

DESCRIPTION

TITLE OF INVENTION: CARBONATED BEVERAGE, AND METHOD FOR
ENHANCING SENSE OF CARBONATION OF BEVERAGE

5

TECHNICAL FIELD

[0001]

The present invention relates to a carbonated
beverage. The present invention also relates to, for
10 example, a method of enhancing fizzy sensation of a
carbonated beverage.

BACKGROUND ART

[0002]

15 Carbonated beverages are beverages that give a unique
fizzy sensation during drinking, which is not found in
other soft drinks. The fizzy sensation of carbonated
beverages is caused by, for example, a stimulation created
by effervescence, in the mouth or throat, of carbon dioxide
20 gas dissolved in the beverages. However, there are cases
where the fizzy sensation of carbonated beverage decreases
due to a decrease in carbon dioxide pressure, for example,
during sterilization or storage of the beverages or after
opening of the containers of the beverages. Thus, methods
25 of enhancing the fizzy sensation have been examined. For
example, Patent Literature 1 discloses a method of
enhancing the fizzy sensation using pungent substances such
as capsicum extract and pepper extract.

[0003]

30 R-3-hydroxybutyric acid is a type of short-chain
fatty acid and is produced as an energy source when glucose
in the body is depleted during carbohydrate restriction or
intense exercise, for example. It has been reported that
R-3-hydroxybutyric acid has various physiological functions
35 in addition to the action as an energy source. Patent

Literature 2 discloses a collagenase MMP1 and MMP3
production inhibitor containing R-3-hydroxybutyric acid as
an active ingredient. Patent Literature 3 discloses a
tropoelastin expression promoter containing R-3-
5 hydroxybutyric acid as an active ingredient.

CITATION LIST

- Patent Literature

[0004]

10 Patent Literature 1: JP 2010-068749 A

Patent Literature 2: JP 2018-158897 A

Patent Literature 3: JP 2018-158898 A

SUMMARY OF INVENTION

15 - Technical Problem

[0005]

The present invention aims to provide a carbonated
beverage with an enhanced fizzy sensation. The present
invention also aims to provide a method of enhancing fizzy
20 sensation of a carbonated beverage.

- Solution to Problem

[0006]

As a result of extensive studies to solve the above
25 problem, the present inventors found that the fizzy
sensation of carbonated beverages can be enhanced by adding
3-hydroxybutyric acid to the carbonated beverages.

[0007]

The present invention relates to, but is not limited
30 to, the following carbonated beverage and method of
enhancing fizzy sensation of a carbonated beverage, for
example.

(1) A carbonated beverage containing 3-hydroxybutyric
acid.

35 (2) The carbonated beverage according to (1) above,

wherein a 3-hydroxybutyric acid concentration is 0.01 to 4.0 g/100 mL.

(3) The carbonated beverage according to (1) or (2) above further containing a lower aliphatic alcohol.

5 (4) The carbonated beverage according to (3) above, wherein the lower aliphatic alcohol is at least one selected from the group consisting of ethanol, propylene glycol, 1-propanol, 2-propanol, 1-butanol, 2-butanol, 1-pentanol, 2-pentanol, 3-pentanol, and ethylene glycol.

10 (5) The carbonated beverage according to (3) or (4) above, wherein a lower aliphatic alcohol concentration is 0.1 to 1.2 v/v%.

(6) The carbonated beverage according to any one of (1) to (5) above further containing a sweetener.

15 (7) The carbonated beverage according to (6) above, wherein the sweetener is at least one selected from the group consisting of sucralose, acesulfame potassium, aspartame, sucrose, glucose, maltose, erythritol, xylitol, maltitol, trehalose, and stevia.

20 (8) The carbonated beverage according to (6) or (7) above, wherein a sweetener concentration in terms of sucrose is less than 20 g/100 mL.

(9) A method of enhancing fizzy sensation of a carbonated beverage, including adding 3-hydroxybutyric acid
25 to a carbonated beverage.

- Advantageous Effects of Invention
[0008]

The present invention can provide a carbonated
30 beverage with an enhanced fizzy sensation. The present invention can also provide a method of enhancing fizzy sensation of a carbonated beverage.

DESCRIPTION OF EMBODIMENTS

35 [0009]

The carbonated beverage of the present invention contains 3-hydroxybutyric acid (3HB).

Carbonated beverages are beverages containing carbon dioxide gas (carbon dioxide). The carbonated beverage of
5 the present invention contains carbon dioxide gas and further contains 3-hydroxybutyric acid. Preferred carbonated beverages are beverages into which carbon dioxide gas has been introduced under pressure. Any carbonated beverage, such as a non-alcoholic beverage, an
10 alcoholic beverage, etc., may be mentioned, but a non-alcoholic beverage is preferred. The term "non-alcoholic beverage" as used herein refers to a beverage having an ethanol concentration of 1.2 v/v% or less, preferably 1.0 v/v% or less, more preferably 0.5 v/v% or less. The
15 carbonated beverage of the present invention is not limited. Examples include carbonated water, carbonated beverages (e.g., cider, ramune, etc.) with the aroma and flavor of lemon, lemon lime, lime, orange, grapefruit, grape, etc., cola drinks, ginger ale, carbonated beverages
20 with fruit juice, and carbonated beverages with milk.
[0010]

In the present invention, the fizzy sensation of the carbonated beverage can be enhanced by the use of 3-hydroxybutyric acid. 3-Hydroxybutyric acid is a type of
25 short-chain fatty acid and is also referred to as " β -hydroxybutyric acid". In the present invention, the 3-hydroxybutyric acid may be in the R-form (R-3-hydroxybutyric acid), the S-form (S-3-hydroxybutyric acid), or a mixture of the R-form and the S-form. Preferably, the
30 3-hydroxybutyric acid is R-3-hydroxybutyric acid. The 3-hydroxybutyric acid may be derived from any source and produced by any method. It may be a chemically synthesized product or may be a product produced by a fermentation method or an enzymatic method. A commercial 3-
35 hydroxybutyric acid is available, and a commercial product

can also be used. The 3-hydroxybutyric acid may be added in the form of a salt thereof to a beverage. The salt is preferably one that can be used in food or beverages.

Preferred examples include metal salts such as sodium salt, potassium salt, magnesium salt, and calcium salt, and basic amino acid salts such as arginine salt.

[0011]

The term "fizzy sensation" as used herein refers to a stimulation (herein, sometimes also referred to as "carbonic acid stimulation") that is perceived as pressure or pain to the tongue from carbon dioxide bubbles during drinking of a carbonated beverage. When a carbonated beverage contains 3-hydroxybutyric acid, the carbonated beverage gives a stronger fizzy sensation than a carbonated beverage not containing 3-hydroxybutyric acid. The fizzy sensation of a beverage can be evaluated by a sensory test as described in Examples provided later.

[0012]

Preferably, the carbonated beverage of the present invention has a 3-hydroxybutyric acid concentration of 0.01 to 4.0 g/100 mL. When the 3-hydroxybutyric acid concentration in the carbonated beverage is in the above range, the fizzy sensation of the carbonated beverage can be effectively enhanced. In order to more effectively enhance the fizzy sensation of the carbonated beverage, the 3-hydroxybutyric acid concentration is more preferably 0.1 g/100 mL or more, still more preferably 0.5 g/100 mL or more, particularly preferably 1.0 g/100 mL or more. The 3-hydroxybutyric acid concentration is more preferably 3.0 g/100 mL or less, still more preferably 2.0 g/100 mL or less. In one embodiment, the upper limit of the 3-hydroxybutyric acid concentration is preferably in the above range in terms of aroma and flavor and the like of the beverage. In one embodiment, the 3-hydroxybutyric acid concentration in the carbonated beverage is more preferably

0.1 to 3.0 g/100 mL, still more preferably 0.5 to 2.0 g/100 mL, particularly preferably 1.0 to 2.0 g/100 mL. The 3-hydroxybutyric acid concentration can be measured by a high-performance liquid chromatography (HPLC) system (e.g.,
5 LC-10 series available from Shimadzu Corporation). The following measurement conditions and the like can be employed.

Column: SHIM-PACK SCR-102H (8 mm I.D. × 300 mm L)
(available from Shimadzu Corporation)

10 Mobile phase: mixture of water, p-toluenesulfonic acid, EDTA, and Bis-Tris

Flow rate: 0.8 mL/min

Column temperature: 40°C

Detection: electrical conductivity (with polarity set to
15 positive)

Analysis time: 30 minutes

[0013]

The carbon dioxide gas pressure of the carbonated beverage of the present invention is not limited, but the
20 gas pressure at 20°C is preferably 1.0 to 5.0 kgf/cm², more preferably 1.5 to 4.8 kgf/cm², still more preferably 2.0 to 4.5 kgf/cm². The carbon dioxide gas pressure of the carbonated beverage can be measured by a commercial gas pressure gauge (e.g., a gas volume meter GVA-500A available
25 from Kyoto Electronics Manufacturing Co., Ltd.). The carbon dioxide gas pressure can be measured at a liquid temperature of 20°C. The carbon dioxide gas pressure may be measured after the temperature of a sample is set to 20°C, the gas inside a container is released (snifted) in
30 the gas pressure gauge, and the container is shaken.

[0014]

Preferably, the carbonated beverage of the present invention contains a lower aliphatic alcohol. In the present invention, the term "lower aliphatic alcohol"
35 refers to any of lower aliphatic mono- to trihydric

alcohols, with a lower aliphatic monohydric alcohol or a lower aliphatic dihydric alcohol being preferred. When the carbonated beverage contains a lower aliphatic alcohol, the fizzy sensation is more effectively enhanced. These lower
5 aliphatic alcohols may be used alone or in combination of two or more. In one embodiment, the lower aliphatic alcohol may be added using additives such as flavoring or masking agents.

[0015]

10 The lower aliphatic alcohol is preferably a C2-C5 aliphatic alcohol, more preferably a C2-C3 aliphatic alcohol. Preferably, the lower aliphatic alcohol is, for example, at least one selected from the group consisting of ethanol, propylene glycol, 1-propanol, 2-propanol, 1-
15 butanol, 2-butanol, 1-pentanol, 2-pentanol, 3-pentanol, and ethylene glycol. Particularly in the present invention, at least one of ethanol or propylene glycol is more preferred.

[0016]

When the carbonated beverage contains a lower
20 aliphatic alcohol, the lower aliphatic alcohol concentration is preferably 0.001 v/v% or more, more preferably 0.01 v/v% or more, and is preferably 1.2 v/v% or less, more preferably 1.0 v/v% or less, still more preferably 0.5 v/v% or less. When the lower aliphatic
25 alcohol concentration is in the above ranges, the fizzy sensation can be further enhanced. In one embodiment, the lower aliphatic alcohol concentration in the carbonated beverage is preferably 0.001 to 1.2 v/v%, more preferably 0.01 to 1.0 v/v%, still more preferably 0.01 to 0.5 v/v%.
30 When the beverage contains two or more lower aliphatic alcohols, the lower aliphatic alcohol concentration is the total concentration thereof.

The lower aliphatic alcohol concentration can be measured by a method known to a skilled person. For
35 example, it can be measured by high performance liquid

chromatography (HPLC) or the like.

[0017]

The carbonated beverage of the present invention may contain a sweetener. One sweetener may be used alone, or
5 two or more sweeteners may be used in combination. The lower aliphatic alcohol described above is not included in the sweetener in the present invention. The presence of a sweetener in the carbonated beverage is preferred in terms of aroma and flavor of the beverage. At the same time, the
10 fizzy sensation tends to decrease when a sweetener is contained in the carbonated beverage, as compared to when no sweetener is contained. In the present invention, the fizzy sensation of a carbonated beverage containing a sweetener can be enhanced by the use of 3-hydroxybutyric
15 acid. In one embodiment, when a carbonated beverage contains a sweetener, preferably, the beverage contains a lower aliphatic alcohol.

[0018]

Examples of the sweetener include sucralose,
20 acesulfame potassium (acesulfame K), aspartame, sucrose, glucose, maltose, erythritol, xylitol, maltitol, trehalose, stevia (rebaudioside, stevioside), thaumatin, saccharin, sodium saccharin, licorice, monkfruit, neotame, mabinlin, brazzein, monellin, glycyrrhizin, alitame, cyclamate,
25 zultin, and neohesperidin. Preferably, the sweetener is at least one selected from the group consisting of sucralose, acesulfame potassium, aspartame, sucrose, glucose, maltose, erythritol, xylitol, maltitol, trehalose, and stevia. More preferably, the sweetener is at least one selected from the
30 group consisting of sucralose, acesulfame potassium, and stevia. Still more preferably, the sweetener is at least one of sucralose or acesulfame potassium.

[0019]

Preferably, the sweetener concentration in terms of
35 sucrose in the carbonated beverage is less than 20 g/100

mL. When the sweetener concentration in terms of sucrose in the carbonated beverage is less than 20 g/100 mL, the fizzy sensation can be effectively enhanced owing to the presence of the 3-hydroxybutyric acid. The sweetener concentration in terms of sucrose is preferably 3 to 15 g/100 mL, more preferably 5 to 14 g/100 mL. When the beverage contains two or more sweeteners, the sweetener concentration is the total concentration thereof.

The concentration in terms of sucrose is obtained by converting the sweetener concentration in the beverage into the sucrose concentration. The sweetener concentration in terms of sucrose is calculated using the sweetness level of the sweetener and the sweetness level of sucrose. The sweetness level is an index that indicates the sweetness of a beverage as determined based on the sweetness of 100 g of a beverage containing 1 g of sucrose, which is taken as 1. For example, in the case of sucralose, the concentration in terms of sucrose can be calculated by multiplying the sucralose concentration by "sweetness level (600) of sucralose/sweetness level (1) of sucrose". In the case of acesulfame potassium, the concentration in terms of sucrose can be determined by multiplying the acesulfame potassium concentration in a beverage by "sweetness level (200) of acesulfame potassium/sweetness level (1) of sucrose". The concentration in terms of sucrose can be similarly determined for other sweeteners such as aspartame (sweetness level 100), glucose (sweetness level 0.6), maltose (sweetness level 0.4), erythritol (sweetness level 0.8), xylitol (sweetness level 0.6), maltitol (sweetness level 0.8), trehalose (sweetness level 0.4), and stevia (sweetness level 100).

The sweetener concentration in the beverage can be measured by a high-performance liquid chromatography (HPLC) system or the like.

[0020]

The carbonated beverage of the present invention may contain, for example, various additives as in general beverages, as long as the effect of the present invention is not impaired. Examples of the additives include
5 flavoring or masking agents, vitamins, pigments, antioxidants, acidulants, emulsifiers, preservatives, seasonings, extracts, pH adjusters, and quality stabilizers. Food ingredients such as fruit juices, coffee extracts, tea leaf extracts, and milk ingredients may also
10 be added depending on the purpose. The carbonated beverage of the present invention contains water. The carbonated beverage of the present invention is a liquid composition usually containing water as a base. Preferably, the pH of the carbonated beverage of the present invention is 2.0 to
15 8.0 in terms of aroma and flavor of the beverage. The pH is measured at 25°C. The pH can be measured by a commercial pH meter.

[0021]

The carbonated beverage of the present invention may
20 contain, for example, one or more metal ions. Preferred metal ions are, for example, ions of metals such as Na, Ca, Mg, K, and the like. The metal ions may be added in the form of salts.

[0022]

25 In the present invention, the carbonated beverage may be in any form and can be provided as a beverage sealed in a container. In one embodiment, preferably, the beverage is a carbonated beverage sealed in a container. The container can be a known beverage container (examples
30 include metal containers such as cans, bottles (e.g., a glass bottle), retort pouches, plastic bottles, and cartons). Of these, plastic bottles, cans, and glass bottles are preferred, and plastic bottles are more preferred.

35 [0023]

The carbonated beverage of the present invention may or may not be heat sterilized but is preferably heat sterilized. When the carbonated beverage of the present invention is heat sterilized, any known method can be used
5 for the treatment.
[0024]

The carbonated beverage of the present invention may be produced by any method. For example, the above-described components are appropriately added, and the
10 beverage is mixed with carbon dioxide gas as necessary. The carbonated beverage of the present invention can also be produced by adding the above-described components such as 3-hydroxybutyric acid to a carbonated beverage. The beverage can be mixed with carbon dioxide gas by a method
15 commonly known to a person skilled in the art. For example, although not limited thereto, carbon dioxide may be dissolved in the beverage under pressure, or the beverage may be mixed with carbon dioxide in a tube using a mixer such as a carbonator. Alternatively, carbon dioxide
20 may be absorbed into a beverage by spraying the beverage into a tank filled with carbon dioxide, or the beverage may be mixed with carbonated water.
[0025]

When the carbonated beverage is provided as a
25 beverage sealed in a container, any method may be used to fill the container with the beverage, and the method can be selected according to the container and the like. For example, a method such as a hot pack filling method or an aseptic filling method can be employed. Filling conditions
30 can be appropriately set according to the container type and the like. The container is sealed after filling, whereby a beverage sealed in a container can be obtained. The filling with the beverage may be followed by a step of filling a headspace with nitrogen gas or carbon dioxide
35 gas. The filling the container with the carbonated

beverage may be followed by heat sterilization. The heat sterilization can be performed by a known method.

[0026]

The present invention also encompasses a method of enhancing fizzy sensation of a carbonated beverage, the method including adding 3-hydroxybutyric acid to a carbonated beverage. 3-Hydroxybutyric acid has an action to enhance the fizzy sensation of a carbonated beverage and can be used to enhance the fizzy sensation of a carbonated beverage. The present invention also encompasses a fizzy sensation enhancing agent containing 3-hydroxybutyric acid as an active ingredient; and use of 3-hydroxybutyric acid for enhancing fizzy sensation of a carbonated beverage.

A preferred 3-hydroxybutyric acid concentration range in a carbonated beverage is the same as the preferred 3-hydroxybutyric acid concentration range in the carbonated beverage of the present invention. In the method of enhancing fizzy sensation of a carbonated beverage, the lower aliphatic alcohol described above may be added to a carbonated beverage. A sweetener may be added to the carbonated beverage. The lower aliphatic alcohol, sweetener, preferred embodiments thereof, and the like are as described above for the carbonated beverage of the present invention.

[0027]

The numerical range defined by the lower limit and the upper limit herein, i.e., "the lower limit to the upper limit", includes the lower limit and the upper limit. For example, the range defined by "1 to 2" means 1 or more and 2 or less, with 1 and 2 being inclusive. Herein, the range may be any combination of any upper limit and any lower limit.

EXAMPLES

[0028]

The following provides Examples that more specifically describe the present invention. The present invention is not limited to these Examples.

[0029]

5 In Examples, R-hydroxybutyric acid (D-3-hydroxybutyric acid) (hereinafter described as "3HB") was used as the 3-hydroxybutyric acid. 3HB available from Osaka Gas Co., Ltd. was used.

[0030]

10 <Example 1>

 Commercial carbonated water (hereinafter described as "carbonated water A") was used as control. The carbonated water A was unsweetened carbonated water (gas pressure at 20°C: 4.0 kgf/cm²) with a lower aliphatic alcohol (e.g.,
15 ethanol) concentration of 0 v/v%.

 The carbonated water A was mixed with 3HB to obtain samples 1-1 to 1-3 shown in Table 1. Each of the resulting beverages had a colorless and transparent appearance. Table 1 shows the 3HB concentration in each sample.

20 [0031]

 The resulting samples were subjected to sensory evaluation of fizzy sensation by three fully trained panelists.

 In the sensory evaluation, the panelists drank the
25 samples cooled to 5°C and evaluated the fizzy sensation (refreshing stimulation sensation) during drinking. The fizzy sensation was evaluated for each sample with one to five points (five-point scale) based on the following criteria. Then, the scores given by the panelists were
30 averaged. As the reference points, the fizzy sensation of the control (carbonated water A) was given two points.

[0032]

 Criteria for evaluation of fizzy sensation
5 points: The fizzy sensation is significantly enhanced as
35 compared to the control.

4 points: The fizzy sensation is enhanced as compared to the control.

3 points: The fizzy sensation is slightly enhanced as compared to the control.

5 2 points: The fizzy sensation remains the same as compared to the control.

1 point: The fizzy sensation is decreased as compared to the control.

[0033]

10 Table 1 shows the sensory evaluation results (average scores). It was found that the fizzy sensation was enhanced by adding 3HB to the carbonated beverage.

[0034]

[Table 1]

	Control	Sample		
		1-1	1-2	1-3
3HB (g/100 mL)	0.0	0.3	1.0	3.0
Evaluation results (points)	2.0	2.7	4.3	4.7

15

[0035]

<Example 2>

The carbonated water A (same as the carbonated water A used in Example 1) was mixed with various components to obtain samples 2-1 to 2-8 (carbonated beverages) shown in Table 2. Specifically, the carbonated water A was mixed with 3HB to obtain the samples 2-1 and 2-2. The carbonated water A was mixed with a flavoring or masking agent, ethanol or propylene glycol, and 3HB to obtain the samples 2-3 to 2-5. The carbonated water A was mixed with acesulfame K, sucralose, and a flavoring or masking agent to obtain the sample 2-6. The carbonated water A was mixed with 3HB, acesulfame K, sucralose, and a flavoring or masking agent to obtain the samples 2-7 and 2-8.

30 Each of the resulting beverages had a colorless and

transparent appearance. Table 2 shows the concentration of each component in each sample.

[0036]

The above samples were prepared using the following components.

Acesulfame K: available from Celanese Production Germany GmbH & Co. KG

Sucralose: available from TATE & LYLE Sucralose LLC

Flavoring or masking agent: lemon flavor available from

Taiyo Corporation, containing 50 to 60 v/v% ethanol

Ethanol: available from Japan Alcohol Trading Co., Ltd.

Propylene glycol: available from FUJIFILM Wako Pure Chemical Corporation

[0037]

The resulting samples were subjected to sensory evaluation of fizzy sensation by two fully trained panelists. The sensory evaluation was performed as in Example 1.

Table 2 shows the sensory evaluation results (average scores).

[0038]

[Table 2]

	Control	Sample							
		2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8
3HB (g/100 mL)	0	0.6	1.2	1.2	1.2	1.2	0	1.2	1.8
Acesulfame K (mg/100 mL)	0	0	0	0	0	0	25	25	25
Sucralose (mg/100 mL)	0	0	0	0	0	0	15	15	15
Flavoring or masking agent (v/v%)	0	0	0	0.2	0	0	0.2	0.2	0.2
Ethanol (v/v%)	0	0	0	0	0.2	0	0	0	0
Propylene glycol (v/v%)	0	0	0	0	0	0.2	0	0	0
Evaluation results (points)	2.0	3.0	4.0	5.0	5.0	5.0	2.5	4.5	4.5

[0039]

In the samples 2-6 to 2-8, the acesulfame K concentration in terms of sucrose and the sucralose concentration in terms of sucrose are as described below.

5 Acesulfame K (sweetness level 200) concentration (g/100 mL) in terms of sucrose: $0.025 \times 200 = 5$

Sucralose (sweetness level 600) concentration (g/100 mL) in terms of sucrose: $0.015 \times 600 = 9$

10 In the samples 2-6 to 2-8, the sweetener (acesulfame K and sucralose) concentration in terms of sucrose was 14 g/100 mL.

[0040]

15 The fizzy sensation was enhanced by adding 3HB to the carbonated beverages (samples 2-1 and 2-2). It was found that the fizzy sensation was further enhanced by adding 3HB and a lower aliphatic alcohol to the carbonated beverages (samples 2-3 to 2-5 and 2-7 to 2-8). This shows that the 3-hydroxybutyric acid is useful in enhancing the fizzy sensation of the carbonated beverages.

CLAIMS

Claim 1. A carbonated beverage comprising:
3-hydroxybutyric acid.

5

Claim 2. The carbonated beverage according to claim
1,
wherein a 3-hydroxybutyric acid concentration is 0.01
to 4.0 g/100 mL.

10

Claim 3. The carbonated beverage according to claim 1
or 2 further comprising a lower aliphatic alcohol.

Claim 4. The carbonated beverage according to claim
15 3,

wherein the lower aliphatic alcohol is at least one
selected from the group consisting of ethanol, propylene
glycol, 1-propanol, 2-propanol, 1-butanol, 2-butanol, 1-
pentanol, 2-pentanol, 3-pentanol, and ethylene glycol.

20

Claim 5. The carbonated beverage according to claim
3,
wherein a lower aliphatic alcohol concentration is
0.1 to 1.2 v/v%.

25

Claim 6. The carbonated beverage according to claim 1
or 2 further comprising a sweetener.

Claim 7. The carbonated beverage according to claim
30 6,

wherein the sweetener is at least one selected from
the group consisting of sucralose, acesulfame potassium,
aspartame, sucrose, glucose, maltose, erythritol, xylitol,
maltitol, trehalose, and stevia.

35

Claim 8. The carbonated beverage according to claim
6,

wherein a sweetener concentration in terms of sucrose
is less than 20 g/100 mL.

5

Claim 9. A method of enhancing fizzy sensation of a
carbonated beverage, comprising:

adding 3-hydroxybutyric acid to a carbonated
beverage.