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(54) Title: BEER FLAVORED CARBONATED BEVERAGE

(57) Abstract: A beer flavored carbonated beverage comprises the following components (A) and (B): from 0.05 to 0.15 mass% of chlorogenic acids (A); and from 0.5 to 3.2 (v/v) (NTP) by volume of carbon dioxide gas (B), and has a pH of from 2.8 to 4.2.



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Description

BEER FLAVORED CARBONATED BEVERAGE

Field of the Invention

[0001] The present invention relates to a beer flavored carbonated beverage.

Background of the Invention

[0002] Beer flavored beverages include, for example, an alcoholic beverage such as beer or low-malt beer and a non-alcoholic beer flavored beverage, and various products have been marketed for different lifestyles. In recent years, the beer flavored beverages have become more diverse, and for example, there has been proposed, as a beer flavored beverage having a new additional value, a low-malt beer having a coffee taste and flavor and obtained using, for example, malt as a raw material by adding coffee beans between a Maische formation step and a wort filtration step (Patent Document 1).

[0003] On the other hand, coffee beans contain chlorogenic acids having physiological functions such as an antioxidant effect and a blood-pressure-lowering effect, and there has been reported an ability of chlorogenic acid to prevent deterioration of the flavor of a beverage when used in combination with an apple extract, as a function of the chlorogenic acids other than the above-mentioned physiological functions (Patent Document 2). In addition, it has been reported that a specific polyphenol in labiatae herb, such

as tetrahydropapaveroline hydrobromide, has an effect of enhancing foam in a beverage, whereas chlorogenic acid having a chemical structure similar to tetrahydropapaveroline hydrobromide has no effect of enhancing foam (the paragraph [0092] in Patent Document 3).

[0004]

[Patent Document 1] JP-A-11-75808

[Patent Document 2] JP-A-8-23939

[Patent Document 3] WO 2005/028610 A1

Summary of the Invention

[0005] The present invention provides a beer flavored carbonated beverage, comprising the following components (A) and (B):

(A) 0.05 to 0.15 mass% of chlorogenic acids; and

(B) 0.5 to 3.2 (v/v) (NTP) by volume of carbon dioxide gas, in which the beer flavored carbonated beverage has a pH of from 2.8 to 4.2.

[0006] Also, the present invention provides a foam-improving agent for a foamable food and beverage, comprising chlorogenic acids as active ingredients.

[0007] Further, the present invention provides a foam-improving method for a foamable food and beverage, comprising adding chlorogenic acids to the foamable food and beverage.

[0008] Moreover, the present invention provides use of chlorogenic acids for improving foam in a foamable food and beverage.

Detailed Description of the Invention

[0009] A beer flavored alcoholic beverage such as beer or low-malt beer is generally produced by adding water to a barley to cause germination, drying the resultant, adding warm water thereto to saccharify starch by actions of enzymes contained in the malt to prepare a saccharified solution, adding hop to the saccharified solution, boiling the mixture, cooling the mixture, and adding yeast thereto to perform alcohol fermentation. During the alcohol fermentation, sugars are decomposed to generate alcohol and carbon dioxide gas. The carbon dioxide gas dissolved in the alcoholic beverage has an excellent bubbling, form a fine foam and maintain the state for a certain length of time, and hence it is possible to achieve exhilaration feeling and pleasant cooling feeling through stimulation in the oral cavity or a feeling of stimulation during passing thorough the throat (feeling on the throat) when the beverage is drunk. Thus, bubbling, foam quality, and foam retainability are important elements for determining palatability of a beer flavored beverage.

[0010] The inventors of the present invention have made studies to develop a beer flavored carbonated beverage without alcoholic fermentation with yeast. First, it found that, when a foaming agent such as a saponin was blended to reproduce the bubbling and foam retainability specific to beer, large foam poor in fineness was formed, and further disappeared in a short length of time.

Therefore, the present invention provides a beer flavored

carbonated beverage that can has an excellent bubbling, form a fine foam and can maintain the state for a certain length of time.

[0011] The inventors of the present invention found that, when a specific polyphenol is blended in a beer flavored beverage containing carbon dioxide, the beverage can has an excellent bubbling, form a fine foam and can maintain the state for a certain length of time.

[0012] According to the present invention, it is possible to provide a beer flavored carbonated beverage that can has an excellent bubbling, form a fine foam and can maintain the state for a certain length of time. According to the present invention, it is also possible to provide a foam-improving agent for improving foam properties of a foamable food and beverage such as a carbonated beverage.

[0013] First, the beer flavored beverage of the present invention is described.

The term "beer flavored beverage" as used herein refers to a carbonated beverage produced by fermentation of malt with yeast or the like and having taste and odor similar to those of a general beer beverage.

[0014] The beer flavored beverage of the present invention comprises chlorogenic acids (A). The term "chlorogenic acids (A)" as used herein is a general term collectively encompassing: monocaffeoylquinic acids including 3-caffeoylquinic acid, 4-caffeoylquinic acid, and 5-caffeoylquinic acid;

monoferuloylquinic acids including 3-feruloylquinic acid, 4-feruloylquinic acid, and 5-feruloylquinic acid; and dicaffeoylquinic acids including 3,4-dicaffeoylquinic acid, 3,5-dicaffeoylquinic acid, and 4,5-dicaffeoylquinic acid. In the present invention, at least one out of the nine chlorogenic acids is incorporated therein. Of those, monocaffeoylquinic acids are preferred, and 5-caffeoylquinic acid is more preferred from the viewpoint of further improving foam properties.

[0015] Commercially available reagents may be used as the chlorogenic acids (A), and an extract obtained from coffee beans having a riched chlorogenic acids (A) contained therein may be used. In the case of using a coffee extract, it is not necessary to purify the extract so as to produce a pure product by fractionation or the like. The coffee extract may be used without additional treatments, or if necessary, may be concentrated or diluted with water. In addition, two or more coffee extracts may be used in combination, or commercially available reagents may be mixed before use.

[0016] As the kind of the coffee beans to be used for the extraction, there are given, for example, *Coffea Arabica*, *Coffea Robusta*, and *Coffea Liberica*. As the production region of the coffee beans, which is not particularly limited, there are given, for example, Brazil, Colombia, Tanzania, Mocha, Kilimanjaro, Mandheling, and Blue Mountain. Further, the coffee beans may be used singly or as a blend of a plurality of kinds.

[0017] The coffee beans to be used for the extraction may be raw beans or roasted beans. From the viewpoint of the content of the chlorogenic acids, an L value, which represents a roasting degree of the coffee beans and is determined with a colorimeter, is preferably 15 or more, more preferably 20 or more, more preferably 25 or more, more preferably 27 or more, even more preferably 30 or more. In addition, from the viewpoint of taste and flavor, the L value is preferably 62 or less, more preferably 60 or less, more preferably 50 or less, more preferably 40 or less, even more preferably 30 or less. The L value of the roasted coffee beans falls within the range of preferably from 15 to 62, more preferably from 15 to 60, more preferably from 20 to 40, even more preferably from 25 to 30. In addition, from the viewpoint of the less coffee-like taste and flavor, the L value ranges preferably from 20 to 62, more preferably 25 to 60, more preferably 27 to 50, even more preferably 30 to 40. The term "L value" as used herein refers to a value determined by measuring a lightness value of roasted coffee beans using a colorimeter based on the L values of black color and white color, which are defined as 0 and 100, respectively. For example, a spectrophotometer SE2000 (manufactured by NIPPON DENSHOKU INDUSTRIES CO., LTD.) may be used as the colorimeter. In addition, in the present invention, two or more coffee beans having different roasting degrees may be mixed and used as the roasted coffee beans, and may be appropriately used in combination so that the average of the L values falls within the above-mentioned range. It should

It should be noted that the average of the L values may be calculated as a sum of values determined by multiplying the L values of roasted coffee beans to be used by the content ratios of the roasted coffee beans. It should be noted that a roasting method for coffee beans is not particularly limited, and roasting temperature and roasting environment are not limited in any way, and a general method may be employed.

[0018] The coffee extract to be used in the present invention is prepared using coffee beans in an amount of preferably 1 g or more, more preferably 2.5 g or more, even more preferably 5 g or more in terms of raw beans relative to 100 g of the coffee extract. It should be noted that an extraction method and extraction conditions are not particularly limited, and a known method and conditions may be employed. For example, the method and conditions described in JP-A-2009-153451 may be employed.

[0019] The content of the chlorogenic acids (A) in the beer flavored beverage of the present invention is from 0.05 to 0.15 mass%. From the viewpoint of further improving foam properties, the content is preferably 0.06 mass% or more, more preferably 0.07 mass% or more, even more preferably 0.08 mass% or more, and from the viewpoint of taste and flavor, the content is preferably 0.14 mass% or less, more preferably 0.13 mass% or less, even more preferably 0.12 mass% or less. The content of the chlorogenic acids (A) in the beer flavored beverage falls within the range of preferably from 0.06 to 0.14 mass%, more preferably from 0.07 to 0.13 mass%,

even more preferably from 0.08 to 0.12 mass%. It should be noted that the content of the chlorogenic acids (A) is defined based on the total amount of the above-mentioned nine chlorogenic acids, and the "content of the chlorogenic acids (A)" is determined in accordance with a measurement method described in Examples to be shown later.

[0020] The content of 5-caffeoylquinic acid in the chlorogenic acids (A) is not particularly limited, and is preferably 5 mass% or more, more preferably 10 mass% or more, more preferably 20 mass% or more, even more preferably 30 mass% or more, from the viewpoint of production. The content of 5-caffeoylquinic acid in the chlorogenic acids (A) may be 100 mass%, and is preferably 90 mass% or less, more preferably 80 mass% or less, more preferably 70 mass% or less, more preferably 60 mass% or less, even more preferably 50 mass% or less, from the viewpoint of production. The content of 5-caffeoylquinic acid in the chlorogenic acids (A) falls within the range of preferably from 5 to 100 mass%, more preferably from 10 to 90 mass%, more preferably from 20 to 80 mass%, more preferably from 20 to 70 mass%, more preferably from 30 to 60 mass%, even more preferably from 30 to 50 mass%.

[0021] The beer flavored carbonated beverage of the present invention further comprises carbon dioxide gas (B).

The carbon dioxide gas (B) to be injected in the beer flavored carbonated beverage of the present invention has a gas volume (v/v) of from 0.5 to 3.2 under standard conditions, i.e., at 0°C and 1

atmosphere (hereinafter, referred to as "NTP"). From the viewpoint of further improving foam properties, the gas volume is preferably 0.8 (v/v) (NTP) or more, more preferably 1.0 (v/v) (NTP) or more, more preferably 1.2 (v/v) (NTP) or more, more preferably 1.4 (v/v) (NTP) or more, even more preferably 1.6 (v/v) (NTP) or more, and is preferably 3.0 (v/v) (NTP) or less, more preferably 2.8 (v/v) (NTP) or less, more preferably 2.6 (v/v) (NTP) or less, even more preferably 2.4 (v/v) (NTP) or less. The gas volume of the carbon dioxide gas (B) to be injected in the beer flavored carbonated beverage falls within the range of preferably from 0.8 to 3.2 (v/v) (NTP), more preferably from 1.0 to 3.0 (v/v) (NTP), more preferably from 1.2 to 2.8 (v/v) (NTP), more preferably from 1.4 to 2.6 (v/v) (NTP), even more preferably from 1.6 to 2.4 (v/v) (NTP). The term "gas volume (gas volume ratio)" as used herein refers to a ratio of the volume at 0°C and 1 atmosphere of carbon dioxide gas dissolved in a beverage to the volume of the beverage.

In general, the carbonated beverage contains the carbon dioxide gas at about 2.5 (v/v) (NTP), and the beer flavored carbonated beverage of the present invention can have an excellent bubbling, form a fine foam during drinking and can maintain the state for a certain length of time, even when the amount of the carbon dioxide gas is reduced to a level lower than that of a general carbonated beverage.

[0022] Further, a ratio [(A)/(B)] between the mass of the chlorogenic acids (A) and the volume of the carbon dioxide gas (B) is preferably 0.26 (g/L) (NTP) or more, more preferably 0.30 (g/L)

(NTP) or more, more preferably 0.32 (g/L) (NTP) or more, even more preferably 0.35 (g/L) (NTP) or more, and is preferably 0.85 (g/L) (NTP) or less, more preferably 0.70 (g/L) (NTP) or less, even more preferably 0.65 (g/L) (NTP) or less, from the viewpoint of further improving foam properties. Such ratio [(A)/(B)] falls within the range of preferably from 0.26 to 0.85 (g/L) (NTP), more preferably from 0.30 to 0.70 (g/L) (NTP), more preferably from 0.32 to 0.65 (g/L) (NTP), even more preferably from 0.35 to 0.65 (g/L) (NTP).

[0023] The beer flavored carbonated beverage of the present invention may further contain a foaming agent (C) to further improve the foam properties.

The foaming agent (C) is not particularly limited as long as the agent can impart ability to impart the bubbling thereto, and examples thereof include a saponin, a glycerin fatty acid ester, a propylene glycol fatty acid ester, and a sucrose fatty acid ester. The agent may be used singly or at least two of the agents may be used in combination. Of those, a saponin is preferred from the viewpoints of retainability and fineness of foam.

The saponin is not particularly limited as long as the saponin is a glycoside obtained by bonding a sugar to a triterpene or steroid, and a saponin-rich plant extract may be used. Examples thereof include a Quillaja extract, a Yucca extract, an Asian ginseng extract, a soybean extract, and a Japanese pagoda tree extract. At least one of the extracts may be used. Of those, at least one selected from a Quillaja extract, a Yucca extract, and an Asian ginseng extract

is preferably used from the viewpoint of further improving foam properties. It should be noted that the saponin may be a marketed product, and for example, the Quillaja extract is commercially available as Quillajanin C-100 (product name, manufactured by MARUZEN PHARMACEUTICALS CO., LTD.).

[0024] The content of the foaming agent (C) in the beer flavored carbonated beverage of the present invention may be appropriately selected, and a mass ratio [(A)/(C)] between the chlorogenic acids (A) and the solids of the foaming agent (C) is preferably 22.5 or more, more preferably 25.0 or more, even more preferably 38.5 or more, from the viewpoint of further improving foam properties, and is preferably 89.5 or less, more preferably 68.0 or less, even more preferably 45.0 or less, from the viewpoint of taste and flavor. The mass ratio [(A)/(C)] falls within the range of preferably from 22.5 to 89.5, more preferably from 25.0 to 68.0, even more preferably from 38.5 to 45.0.

[0025] In order to impart beer-like taste and flavor, the beer flavored carbonated beverage of the present invention may further contain at least one selected from a malt extract, a hop extract, a cereal extract, and a flavor.

[0026] The malt extract is a liquid obtained by extraction of malt with water or a water-soluble organic solvent such as ethanol, or a mixed solvent of water and the water-soluble organic solvent. In addition, the malt is obtained by adding water to seeds of a cereal such as barley and incubating the seeds at an appropriate

temperature to cause germination, and is also called "malt" (The Great Japanese Dictionary, published by KODANSHA LTD., 1989). Two-rowed barley, six-rowed barley, wheat, oat, rye, rice, corn, soybean, or the like may be used as the cereal. As a method for the germination, there are given, for example, a Kasten germination method, a Wanderhaufen germination method, a Flexibox germination method, a Tower germination method, and a Trommel germination method, and the method may be appropriately selected.

Specific examples of the malt extract include the following (i) to (iv).

(i) A product obtained by adding warm water to malt to decompose starch present in the malt into sugars (saccharification) and to decompose proteins into amino acids, through reactions with inherent enzymes (mainly include α -amylase, β -amylase, glucoamylase, protease, etc.) in the malt, and then performing compression or extraction. The product is also called "wort".

(ii) A product obtained by deactivating enzymes in an extract solution obtained from malt or in malt before extraction, and then further adding at least one enzyme to selectively decompose starch or proteins or to control the content of a sugar or an amino acid to an appropriate value.

(iii) A product obtained by deactivating inherent enzymes in malt and then performing compression or extraction without enzymatic reactions.

(iv) A product obtained by performing compression or extraction

without deactivation of inherent enzymes in malt and enzymatic reactions.

In addition, a product obtained by allowing an enzyme to act, inoculating yeast, and performing fermentation may be used as the malt extract, but an unfermented product is preferred from the viewpoint of easy production of a beverage having a low alcohol content. Further, a product concentrated into a liquid sugar like or dried into powder like may be used as the malt extract.

[0027] Hop is a moraceous climbing perennial, and the hop extract can be prepared by performing extraction of hop cones or a compressed product thereof without additional treatments or after pulverization, with carbon dioxide gas, water, or a solvent such as an organic solvent. For example, a general preparation method for a hop extract to be used for beer brewing may be appropriately selected as an extraction procedure, and for example, there may be employed: a method involving immersing hop cones or a pulverized product thereof or the like by cold extraction or warm extraction or the like; a method involving performing extraction with heating and stirring and filtering the resultant mixture to prepare an extract solution; and a percolation method or the like. In addition, a crude extract obtained by the extraction procedure may be subjected to solid-liquid separation such as filtration or centrifugation, if necessary.

After the extraction procedure, the resultant liquid may be used as a hop extract by subjecting the liquid to a solid-liquid

separation, if necessary. Alternatively, the hop extract may be used as, for example, a concentrate obtained by removing at least part of the solvent contained in the liquid, or a dried product obtained by drying the liquid through drying under reduced pressure or freeze-drying or the like. Further, a commercially available hop extract may be used.

[0028] Further, examples of the cereal extract other than a barley may include extracts obtained from cereals such as wheat, and Job's Tears, pulses, rices and coarse cereals. Examples of the pulses include soybeans, black beans, adzuki beans, mung beans, peas, and common beans. Further, an example of the rices is brown rice, and an example of the coarse cereals is corn. Of those, a wheat extract is preferred as the cereal extract.

A known extraction method may be employed for the extraction procedure, and a crude extract obtained through the extraction procedure may be subjected to solid-liquid separation such as filtration or centrifugation, if necessary. The cereal extract may be used without additional treatments, or may be concentrated or diluted with water, if necessary.

[0029] Examples of the flavor include a malt flavor, a hop flavor, a beer flavor, an alcohol flavor, and a caramel flavor, and one or two or more thereof may be used. As those flavors, commercially available products may be used without any particular limitation.

[0030] From the viewpoints of production efficiency and ease of imparting beer-like taste and flavor, a flavor is preferably

used as a beer-like taste and flavor component.

A content of the beer-like taste and flavor component may be appropriately selected depending on palatability, and for example, in the case of the malt extract, the content of the beer-like taste and flavor component in the beer flavored carbonated beverage of the present invention is preferably from 0.05 to 4 mass%, more preferably from 0.2 to 3 mass%, more preferably from 0.1 to 2 mass%, even more preferably from 0.3 to 1 mass% in terms of solids. In addition, the content of the hop extract in the beer flavored carbonated beverage of the present invention is preferably from 0.002 to 0.05 mass%, more preferably from 0.0045 to 0.03 mass%, even more preferably from 0.009 to 0.02 mass% in terms of the mass of solids. Further, the content of the cereal extract in the beer flavored carbonated beverage of the present invention is preferably from 0.2 to 1.2 mass%, more preferably from 0.3 to 1.0 mass%, even more preferably from 0.4 to 0.9 mass% in terms of the mass of solids. The content of the flavor in the beer flavored carbonated beverage of the present invention is preferably from 0.05 to 1 mass%, more preferably from 0.1 to 0.8 mass%, even more preferably from 0.2 to 0.6 mass%. The term "solids" as used herein refers to a residue obtained by drying a sample using an electric thermostat dryer at 105°C for 3 hours to remove volatile components therefrom.

[0031] In addition, the beer flavored carbonated beverage of the present invention preferably contains dimethyl sulfide (DMS) (K) as a beer-like taste and flavor component. Dimethyl sulfide

is generally known as an unpleasant aroma component, but can greatly contribute to imparting the beer-like taste and flavor when being contained in a very small amount. Dimethyl sulfide is a component mainly derived from a flavor, and may be one derived from another raw material. Further, a reagent may be added.

A content of dimethyl sulfide (K) in the beer flavored carbonated beverage of the present invention is preferably 3 $\mu\text{g/L}$ or more, more preferably 5 $\mu\text{g/L}$ or more, more preferably 10 $\mu\text{g/L}$ or more, more preferably 15 $\mu\text{g/L}$ or more, even more preferably 20 $\mu\text{g/L}$ or more, and is preferably 65 $\mu\text{g/L}$ or less, more preferably 60 $\mu\text{g/L}$ or less, more preferably 55 $\mu\text{g/L}$ or less, more preferably 50 $\mu\text{g/L}$ or less, more preferably 45 $\mu\text{g/L}$ or less, even more preferably 40 $\mu\text{g/L}$ or less, from the viewpoint of imparting beer-like taste and flavor. The range of the content of dimethyl sulfide (K) in the beer flavored beverage is preferably from 3 to 65 $\mu\text{g/L}$, more preferably from 5 to 60 $\mu\text{g/L}$, more preferably from 10 to 55 $\mu\text{g/L}$, more preferably from 10 to 50 $\mu\text{g/L}$, more preferably from 15 to 45 $\mu\text{g/L}$, even more preferably from 20 to 40 $\mu\text{g/L}$. It should be noted that the analysis of dimethyl sulfide is performed in accordance with a measurement method described in Examples to be shown later.

[0032] The beer flavored carbonated beverage of the present invention may be an alcoholic beverage or a non-alcoholic beverage. The term "non-alcoholic" as used herein refers to a concept encompassing not only an alcohol content of 0 mass% but also an alcohol content that does not fall within an alcohol content of

an alcoholic beverage defined by an applied regulation (Liquor Tax Act in a case of Japan).

For example, the alcohol content of the alcoholic beverage is preferably from 1 to 15 mass%, more preferably 4 to 15 mass%. In addition, the alcohol content of the non-alcoholic beverage is preferably less than 1 mass%, more preferably less than 0.7 mass%, more preferably less than 0.5 mass%, even more preferably less than 0.3 mass%, and may be 0 mass%. It should be noted that the phrase "alcohol content of 0 mass%" refers to a concept comprising a case where the alcohol content is lower than a detection limit in the "Analysis of alcohol" described in Examples to be shown later.

[0033] The pH (20°C) of the beer flavored carbonated beverage of the present invention, which is from 2.8 to 4.2, is preferably 3.0 or more, more preferably 3.2 or more, even more preferably 3.3 or more, and is preferably 4.0 or less, more preferably 3.9 or less, from the viewpoint of further improving foam properties. The range of the pH is preferably from 3.0 to 4.0, more preferably from 3.2 to 4.0, even more preferably from 3.3 to 3.9.

[0034] The beer flavored carbonated beverage of the present invention may contain an acidulant in order to adjust the pH of the beverage within the above-mentioned range. As the acidulant, there may be used, for example, at least one selected from organic acids such as ascorbic acid, citric acid, gluconic acid, succinic acid, tartaric acid, lactic acid, fumaric acid, malic acid, and adipic acid; inorganic acids such as phosphoric acid; and salts

thereof.

[0035] The beer flavored carbonated beverage of the present invention may further contain a combination of at least one additive such as sugars, amino acids, sweeteners, vitamins, minerals, antioxidants, various esters, pigments, emulsifiers, preservatives, seasonings, fruit juice extracts, vegetable extracts, nectar extracts, and food stabilizers. It should be noted that the content of any such additive may be appropriately set as long as the object of the present invention is not impaired.

[0036] In addition, the beer flavored carbonated beverage of the present invention may be provided by being filled in a general packaging container such as a molded container mainly formed of polyethylene terephthalate (so-called PET bottle), a metal can, or a bottle. In such case, for example, when the beverage can be heat-sterilized after being filled in a container such as a metal can, the beverage can be produced under sterilization conditions defined by an applied regulation (Food Sanitation Act in a case of Japan). In the case of using a container that cannot be subjected to retort sterilization, such as a PET bottle, there may be employed, for example, a method involving preliminarily sterilizing the beverage under the equivalent sterilization conditions as above, for example, at high temperature in a short length of time using a plate heat exchanger, cooling the beverage to a certain temperature, and filling the beverage in a container. In addition, another component may be blended and filled in a container filled with the

beverage under an aseptic condition.

[0037] The beer flavored carbonated beverage of the present invention is described above, and the same constituent elements as above may also be employed in the foam-improving agent for a foamable food and beverage, foam-improving method for a foamable food and beverage, and use for improving foam in a foamable food and beverage.

In the foam-improving agent, foam-improving method, and use for improving foam of the present invention, the chlorogenic acids are used as an active ingredient and are employed for improving foam properties of the foamable food and beverage, such as bubbling, foam retention, and foam quality.

The foamable food and beverage is not particularly limited as long as it has a foamability, and examples thereof include: a carbonated beverage such as soda pop, lemon soda, cola, or a carbonated beverage containing fruit juice; foaming wine; whipped cream; and whipped cream confectionery or the like. Of those, a carbonated beverage is preferred, and a beer flavored carbonated beverage is more preferred.

The amount of the chlorogenic acids added to the foamable food and beverage may be appropriately selected depending on the type of the food and beverage. For example, in the case of the carbonated beverage, the same constituent element as that of the above-mentioned beer flavored carbonated beverage may be employed. In addition, in the foam-improving agent, foam-improving method, and use for

improving foam of the present invention, a foaming agent may be used in combination. The use in combination with the foaming agent can further improve foam retainability and foam quality. It should be noted that specific constituent element thereof are as described in the beer flavored carbonated beverage above.

[0038] The present invention further discloses the following beer flavored carbonated beverage, agent, method, and use, with reference to the above-mentioned embodiments.

<1-1>

A beer flavored carbonated beverage, comprising the following components (A) and (B);

(A) 0.05 to 0.15 mass% of chlorogenic acids; and

(B) 0.5 to 3.2 (v/v) (NTP) by volume of carbon dioxide gas, in which the beer flavored carbonated beverage has a pH of from 2.8 to 4.2.

[0039]

<1-2>

The beer flavored carbonated beverage according to the above-mentioned item <1-1>, in which the chlorogenic acids (A) are preferably at least one selected from 3-caffeoylquinic acid, 4-caffeoylquinic acid, 5-caffeoylquinic acid, 3-feruloylquinic acid, 4-feruloylquinic acid, 5-feruloylquinic acid, 3,4-dicaffeoylquinic acid, 3,5-dicaffeoylquinic acid, and 4,5-dicaffeoylquinic acid, more preferably at least one selected from 3-caffeoylquinic acid, 4-caffeoylquinic acid, and

5-caffeoylquinic acid, even more preferably 5-caffeoylquinic acid.

<1-3>

The beer flavored carbonated beverage according to the above-mentioned item <1-1> or <1-2>, in which the content of 5-caffeoylquinic acid in the chlorogenic acids (A) is preferably 5 mass% or more, more preferably 10 mass% or more, more preferably 20 mass% or more, even more preferably 30 mass% or more, and is preferably 100 mass% or less, more preferably 90 mass% or less, more preferably 80 mass% or less, more preferably 70 mass% or less, more preferably 60 mass% or less, even more preferably 50 mass% or less.

<1-4>

The beer flavored carbonated beverage according to any one of items <1-1> to <1-3>, in which the content of 5-caffeoylquinic acid in the chlorogenic acids (A) is preferably 100 mass%, more preferably from 5 to 100 mass%, more preferably from 10 to 90 mass%, more preferably from 20 to 80 mass%, more preferably from 20 to 70 mass%, more preferably from 30 to 60 mass%, even more preferably from 30 to 50 mass%.

<1-5>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-4>, in which the chlorogenic acids (A) are preferably derived from at least one selected from raw coffee beans and roasted coffee beans.

<1-6>

The beer flavored carbonated beverage according to the above-mentioned item <1-5>, in which the roasted coffee beans have an L value of preferably 15 or more, more preferably 20 or more, more preferably 25 or more, more preferably 27 or more, even more preferably 30 or more, and of preferably 62 or less, more preferably 60 or less, more preferably 50 or less, more preferably 40 or less, even more preferably 30 or less.

<1-7>

The beer flavored carbonated beverage according to the above-mentioned item <1-5> or <1-6>, in which the roasted coffee beans have an L value of preferably from 15 to 62, more preferably from 15 to 60, more preferably from 20 to 40, more preferably from 25 to 30, or of preferably from 20 to 62, more preferably from 25 to 60, more preferably from 27 to 50, even more preferably from 30 to 40.

<1-8>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-7>, in which the content of the chlorogenic acids (A) is preferably 0.06 mass% or more, more preferably 0.07 mass% or more, even more preferably 0.08 mass% or more, and is preferably 0.14 mass% or less, more preferably 0.13 mass% or less, even more preferably 0.12 mass% or less.

<1-9>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-8>, in which the content

of the chlorogenic acids (A) is preferably from 0.06 to 0.14 mass%, more preferably from 0.07 to 0.13 mass%, even more preferably from 0.08 to 0.12 mass%.

[0040]

<1-10>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-9>, in which the carbon dioxide gas (B) has a gas volume of preferably 0.8 (v/v) (NTP) or more, more preferably 1.0 (v/v) (NTP) or more, more preferably 1.2 (v/v) (NTP) or more, more preferably 1.4 (v/v) (NTP) or more, even more preferably 1.6 (v/v) (NTP) or more, and of preferably 3.0 (v/v) (NTP) or less, more preferably 2.8 (v/v) (NTP) or less, more preferably 2.6 (v/v) (NTP) or less, even more preferably 2.4 (v/v) (NTP) or less.

<1-11>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-10>, in which the carbon dioxide gas (B) has a gas volume of preferably from 0.8 to 3.2 (v/v) (NTP), more preferably from 1.0 to 3.0 (v/v) (NTP), more preferably from 1.2 to 2.8 (v/v) (NTP), more preferably from 1.4 to 2.6 (v/v) (NTP), even more preferably from 1.6 to 2.4 (v/v) (NTP).

<1-12>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-11>, in which a ratio [(A)/(B)] between the mass of the chlorogenic acids (A) and the

volume of the carbon dioxide gas (B) is preferably 0.26 (g/L) (NTP) or more, more preferably 0.30 (g/L) (NTP) or more, more preferably 0.32 (g/L) (NTP) or more, even more preferably 0.35 (g/L) (NTP) or more, and is preferably 0.85 (g/L) (NTP) or less, more preferably 0.70 (g/L) (NTP) or less, even more preferably 0.65 (g/L) (NTP).

<1-13>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-12>, in which a ratio $[(A)/(B)]$ between the mass of the chlorogenic acids (A) and the volume of the carbon dioxide gas (B) is preferably from 0.26 to 0.85 (g/L) (NTP), more preferably from 0.30 to 0.70 (g/L) (NTP), more preferably from 0.32 to 0.65 (g/L) (NTP), even more preferably from 0.35 to 0.65 (g/L) (NTP).

[0041]

<1-14>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-13>, preferably further comprising a foaming agent (C).

<1-15>

The beer flavored carbonated beverage according to the above-mentioned item <1-14>, in which the foaming agent (C) is preferably at least one selected from a saponin, a glycerin fatty acid ester, a propylene glycol fatty acid ester, and a sucrose fatty acid ester.

<1-16>

The beer flavored carbonated beverage according to the above-mentioned item <1-15>, in which the saponin is preferably at least one selected from a Quillaja extract, a Yucca extract, an Asian ginseng extract, a soybean extract, and a Japanese pagoda tree extract, more preferably at least one selected from a Quillaja extract, a Yucca extract, and an Asian ginseng extract.

<1-17>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-14> to <1-16>, in which a mass ratio $[(A)/(C)]$ between the chlorogenic acids (A) and the solids of the foaming agent (C) is preferably 22.5 or more, more preferably 25.0 or more, even more preferably 38.5 or more, and is preferably 89.5 or less, more preferably 68.0 or less, even more preferably 45.0 or less.

<1-18>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-14> to <1-17>, in which a mass ratio $[(A)/(C)]$ between the chlorogenic acids (A) and the solids of the foaming agent (C) is preferably from 22.5 to 89.5, more preferably from 25.0 to 68.0, even more preferably from 38.5 to 45.0.

[0042]

<1-19>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-18>, preferably further comprising at least one selected from a malt extract, a hop extract,

a cereal extract, and a flavor.

<1-20>

The beer flavored carbonated beverage according to the above-mentioned item <1-19>, in which the malt extract is preferably at least one selected from the following (i) to (iv):

(i) a product obtained by adding warm water to malt to decompose starch present in the malt into sugars and to decompose proteins into amino acids, through reactions with inherent enzymes (mainly include α -amylase, β -amylase, glucoamylase, protease, etc.) in the malt, and then performing compression or extraction;

(ii) a product obtained by deactivating enzymes in an extract solution obtained from malt or in malt before extraction, and then further adding at least one enzyme to selectively decompose starch or proteins or to control the content of a sugar or an amino acid to an appropriate value;

(iii) a product obtained by deactivating inherent enzymes in malt and then performing compression or extraction without enzymatic reactions; and

(iv) a product obtained by performing compression or extraction without deactivation of inherent enzymes in malt and enzymatic reactions.

<1-21>

The beer flavored carbonated beverage according to the above-mentioned item <1-19> or <1-20>, in which the malt extract is preferably an unfermented one.

<1-22>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-19> to <1-21>, in which the cereal extract is preferably at least one extract from a cereal selected from barley, wheat, Job's Tears, pulses, rices, and coarse cereals, more preferably a wheat extract.

[0043]

<1-23>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-19> to <1-22>, in which the flavor is preferably at least one selected from a malt flavor, a hop flavor, a beer flavor, an alcohol flavor, and a caramel flavor.

<1-24>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-19> to <1-23>, in which the content of the malt extract in the beer flavored carbonated beverage is preferably from 0.05 to 4 mass%, more preferably from 0.2 to 3 mass%, more preferably from 0.1 to 2 mass%, even more preferably from 0.3 to 1 mass%, in terms of solids.

<1-25>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-19> to <1-24>, in which the content of the hop extract in the beer flavored carbonated beverage is preferably from 0.002 to 0.05 mass%, more preferably from 0.0045 to 0.03 mass%, even more preferably from 0.009 to 0.02 mass% in

terms of the mass of solids.

<1-26>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-19> to <1-25>, in which the content of the cereal extract in the beer flavored carbonated beverage is preferably from 0.2 to 1.2 mass%, more preferably from 0.3 to 1.0 mass%, even more preferably from 0.4 to 0.9 mass% in terms of the mass of solids.

<1-27>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-19> to <1-26>, in which the content of the flavor in the beer flavored carbonated beverage is preferably from 0.05 to 1 mass%, preferably from 0.1 to 0.8 mass%, more preferably from 0.2 to 0.6 mass%.

[0044]

<1-28>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-27>, in which the beer flavored carbonated beverage is preferably an alcoholic beverage or a non-alcoholic beverage.

<1-29>

The beer flavored carbonated beverage according to the above-mentioned item <1-28>, in which the beer flavored carbonated beverage is preferably the alcoholic beverage, and the alcohol content in the alcoholic beverage is preferably from 1 to 15 mass%,

more preferably from 4 to 15 mass%.

<1-30>

The beer flavored carbonated beverage according to the above-mentioned item <1-28>, in which the beer flavored carbonated beverage is preferably the non-alcoholic beverage, and the alcohol content in the non-alcoholic beverage is preferably less than 1 mass%, more preferably less than 0.7 mass%, more preferably less than 0.5 mass%, more preferably less than 0.3 mass%, even more preferably 0 mass%.

<1-31>

The beer flavored carbonated beverage according to the above-mentioned item <1-28>, in which the beer flavored carbonated beverage is preferably the non-alcoholic beverage, and the alcohol content in the non-alcoholic beverage is an alcohol content that does not fall within an alcohol content of an alcoholic beverage defined by an applied regulation (Liquor Tax Act in a case of Japan).

<1-32>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-31>, in which the pH is preferably 3.0 or more, more preferably 3.2 or more, even more preferably 3.3 or more, and is preferably 4.0 or less, more preferably 3.9 or less.

<1-33>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-32>, in which the pH is

preferably from 3.0 to 4.0, more preferably from 3.2 to 4.0, even more preferably from 3.3 to 3.9.

<1-34>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-33>, preferably further comprising an acidulant.

[0045]

<1-35>

The beer flavored carbonated beverage according to the above-mentioned item <1-34>, in which the acidulant is preferably at least one selected from organic acids, inorganic acids, and salts thereof.

<1-36>

The beer flavored carbonated beverage according to the above-mentioned item <1-34> or <1-35>, in which the acidulant is preferably at least one selected from ascorbic acid, citric acid, gluconic acid, succinic acid, tartaric acid, lactic acid, fumaric acid, malic acid, adipic acid, phosphoric acid, and salts thereof.

<1-37>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-36>, preferably further comprising at least one selected from sugars, amino acids, sweeteners, vitamins, minerals, antioxidants, various esters, pigments, emulsifiers, preservatives, seasonings, fruit juice extracts, vegetable extracts, nectar extracts, and food stabilizers.

<1-38>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-37>, in which is preferably a packaged beer flavored carbonated beverage.

<1-39>

The beer flavored carbonated beverage according to the above-mentioned item <1-38>, in which the package is preferably a PET bottle, a metal can or a bottle.

<1-40>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-39>, in which is preferably subjected to a heat-sterilization.

<1-41>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-40>, in which the content of dimethyl sulfide (K) in the beer flavored carbonated beverage is preferably 3 µg/L or more, more preferably 5 µg/L or more, more preferably 10 µg/L or more, more preferably 15 µg/L or more, even more preferably 20 µg/L or more, and is preferably 65 µg/L or less, more preferably 60 µg/L or less, more preferably 55 µg/L or less, more preferably 50 µg/L or less, more preferably 45 µg/L or less, even more preferably 40 µg/L or less.

<1-42>

The beer flavored carbonated beverage according to any one of the above-mentioned items <1-1> to <1-41>, in which the content

of dimethyl sulfide (K) in the beer flavored carbonated beverage is preferably from 3 to 65 µg/L, more preferably from 5 to 60 µg/L, more preferably from 10 to 55 µg/L, more preferably from 10 to 50 µg/L, more preferably from 15 to 45 µg/L, even more preferably from 20 to 40 µg/L.

[0046]

<2-1>

A foam-improving agent for a foamable food and beverage, comprising chlorogenic acids as active ingredients.

[0047]

<2-2>

A foam-improving method for a foamable food and beverage, comprising adding chlorogenic acids to the foamable food and beverage.

[0048]

<2-3>

Use of chlorogenic acids for improving foam in a foamable food and beverage.

[0049]

<2-4>

The foam-improving agent for a foamable food and beverage according to the above-mentioned item <2-1>, the foam-improving method for a foamable food and beverage according to the above-mentioned item <2-2>, or the use for improving foam in a foamable food and beverage according to the above-mentioned item <2-3>, in

which the chlorogenic acids are preferably at least one selected from 3-caffeoylquinic acid, 4-caffeoylquinic acid, 5-caffeoylquinic acid, 3-feruloylquinic acid, 4-feruloylquinic acid, 5-feruloylquinic acid, 3,4-dicaffeoylquinic acid, 3,5-dicaffeoylquinic acid, and 4,5-dicaffeoylquinic acid, more preferably at least one selected from 3-caffeoylquinic acid, 4-caffeoylquinic acid, and 5-caffeoylquinic acid, even more preferably 5-caffeoylquinic acid (hereinafter the "foam-improving agent for a foamable food and beverage, foam-improving method for a foamable food and beverage, or use for improving foam in a foamable food and beverage" is referred to as "foam-improving agent or the like").

<2-5>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-4>, in which the content of 5-caffeoylquinic acid in the chlorogenic acids is preferably 5 mass% or more, more preferably 10 mass% or more, more preferably 20 mass% or more, even more preferably 30 mass% or more, and is preferably 100 mass% or less, more preferably 90 mass% or less, more preferably 80 mass% or less, more preferably 70 mass% or less, more preferably 60 mass% or less, even more preferably 50 mass% or less.

<2-6>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-5>, in which the content of 5-caffeoylquinic acid in the chlorogenic acids is preferably 100

mass%, more preferably from 5 to 100 mass%, more preferably from 10 to 90 mass%, more preferably from 20 to 80 mass%, more preferably from 20 to 70 mass%, more preferably from 30 to 60 mass%, even more preferably from 30 to 50 mass%.

<2-7>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-6>, in which the chlorogenic acids are preferably derived from at least one selected from raw coffee beans and roasted coffee beans.

<2-8>

The foam-improving agent or the like according to the above-mentioned item <2-7>, in which the roasted coffee beans have an L value of preferably 20 or more, more preferably 25 or more, more preferably 27 or more, even more preferably 30 or more, and of preferably 62 or less, more preferably 60 or less, more preferably 50 or less, even more preferably 40 or less.

<2-9>

The foam-improving agent or the like according to the above-mentioned item <2-7> or <2-8>, in which the roasted coffee beans have an L value of preferably from 20 to 62, more preferably from 25 to 60, more preferably from 27 to 50, even more preferably from 30 to 40.

<2-10>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-9>, in which the amount of

the chlorogenic acids added in the foamable food and beverage is preferably 0.06 mass% or more, more preferably 0.07 mass% or more, even more preferably 0.08 mass% or more, and is preferably 0.14 mass% or less, more preferably 0.13 mass% or less, even more preferably 0.12 mass% or less.

<2-11>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-10>, in which the amount of the chlorogenic acids added in the foamable food and beverage is preferably from 0.06 to 0.14 mass%, more from preferably 0.07 to 0.13 mass%, even more preferably from 0.08 to 0.12 mass%.

[0050]

<2-12>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-11>, in which the foamable food and beverage is preferably a carbonated beverage.

<2-13>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-12>, in which the foam-improving is preferably one selected from promotion of bubbling, promotion of foam retention, and improvement in foam quality.

<2-14>

The foam-improving agent or the like according to any one of the above-mentioned items <2-1> to <2-13>, in which is preferably used in combination with a foaming agent.

<2-15>

The foam-improving agent or the like according to the above-mentioned item <2-14>, in which the foaming agent is preferably at least one selected from a saponin, a glycerin fatty acid ester, a propylene glycol fatty acid ester, and a sucrose fatty acid ester, and is more preferably a saponin.

<2-16>

The foam-improving agent or the like according to the above-mentioned item <2-15>, in which the saponin is preferably at least one selected from a Quillaja extract, a Yucca extract, an Asian ginseng extract, a soybean extract, and a Japanese pagoda tree extract, more preferably at least one selected from a Quillaja extract, a Yucca extract, and an Asian ginseng extract.

<2-17>

The foam-improving agent or the like according to any one of the above-mentioned items <2-14> to <2-16>, in which a mass ratio $[(A)/(C)]$ between the chlorogenic acids (A) and the solids of the foaming agent (C) is preferably 22.5 or more, more preferably 25.0 or more, even more preferably 38.5 or more, and is preferably 89.5 or less, more preferably 68.0 or less, even more preferably 45.0 or less.

<2-18>

The foam-improving agent or the like according to any one of the above-mentioned items <2-14> to <2-17>, in which a mass ratio $[(A)/(C)]$ between the chlorogenic acids (A) and the solids of the

foaming agent (C) is preferably from 22.5 to 89.5, more preferably from 25.0 to 68.0, even more preferably from 38.5 to 45.0.

Examples

[0051] 1. Analysis of chlorogenic acids

HPLC was used as analyzer. The model numbers of component units in the analyzer are as follows:

- UV-VIS detector: L-2420 (Hitachi High-Technologies Corporation),
- Column oven: L-2300 (Hitachi High-Technologies Corporation),
- Pump: L-2130 (Hitachi High-Technologies Corporation),
- Autosampler: L-2200 (Hitachi High-Technologies Corporation),
- Column: Cadenza CD-C18, 4.6 mm (inner diameter) × 150 mm (length), particle diameter: 3 μm (Imtakt Corp.).

[0052] Analysis conditions are as follows:

- Sample injection volume: 10 μL,
- Flow rate: 1.0 mL/min,
- Predetermined wavelength of UV-VIS detector: 325 nm,
- Predetermined temperature of column oven: 35°C,
- Eluent A: 5 (V/V) % acetonitrile solution containing 0.05 M acetic acid, 0.1 mM 1-hydroxyethane-1,1-diphosphonic acid, and 10 mM sodium acetate,
- Eluent B: acetonitrile.

[0053] Concentration gradient conditions

Time	Eluent A	Eluent B
0.0 min.	100%	0%
10.0 min.	100%	0%

15.0 min.	95%	5%
20.0 min.	95%	5%
22.0 min.	92%	8%
50.0 min.	92%	8%
52.0 min.	10%	90%
60.0 min.	10%	90%
60.1 min.	100%	0%
70.0 min.	100%	0%

[0054] In HPLC, 1 g of a sample was weighed accurately and increased to 10 mL with Eluent A, and the resultant was filtered by a membrane filter (GL chromatodisc 25A, pore diameter 0.45 μ m, GL Sciences Inc.), and was then analyzed.

Retention time of chlorogenic acids (unit: minute)

- Monocaffeoylquinic acid: 3 peaks in total at 5.3, 8.8, and 11.6,
- Monoferuloylquinic acid: 3 peaks in total at 13.0, 19.9, and 21.0,
- Dicafeoylquinic acid: 3 peaks in total at 36.6, 37.4, and 44.2.

From area values for the nine chlorogenic acids determined therein, the content of chlorogenic acids (mass%) was determined by using 5-cafeoylquinic acid as a standard substance.

[0055] 2. Analysis of carbon dioxide gas

A method described in "1-4-11(2) Gas Volume" in "The latest soft drinks (The latest soft drinks editorial board, KORIN PUBLISHING CO., LTD., published on September 30, 2003)" was used. Specifically, the method is as follows.

[0056] 1) A product was heated before measurement to about 20°C

(18 to 22°C) in a thermostatic bath to achieve a uniform liquid temperature.

2) A gas volume was applied to a measurement machine to perform snifting (a snifting valve was opened until the gauge indicated the atmospheric pressure). The snifting procedure was carried out to release air in the head space.

3) Subsequently, the product was vigorously vibrated until the gauge indicated a constant pressure, and the value of the gauge was read. Then, the temperature of the product was measured, and the gas volume was determined based on a table (gas volume chart for snifting).

[0057] 3. Analysis of dimethyl sulfide (DMS)

2 g of a sample was placed in a vial, and aroma components in the head space were adsorbed by SPME fiber, followed by GC/MS measurement. Then, the concentration ($\mu\text{g/L}$) was determined based on area values for known concentrations of standard substances.

•Analyzer: HP 6890 (manufactured by Agilent)

•Column: BC-WAX, 0.25 mm (inner diameter) $\times$ 50 m (length), particle diameter: 0.25 μm (GL Sciences Inc.)

•Temperature program: 60°C (5 min) $\rightarrow$ 230°C at a temperature increasing rate of 5°C/min

•Head pressure: 14.8 psi

•Inlet temperature: 210°C

•Detector temperature: 200°C

•Split ratio: 30:1

- Carrier gas: helium

- Scan mode: ionization voltage of 70 eV

[0058] 4. Analysis of amount of solids

1 g of a sample was weighed accurately in a weighing bottle and dried in an electric thermostat dryer at 105°C for 3 hours to remove volatile components, and the mass after drying was weighed to determine an amount of solids.

[0059] 5. Analysis of saponin

The content of the saponin can be determined by a known method such as an HPLC analysis method. Specifically, the content can be determined by the following method.

HPLC is used as an analyzer. The model numbers of component units in the analyzer are as follows.

- Detector: UV-8000 (ultraviolet portion absorption detector manufactured by Tosoh Corporation)

- Pump: CCPM type (manufactured by Tosoh Corporation)

- Column: IPG-ODS, particle diameter: 10 μ m, pore diameter: 550A, 4.0 mm I.D. $\times$ 250 mm (manufactured by ISE CHEMICALS CORPORATION)

[0060] Analysis conditions are as follows:

- Sample injection volume: 10 μ L,

- Flow rate: 2.0 mL/min,

- Predetermined wavelength of UV detector: 203 nm,

- Column oven: room temperature,

- Eluent: acetonitrile: 5 mM KH₂PO₄=25.5:74.5.

[0061] In HPLC, 1 g of a sample is weighed, subjected to shaking

extraction with 70% methanol at room temperature for 30 minutes and to cartridge treatment using Spe-PakC13, and then analyzed. Ginsenoside-Rb1, Rb2, Rc, Rd, Re, and Rg1 (for crude drug test, manufactured by Funakoshi Corporation) are used as standard substances to determine the contents of saponins.

[0062] 6. Analysis of alcohol (analysis of ethanol)

The content of ethanol can be determined by a known method such as a gas chromatographic method. Specifically, the content can be determined by the following method.

GC-14B (manufactured by Shimadzu Corporation) is used as an analyzer.

Component units in the analyzer are as follows.

- Detector: FID
- Column: Gaskuropack55, 80 to 100 mesh, ϕ 3.2 mm×3.1 mm

[0063] Analysis conditions are as follows.

- Temperature: sample inlet and detector: 250°C, column: 130°C
- Gas pressure: helium (carrier gas): 140 kPa, hydrogen: 60 kPa, air: 50 kPa
- Injection volume: 2 μ L

[0064] A sample for the analysis is prepared by the following procedure.

5 g of a specimen is weighed accurately in a weighing bottle and water is added thereto to a constant volume of 25 mL. The solution is subjected to disc filtration to prepare a sample solution. The prepared sample solution is subjected to gas chromatographic

analysis.

[0065] 7. Evaluation of bubbling and foam retention

50 mL of each of the beverages cooled to 5°C were poured from a position 10 cm above a 100 mL-volume graduated cylinder (IWAKI, PYREX (trademark)) in near the center of the bottom, and the amount (mL) of foam generated during pouring and time (sec) until the foam disappeared were measured.

[0066] 8. Evaluation of foam quality

A panel of ten experts evaluated the foam quality of each of the beverages cooled to 5°C through visual observation in accordance with the following criteria, and then determined scores through discussion.

[0067] Criteria for evaluation

- A: Very fine
- B: Fine
- C: Rather fine
- D: Rather coarse
- E: Coarse

[0068] 9. Evaluation of taste and flavor

A panel of ten experts drank each of the beverages cooled to 5°C, evaluated richness and beer-like flavor in accordance with the following criteria, and then determined scores through discussion.

[0069] Criteria for evaluation

- A: Very satisfactory

B: Satisfactory

C: Rather satisfactory

D: Rather poor

E: Poor

[0070] Production of coffee extract

Production Example 1

400 g of roasted coffee beans (L30) were subjected to drip extraction with 95°C hot water at a flow rate of 120 mL/min, thereby obtaining 2,400 g (Brix 5) of an extract solution. The resultant extract solution was filtered by a filter to remove fine powder, and concentrated by heating, thereby obtaining 400 g of a roasted coffee bean extract (Brix 30). The roasted coffee bean extract was found to have a chlorogenic acid content of 5.4 mass% and a 5-caffeoylquinic acid content of 2.2 mass%.

[0071] Production Example 2

A roasted coffee bean extract solution (Brix 5.2) was obtained in the same manner as in Production Example 1 except that roasted coffee beans (L25) were used instead of the roasted coffee beans (L30). The resultant extract solution was filtered by a filter to remove fine powder, and concentrated by heating, thereby obtaining a roasted coffee bean extract (Brix 30). The roasted coffee bean extract was found to have a chlorogenic acid content of 3.8 mass% and a 5-caffeoylquinic acid content of 1.3 mass%.

[0072] Production Example 3

A raw coffee bean extract solution (Brix 4.8) was obtained

in the same manner as in Production Example 1 except that raw coffee beans (L60) were used instead of the roasted coffee beans (L30). The resultant extract solution was filtered by a filter to remove fine powder, and concentrated by heating, thereby obtaining a raw coffee bean extract (Brix 30). The raw coffee bean extract was found to have a chlorogenic acid content of 15.1 mass% and a 5-caffeoylquinic acid content of 6.3 mass%.

[0073] Examples 1 to 5

Gluconic acid (G) was added to 5-caffeoylquinic acid (A), and pH of the mixture was adjusted to 3.8. After that, a malt flavor, a hop flavor (D), a sugar (E), and an amino acid (F) were added to prepare a syrup. Subsequently, the syrup was subjected to a heat sterilization at 108°C for 30 seconds, and was cooled, and carbonated water (H) was added thereto to prepare beverage solutions having gas volumes shown in Table 1. 360 ml-volume aluminum cans were filled with 350 mL of the beverage solutions and seamed. Then, the cans were subjected to a heat sterilization at 65°C for 50 minutes, and were cooled to 10°C or less, thereby obtaining each of beer flavored carbonated beverages. Table 1 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverages.

[0074] Comparative Example 1

A beer flavored carbonated beverage was obtained in the same manner as in Example 1 except that 5-caffeoylquinic acid (A) was not blended. Table 1 collectively shows analysis results and

evaluation results for the resultant beer flavored carbonated beverage.

[0075] Comparative Examples 2 to 4

Beer flavored carbonated beverages were obtained in the same manner as in Example 1 except that the foaming agents (C) shown in Table 1 were blended instead of 5-caffeoylquinic acid (A). Table 1 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverages.

[0076] Comparative Example 5

A beer flavored carbonated beverage was obtained in the same manner as in Example 1 except that water (I) was blended instead of carbonated water (H). Table 1 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverage.

[0077] Comparative Example 6

A beer flavored carbonated beverage was obtained in the same manner as in Example 1 except that the gas volume of the beverage was changed to 3.5. Table 1 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverage.

[0078]

[Table 1]

		Example					Comparative Example					
		1	2	3	4	5	1	2	3	4	5	6
Blend (mass%)	5-Caffeoylquinic acid (A) ¹⁾	0.085	0.085	0.085	0.085	0.085	-	-	-	-	0.085	0.085
	Foaming agent (C) (Quillaja extract, solids: 9.5 mass%)	-	-	-	-	-	-	0.02	-	-	-	-
	Foaming agent (C) (Yucca extract, solids: 9.5 mass%)	-	-	-	-	-	-	-	0.02	-	-	-
	Foaming agent (C) (Asian ginseng extract, solids: 9.5 mass%)	-	-	-	-	-	-	-	-	0.02	-	-
	Malt flavor, hop flavor (D)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Sugar (E)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	Amino acid (F)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Gluconic acid (G) ²⁾	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	Carbonated water (H) ³⁾	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	-	Balance
	Water (I)	-	-	-	-	-	-	-	-	-	Balance	-
Analysis values of product	Total	100	100	100	100	100	100	100	100	100	100	100
	pH (20 °C) ⁴⁾	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.8
	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)	2.0	1.0	1.5	2.5	3.0	2.0	2.0	2.0	2.0	0.0	3.5
	Chlorogenic acids (A) (mass%)	0.085	0.085	0.085	0.085	0.085	0.0	0.0	0.0	0.0	0.085	0.085
	Chlorogenic acids (A) /CO ₂ (B) (g/L) (NTP)	0.425	0.850	0.567	0.340	0.283	0.000	0.000	0.000	0.000	-	0.243
	Dimethyl sulfide (DMS) (K) (µg/L)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Evaluation	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]	30	30	30	40	45	3	18	18	18	25	45
	Foam retention [time until foam disappears (sec)]	80	60	75	80	60	10	30	30	27	30	40
	Foam quality [fineness (creamy)]	A	C	B	A	C	E	E	D	D	D	D
	Taste and flavor (richness)	B	B	B	B	B	E	C	C	C	B	B
	Taste and flavor (beer-like odor)	A	A	A	A	A	A	A	A	A	A	A

1) Reagent: manufactured by Tokyo Chemical Industry Co., Ltd.

2) Added in an amount for achieving pH 3.8

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

[0079] Table 1 demonstrates that the beer flavored carbonated beverage excellent in bubbling, foam retainability, and foam quality can be obtained by blending 5-caffeoylquinic acid together with carbon dioxide gas and controlling the pH.

[0080] Examples 6 and 7

Gluconic acid (G) was added to the roasted coffee bean extract obtained in Production Example 1, and pH of the mixture was adjusted to 3.8. After that, precipitates generated were removed by centrifugation, thereby obtaining a supernatant. Subsequently, to the supernatant were added the malt flavor, hop flavor (D), sugar (E), and amino acid (F), thereby obtaining a syrup. Then, the syrup was subjected to a heat sterilization at 108°C for 30 seconds, and was cooled, and carbonated water (H) was added thereto to prepare beverage solutions having the gas volumes shown in Table 1. 360 ml-volume aluminum cans were filled with 350 mL of the beverage solutions and seamed. Subsequently, the cans were subjected to a heat sterilization at 65°C for 50 minutes, and were cooled to 10°C or less, thereby obtaining each of beer flavored carbonated beverages. Table 2 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverages.

[0081] Comparative Example 7

A beer flavored carbonated beverage was obtained in the same manner as in Example 6 except that the amount of the roasted coffee bean extract blended was changed. Table 2 collectively shows analysis results and evaluation results for the resultant beer

flavored carbonated beverage together with the results of Comparative Examples 1 to 4.

[0082]

[Table 2]

	Example		Comparative Example				
	6	7	7	1	2	3	4
Blend (mass%)	Roasted coffee bean extract ⁵⁾						
	1.88	3.10	0.93	-	-	-	-
	-	-	-	-	0.02	-	-
	-	-	-	-	-	0.02	-
	Foaming agent (C) (Asian ginseng extract, solids: 9.5 mass%)						
	-	-	-	-	-	-	-
	Foaming agent (C) (Yucca extract, solids: 9.5 mass%)						
	-	-	-	-	-	-	-
	Foaming agent (C) (Asian ginseng extract, solids: 9.5 mass%)						
	-	-	-	-	-	-	0.02
	Malt flavor, hop flavor (D)						
	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	100	100	100	100	100	100	100
	Total						
	3.8	3.8	3.8	3.8	3.8	3.8	3.8
	Analysis values of product	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)					
2.0		2.0	2.0	2.0	2.0	2.0	2.0
0.085		0.140	0.042	0.0	0.0	0.0	0.0
0.425		0.700	0.210	0.000	0.000	0.000	0.000
25.0		25.0	25.0	25.0	25.0	25.0	25.0
Evaluation	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]						
	32	40	22	3	18	18	18
	Foam retention [time until foam disappears (sec)]						
	80	68	38	10	30	30	27
	Foam quality [fineness (creamy)]						
Foam quality [fineness (creamy)]							
Taste and flavor (richness)							
Taste and flavor (richness)							
Taste and flavor (beer-like odor)							
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2) Added in an amount for achieving pH 3.8

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

5) The roasted coffee bean extract obtained in Production Example 1.

[0083] Table 2 demonstrates that the chlorogenic acids are active ingredients for improving foam properties because if the roasted coffee bean extract containing the chlorogenic acids is blended therein, the same bubbling, foam retainability, and foam quality as those of 5-caffeoylquinic acid described in Table 1 are achieved.

[0084] Examples 8 to 14 and Comparative Examples 8 and 9

Beer flavored carbonated beverages were obtained in the same manner as in Example 6 except that, in Example 6, the roasted coffee bean extract was blended in the amounts shown in Table 3-1 and Table 3-2, and the foaming agents (C) were blended in the supernatant in amounts shown in Table 3-1 and Table 3-2. Table 3-1 and Table 3-2 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverages together with the results of Comparative Examples 1 to 4.

[0085] Examples 15 and 16 and Comparative Examples 10 and 11

Beer flavored carbonated beverages were obtained in the same manner as in Example 9 except that, in Example 9, the pH was adjusted to values shown in Table 3-1 and Table 3-2. Table 3-1 and Table 3-2 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverages together with the results of Comparative Examples 1 to 4.

[0086]

[Table 3-1]

		Example								
		8	9	10	11	12	13	14	15	16
Blend (mass%)	Roasted coffee bean extract ⁵⁾	1.65	1.88	2.83	3.10	1.88	1.88	1.88	1.88	1.88
	Foaming agent (C) (Quillaja extract, solids: 9.5 mass%)	0.02	0.02	0.02	0.02	0.01	-	-	0.02	0.02
	Foaming agent (C) (Yucca extract, solids: 9.5 mass%)	-	-	-	-	-	0.02	-	-	-
	Foaming agent (C) (Asian ginseng extract, solids: 9.5 mass%)	-	-	-	-	-	-	0.02	-	-
	Malt flavor, hop flavor (D)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Sugar (E)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	Amino acid (F)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Gluconic acid (G) ²⁾	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	Carbonated water (H) ³⁾	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	Total	100	100	100	100	100	100	100	100	100
Analysis values of product	pH (20°C) ⁴⁾	3.8	3.8	3.8	3.8	3.8	3.8	3.8	3.0	3.4
	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Chlorogenic acids (A) (mass%)	0.074	0.085	0.128	0.140	0.085	0.085	0.085	0.085	0.085
	Chlorogenic acids (A)/CO ₂ (B) (g/L) (NTP)	0.370	0.425	0.640	0.700	0.425	0.425	0.425	0.425	0.425
	Mass ratio [(A)/(C)] between chlorogenic acids (A) and solids of foaming agent (C)	38.95	44.74	67.37	73.68	89.47	44.74	44.74	44.74	44.74
	Dimethyl sulfide (DMS) (K) (μg/L)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Evaluati on	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]	32	38	45	45	34	35	34	34	36
	Foam retention [time until foam disappears (sec)]	100	120	100	95	100	110	105	100	110
	Foam quality [fineness (creamy)]	A	A	A	C	A	A	A	A	A
	Taste and flavor (richness)	A	A	B	B	C	A	A	C	B
	Taste and flavor (beer-like odor)	A	A	A	A	A	A	A	A	A

2) Added as a pH adjuster

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

5) The roasted coffee bean extract obtained in Production Example 1.

[0087]

[Table 3-2]

		Comparative Example							
		8	9	10	11	1	2	3	4
Blend (mass%)	Roasted coffee bean extract ⁵⁾	0.93	3.79	1.88	1.88	-	-	-	-
	Foaming agent (C) (Quillaja extract, solids: 9.5 mass%)	0.02	0.02	0.02	0.02	-	0.02	-	-
	Foaming agent (C) (Yucca extract, solids: 9.5 mass%)	-	-	-	-	-	-	0.02	-
	Foaming agent (C) (Asian ginseng extract, solids: 9.5 mass%)	-	-	-	-	-	-	-	0.02
	Malt flavor, hop flavor (D)	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	Sugar (E)	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55
	Amino acid (F)	0.008	0.008	0.008	0.008	0.008	0.008	0.008	0.008
	Gluconic acid (G) ²⁾	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	Carbonated water (H) ³⁾	Balance	Balance	Balance	Balance	Balance	Balance	Balance	Balance
	Total	100	100	100	100	100	100	100	100
Analysis values of product	pH (20°C) ⁴⁾	3.8	3.8	2.5	4.5	3.8	3.8	3.8	3.8
	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	Chlorogenic acids (A) (mass%)	0.042	0.171	0.085	0.085	0.0	0.0	0.0	0.0
	Chlorogenic acids (A)/CO ₂ (B) (g/L) (NTP)	0.210	0.855	0.425	0.425	0.000	0.000	0.000	0.000
	Mass ratio [(A)/(C)] between chlorogenic acids (A) and solids of foaming agent (C)	22.11	90.00	44.74	44.74	-	0.00	0.00	0.00
	Dimethyl sulfide (DMS) (K) (μg/L)	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Evaluation	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]	24	32	20	20	3	18	18	18
	Foam retention [time until foam disappears (sec)]	58	60	45	30	10	30	30	27
	Foam quality [fineness (creamy)]	C	D	B	B	E	E	D	D
	Taste and flavor (richness)	B	D	E	E	E	C	C	C
	Taste and flavor (beer-like odor)	A	A	A	A	A	A	A	A

2) Added as a pH adjuster

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

5) The roasted coffee bean extract obtained in Production Example 1.

[0088] Table 3-1 and Table 3-2 demonstrate that the foam retainability and foam quality were remarkably improved by blending the foaming agents together with the chlorogenic acids and carbon dioxide gas and adjusting the pH.

[0089] Examples 17 and 18

Gluconic acid (G) was added to the roasted coffee bean extract or 5-caffeoylquinic acid (A), and pH of the mixture was adjusted to 3.8. After that, the mixture was subjected to a heat sterilization at 108°C for 30 seconds, and was cooled, and carbonated water (H) was added thereto to prepare beverage solutions having the gas volumes shown in Table 4. 360 ml-volume aluminum cans were filled with 350 mL of the beverage solutions and seamed. Subsequently, the cans were subjected to a heat sterilization at 65°C for 50 minutes, and were cooled to 10°C or less, thereby obtaining each of carbonated beverages. Table 4 collectively shows analysis results and evaluation results for the resultant carbonated beverages.

[0090] Comparative Example 12

A carbonated beverage was obtained in the same manner as in Example 17 except that the roasted coffee bean extract was not blended. Table 4 collectively shows analysis results and evaluation results for the resultant carbonated beverage.

[0091] Comparative Example 13

A beer flavored carbonated beverage was obtained in the same manner as in Comparative Example 12 except that water (I) was blended instead of carbonated water (H). Table 4 collectively shows analysis

results and evaluation results for the resultant beer flavored carbonated beverage.

[0092]

[Table 4]

		Example		Comparative Example	
		17	18	12	13
Blend (mass%)	Roasted coffee bean extract ⁵⁾	1.88	-	-	-
	5-Caffeoylquinic acid ¹⁾ (A)	-	0.085	-	-
	Gluconic acid (G) ²⁾	Balance	Balance	Balance	Balance
	Carbonated water (H) ³⁾	Balance	Balance	Balance	-
	Water (I)	-	-	-	Balance
	Total	100	100	100	100
Analysis values of product	pH (20°C) ⁴⁾	3.8	3.8	3.8	3.8
	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)	2.0	2.0	2.0	0.0
	Chlorogenic acids (A) (mass%)	0.085	0.085	0.0	0.0
	Chlorogenic acids (A)/CO ₂ (B) (g/L) (NTP)	0.425	0.425	0.000	-
Evaluation	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]	30	30	5	3
	Foam retention [time until foam disappears (sec)]	76	72	3	3
	Foam quality [fineness (creamy)]	A	A	E	E

1) Reagent: manufactured by Tokyo Chemical Industry Co., Ltd.

2) Added in an amount for achieving pH 3.8

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

5) The roasted coffee bean extract obtained in Production Example 1.

[0093] Table 4 demonstrates that the chlorogenic acids can improve foam properties of carbonated water because if the chlorogenic acids with carbonated water were blended therein, the same bubbling, foam retainability, and foam quality as those of

the beer flavored carbonated beverages described in Table 1 are achieved.

[0094] Example 19

A beer flavored carbonated beverage was obtained in the same manner as in Example 8 except that, in Example 8, the raw coffee bean extract obtained in Production Example 3 was blended. Table 5 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverage together with the results of Example 8.

[0095] Example 20

A beer flavored carbonated beverage was obtained in the same manner as in Example 8 except that, in Example 8, the roasted coffee bean extract obtained in Production Example 2 was blended. Table 5 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverage together with the results of Example 8.

[0096]

[Table 5]

		Example		
		8	19	20
Blend (mass%)	Roasted coffee bean extract (roasting degree L30) ⁵⁾	1.65	-	-
	Roasted coffee bean extract (roasting degree L25) ⁶⁾		-	2.36
	Raw coffee bean extract ⁷⁾		0.59	-
	Foaming agent (C) (Quillaja extract)	0.02	0.02	0.02
	Malt flavor, hop flavor (D)	0.4	0.4	0.4
	Sugar (E)	0.55	0.55	0.55
	Amino acid (F)	0.008	0.008	0.008
	Gluconic acid (G) ²⁾	Balance	Balance	Balance
	Carbonated water (H) ³⁾	Balance	Balance	Balance
	Total	100	100	100
Analysis values of product	pH (20°C) ⁴⁾	3.8	3.8	3.8
	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)	2.0	2.0	2.0
	Chlorogenic acids (A) (mass%)	0.074	0.074	0.074
	Chlorogenic acids (A)/CO ₂ (B) (g/L) (NTP)	0.370	0.370	0.370
	Mass ratio [(A)/(C)] between chlorogenic acids (A) and solids of foaming agent (C)	38.95	38.95	38.95
	Dimethyl sulfide (DMS) (K) (μg/L)	25.0	25.0	25.0
Evaluation	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]	32	32	30
	Foam retention [time until foam disappears (sec)]	100	100	60
	Foam quality [fineness (creamy)]	A	A	C
	Taste and flavor (richness)	A	A	A
	Taste and flavor (beer-like flavor)	A	A	E

2) Added in an amount for achieving pH 3.8

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

5) The roasted coffee bean extract obtained in Production Example 1.

6) The roasted coffee bean extract obtained in Production Example 2.

7) The raw coffee bean extract obtained in Production Example 3.

[0097] Table 5 demonstrates that the bubbling, foam retainability, and foam quality can be improved even if the raw coffee bean extract or the roasted coffee bean extract having a higher roasting degree is used.

[0098] Examples 21 to 24

Beer flavored carbonated beverages were obtained in the same manner as in Example 8 except that, in Example 8, the amounts of the malt flavor and hop flavor (D) were changed to blend amounts shown in Table 6. Table 6 collectively shows analysis results and evaluation results for the resultant beer flavored carbonated beverages together with the results of Example 8.

[0099]

[Table 6]

		Example				
		8	21	22	23	24
Blend (mass%)	Roasted coffee bean extract ⁵⁾	1.65	1.65	1.65	1.65	1.65
	Foaming agent (C) (Quillaja extract)	0.02	0.02	0.02	0.02	0.02
	Malt flavor, hop flavor (D)	0.4	0.1	0.2	0.8	1.0
	Sugar (E)	0.55	0.55	0.55	0.55	0.55
	Amino acid (F)	0.008	0.008	0.008	0.008	0.0
	Gluconic acid (G) ²⁾	Balance	Balance	Balance	Balance	Balance
	Carbonated water (H) ³⁾	Balance	Balance	Balance	Balance	Balance
	Total	100	100	100	100	100
Analysis values of product	pH (20°C) ⁴⁾	3.8	3.8	3.8	3.8	3.8
	Gas volume [(v/v) (NTP)] of carbon dioxide gas (B)	2.0	2.0	2.0	2.0	2.0
	Chlorogenic acids (A) (mass%)	0.074	0.074	0.074	0.074	0.074
	Chlorogenic acids (A)/CO ₂ (B) (g/L) (NTP)	0.370	0.370	0.370	0.370	0.370
	Mass ratio [(A)/(C)] between chlorogenic acids (A) and solids of foaming agent (C)	38.95	38.95	38.95	38.95	38.95
	Dimethyl sulfide (DMS) (K) (μg/L)	25.0	6.3	12.5	50.0	62.5
Evaluation	Bubbling [the amount of foam layer when poured into a 100-mL graduated cylinder (mL)]	32	32	32	32	32
	Foam retention [time until foam disappears (sec)]	100	100	100	100	100
	Foam quality [fineness (creamy)]	A	A	A	A	A
	Taste and flavor (richness)	A	A	A	A	A
	Taste and flavor (beer-like flavor)	A	C	B	C	D

2) Added in an amount for achieving pH 3.8

3) Added in an amount for adjusting the gas volume of carbon dioxide gas to a predetermined value.

4) Measured after decarbonation.

5) The roasted coffee bean extract obtained in Production Example 1.

[0100] Table 6 demonstrates that the beer flavored carbonated beverage having a rich beer-like flavor can be obtained by controlling

the content of dimethyl sulfide to a specific range.

Claims

[Claim 1] A beer flavored carbonated beverage, comprising the following components (A) and (B):

(A) 0.05 to 0.15 mass% of chlorogenic acids; and

(B) 0.5 to 3.2 (v/v) (NTP) by volume of carbon dioxide gas, wherein the beer flavored carbonated beverage has a pH of from 2.8 to 4.2.

[Claim 2] The beer flavored carbonated beverage according to claim 1, further comprising from 3 to 65 $\mu\text{g/g}$ of dimethyl sulfide (K).

[Claim 3] The beer flavored carbonated beverage according to claim 1 or 2, wherein a ratio [(A)/(B)] between a mass of the component (A) and a volume of the component (B) is from 0.26 to 0.85 (g/L) (NTP).

[Claim 4] The beer flavored carbonated beverage according to any one of claims 1 to 3, wherein the chlorogenic acids comprise 5 mass% or more of 5-caffeoylquinic acid.

[Claim 5] The beer flavored carbonated beverage according to any one of claims 1 to 4, further comprising a foaming agent as a component (C).

[Claim 6] The beer flavored carbonated beverage according to claim

5, wherein the foaming agent (C) comprises a saponin.

[Claim 7] The beer flavored carbonated beverage according to claim 6, wherein the saponin comprises at least one selected from a Quillaja extract, a Yucca extract, and an Asian ginseng extract.

[Claim 8] The beer flavored carbonated beverage according to any one of claims 5 to 7, wherein a mass ratio [(A)/(C)] between the component (A) and solids of the component (C) is from 22.5 to 89.5.

[Claim 9] The beer flavored carbonated beverage according to any one of claims 1 to 8, which is a non-alcoholic beverage.

[Claim 10] The beer flavored carbonated beverage according to any one of claims 1 to 9, which is a packaged beverage.

[Claim 11] Use of chlorogenic acids for foam-improving in a foamable food and beverage.

[Claim 12] The use according to claim 11, wherein the foamable food and beverage comprises a carbonated beverage.

[Claim 13] The use according to claim 11 or 12, wherein the foam-improving comprises at least one selected from promotion of bubbling, promotion of foam retention, and improvement in foam

quality.

[Claim 14] The use according to any one of claims 11 to 13, wherein the foam-improving agent is used in combination with a foaming agent.

[Claim 15] The use according to claim 14, wherein the foaming agent comprises saponin.

[Claim 16] The use according to claim 15, wherein the saponin comprises at least one selected from a Quillaja extract, a Yucca extract, and an Asian ginseng extract.

[Claim 17] The use according to any one of claims 11 to 16, wherein an amount of the chlorogenic acids added to the foamable food and beverage is from 0.05 to 0.15 mass%.

[Claim 18] A foam-improving method for a foamable food and beverage, comprising adding chlorogenic acids to the foamable food and beverage.

INTERNATIONAL SEARCH REPORT

International application No
PCT/JP2013/085340

A. CLASSIFICATION OF SUBJECT MATTER INV. A23L2/54 A23L2/56 C12G3/02 C12G3/06 C12C12/04 A23L2/52 ADD. According to International Patent Classification (IPC) or to both national classification and IPC														
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A23L C12G C12C Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EP0-Internal, WPI Data, FSTA, BIOSIS														
C. DOCUMENTS CONSIDERED TO BE RELEVANT <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%;">Category*</th> <th style="width: 70%;">Citation of document, with indication, where appropriate, of the relevant passages</th> <th style="width: 20%;">Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>JP H11 75808 A (SAPPORO BREWERIES) 23 March 1999 (1999-03-23) cited in the application abstract -----</td> <td style="text-align: center; vertical-align: top;">1-10</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>US 2012/189750 A1 (CHIEN MINJIEN [US] ET AL) 26 July 2012 (2012-07-26) paragraphs [0001] - [0003], [0013] - [0017], [0031], [0032]; claims 1,2,4,5,21; examples 1,6-10 -----</td> <td style="text-align: center; vertical-align: top;">1-18</td> </tr> <tr> <td style="text-align: center; vertical-align: top;">X</td> <td>CN 1 570 063 A (KUNMING YINGZHIYUAN AGRICULTUR [CN]) 26 January 2005 (2005-01-26) abstract ----- -/--</td> <td style="text-align: center; vertical-align: top;">1-10</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	JP H11 75808 A (SAPPORO BREWERIES) 23 March 1999 (1999-03-23) cited in the application abstract -----	1-10	X	US 2012/189750 A1 (CHIEN MINJIEN [US] ET AL) 26 July 2012 (2012-07-26) paragraphs [0001] - [0003], [0013] - [0017], [0031], [0032]; claims 1,2,4,5,21; examples 1,6-10 -----	1-18	X	CN 1 570 063 A (KUNMING YINGZHIYUAN AGRICULTUR [CN]) 26 January 2005 (2005-01-26) abstract ----- -/--	1-10
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X	CN 1 570 063 A (KUNMING YINGZHIYUAN AGRICULTUR [CN]) 26 January 2005 (2005-01-26) abstract ----- -/--	1-10												
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Date of the actual completion of the international search 27 March 2014		Date of mailing of the international search report 08/04/2014												
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Tallgren, Antti												

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