 14.0 |

Comparative Example 3

A drink was prepared in the same way as described in example 1, however in this case no tea leaves were added to the mixture of sterol esters and Tween 60™.

Visual evaluation showed the quick formation of an unacceptable amount of sterol ester droplets on the surface. The average droplet size of the sterol esters expressed as D[3,2] and D[4,3] are given in table 4.

| TABLE 4 |  |
| --- | --- | --- |
| Temp. (°C) | Time (min) | D [3,2] (µm) | D [4,3] (µm) |
| 87.1 | 0 | 6.80 | 52.5 |
| 66.8 | 11 | 1.67 | 23.0 |
| 47.3 | 33 | 1.25 | 14.1 |

1. A porous sachet comprising plant sterol, an emulsifier, and a particulate component.
2. A sachet according to claim 1 wherein the plant sterol is a plant sterol fatty acid ester.
3. A sachet according to claim 1 wherein the plant sterol is selected from the group comprising β-sitosterol, δ-sitostanol, campesterol, campestanol, stigmasterol, brassicasterol, brassicastanol or a mixture thereof.
4. A sachet according to claim 1 wherein the emulsifier is selected from monoglycerides, lecithins, diglycerides, polyoxyethylene sorbitan esters, polyglycerol esters, diacetyl tartaric acid esters of monoglyceride, sucrose esters and combinations thereof.
5. A sachet according to claim 1 wherein the particulate component is selected from the group comprising tea, coffee, bouillon, fat, herbs or a combination thereof.
6. A sachet according to claim 5 wherein the particulate component is tea.
7. A sachet according to claim 1 wherein the ratio plant sterol to emulsifier is from 0.01 to 10 (based on the free weight equivalent of the plant sterol to the weight of the emulsifier).
8. A sachet according to claim 1 wherein the amount of plant sterol (calculated as free sterol equivalent) is from 5 to 40% on total weight of the particular component.
9. A kit of parts comprising a sachet according to claim 1 and a separate packaging comprising an aqueous composition.
10. Use of a sachet according to claim 1 for the preparation of a beverage.

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