

DESCRIPTION

TITLE OF INVENTION: ORAL COMPOSITION

5 TECHNICAL FIELD

[0001]

The present invention relates to an oral composition.

BACKGROUND ART

10 [0002]

Mulberry is a plant that has been used in sericulture. According to a report, a component in mulberry leaves has an α -glucosidase inhibitory action. Health food containing mulberry leaves or a mulberry leaf extract has been commercially available. For example, Patent Literature 1 discloses use of a mulberry leaf extract and a mulberry leaf dried/ground product as an α -glucosidase inhibitor.

20 CITATION LIST

- Patent Literature

[0003]

Patent Literature 1: JP 2004-194635 A

25 SUMMARY OF INVENTION

- Technical Problem

[0004]

When the α -glucosidase activity is inhibited in the digestive tract, the breakdown of carbohydrates in food into glucose is suppressed, which can suppress an increase in blood sugar levels. Thus, continuous intake of a mulberry leaf extract is effective in, for example, preventing diabetes or ameliorating its symptoms. However, the mulberry leaf extract has an unpleasant grassy flavor, which may become an obstacle to continuous intake to obtain

an efficacy of the mulberry leaf extract.

[0005]

The present invention aims to provide an oral composition which contains a mulberry leaf extract but is
5 easy to ingest because an unpleasant flavor derived from the mulberry leaf extract is reduced.

- Solution to Problem

[0006]

10 As a result of extensive studies to solve the above problem, the present inventor found that when non-polymer catechins were added at a specific ratio to a mulberry leaf extract, an unpleasant grassy flavor derived from the mulberry leaf extract can be reduced and the bitterness is
15 also reduced, resulting in an oral composition that is easy to ingest continuously on a daily basis.

[0007]

Specifically, although not limited thereto, the present invention relates to the following oral
20 composition.

(1) An oral composition containing: a mulberry leaf extract; and at least one of non-polymer catechins, wherein a weight ratio of a non-polymer catechin content to a mulberry leaf extract content in terms of solid matter is
25 0.04 to 0.5.

(2) The oral composition according to (1) above, wherein the oral composition has a mulberry leaf extract content of 1 to 80 wt% in the solid matter.

(3) The oral composition according to (1) or (2)
30 above, wherein the oral composition has a non-polymer catechin content of 0.1 to 20 wt% in the solid matter.

(4) The oral composition according to any one of (1) to (3) above, wherein the non-polymer catechins are derived from tea leaves.

35 (5) The oral composition according to any one of (1)

to (4) above, wherein a part or all of the non-polymer catechins are added in the form of non-polymer catechin-containing tea leaves.

5 (6) The oral composition according to any one of (1) to (5) above, further containing at least one of fructo-oligosaccharide or dextrin.

(7) The oral composition according to any one of (1) to (6) above, wherein the oral composition is a beverage.

10 (8) The oral composition according to any one of (1) to (7) above, wherein the oral composition is a tea beverage.

(9) The oral composition according to any one of (1) to (8) above, wherein the oral composition is in granular or powder form.

15 (10) The oral composition according to any one of (1) to (9) above, wherein the oral composition is a granular beverage.

20 (11) The oral composition according to any one of (1) to (10) above for use in suppressing an increase in blood sugar levels.

(12) The oral composition according to any one of (1) to (11) above for use in suppressing an increase in blood sugar levels by inhibiting sugar absorption in small intestine.

25 (13) The oral composition according to any one of (1) to (12) above, wherein the oral composition is labeled with at least one function claim selected from the group consisting of "suppressing an increase in blood sugar levels after eating", "moderating an increase in blood sugar levels after eating", "slowing down an increase in blood sugar levels", "reducing absorption of sugar in meal", "for those who are concerned about blood sugar levels", "for those who are concerned about blood sugar levels after eating", and "reducing predisposition to an
35 increase in blood sugar levels".

- Advantageous Effects of Invention

[0008]

The present invention can provide an oral
5 composition, which contains a mulberry leaf extract but is
easy to ingest because an unpleasant flavor derived from
the mulberry leaf extract is reduced.

DESCRIPTION OF EMBODIMENTS

10 [0009]

The oral composition of the present invention
contains: a mulberry leaf extract; and at least one of non-
polymer catechins, wherein a weight ratio of a non-polymer
catechin content to a mulberry leaf extract content in
15 terms of solid matter is 0.04 to 0.5.

The oral composition is a composition for oral
ingestion.

[0010]

The oral composition of the present invention may be
20 in solid or liquid form. For example, when the oral
composition of the present invention is in solid form, it
is a solid at room temperature (25°C). When the oral
composition of the present invention is in solid form, the
form is not limited. The oral composition can be provided
25 in various forms such as powders (dispersants), granules,
capsules, tablets, pills, chewable tablets, and throat
lozenges. In one embodiment, the oral composition of the
present invention is preferably in granular, powder, or
liquid form, more preferably in granular or powder form.

30 [0011]

The mulberry leaf extract can be obtained by
extraction from mulberry leaves with a solvent. Mulberry
leaves are leaves of plants belonging to the genus *Morus* of
the family Moraceae. Plants commonly called mulberry
35 typically include *Morus bombycis*, *Morus alba*, *Morus Lhou*,

and the like. In the present invention, for example, mulberry leaf extracts of *Morus bombycis*, *Morus alba*, *Morus Lhou*, and the like can be used. Mulberry leaf extracts of other species can also be used. In the present invention, commercially available mulberry leaf extracts can be used. For example, mulberry leaf extracts are commercially available from Toyotama Healthy Food Co., Ltd., Nippon Funmatsu Yakuhin Co., Ltd., and the like.

[0012]

Examples of solvents (extraction solvent) for use in extraction of mulberry leaves include water and alcohols such as ethanol. One or more solvents can be used. A preferred extraction solvent is water, ethanol, or a mixture thereof. A preferred mulberry leaf extract is a hot water extract or a hydrous ethanol extract of mulberry leaves.

Mulberry leaves may be directly subjected to extraction or may be shredded or dried before being subjected to extraction. For example, raw mulberry leaves or dried mulberry leaves are shredded and subjected to extraction with hot water or hydrous ethanol for 15 minutes to 10 hours, followed by filtration, whereby a filtrate is obtained. Extraction may be performed statically or under appropriate stirring. The resulting filtrate (mulberry leaf extract liquid) may be directly used as a mulberry leaf extract, or may be concentrated or dried as needed. The mulberry leaf extract may be any of the following: an extract liquid of mulberry leaves extracted with a solvent; a concentrate thereof; or a dried product such as a powder obtained by concentrating and drying the extract liquid. When the oral composition of the present invention is in solid form, a dried product obtained by concentrating and drying an extract liquid of mulberry leaves extracted with a solvent is preferred.

[0013]

The oral composition of the present invention has a mulberry leaf extract content in terms of solid matter of the extract of preferably 1 to 80 wt%, more preferably 5 to 76 wt%, still more preferably 8 to 73 wt%, particularly
5 preferably 10 to 50 wt% in the solid matter of the composition of the present invention. The term "content in terms of solid matter" refers to the content converted into the amount excluding volatile substances such as moisture and solvents.

10 [0014]

In the present invention, the term "non-polymer catechins" is the generic term for catechin, gallocatechin, catechin gallate, gallocatechin gallate, epicatechin, epigallocatechin, epicatechin gallate, and epigallocatechin
15 gallate.

The oral composition of the present invention contains at least one of these eight non-polymer catechins. In the present invention, the non-polymer catechin content is the total amount of these eight non-polymer catechins.

20 The non-polymer catechin content can be measured by liquid chromatography mass spectrometry.

[0015]

The source and production method of non-polymer catechins are not limited, and any of those commonly used
25 for food or beverages can be used. Chemically synthesized non-polymer catechins may be used. Non-polymer catechins derived from plants such as tea leaves may also be used. In the present invention, non-polymer catechins can be added to the composition by using tea leaves containing
30 non-polymer catechins, a tea extract from such tea leaves, a purified product of such a tea extract, or the like.

[0016]

The term "tea leaves" refers to tea leaves of plants selected from those belonging to the genus *Camellia* (e.g.,
35 *Camellia sinensis* such as *C. sinensis* var. *sinensis*

(including Yabukita species) and *C. sinensis* var. *assamica*) and its hybrids.

Tea leaves can be classified into unfermented tea leaves, semi-fermented tea leaves, and fermented tea leaves depending on the processing method. One or more types of tea leaves can be used. Examples of the unfermented tea leaves include leaves of green teas such as Sencha, Bancha, powdered green tea (*Tencha*), refined green tea (*Gyokuro*), *Kabusecha*, *Kamairicha*, stem tea (*Kukicha*), twig tea (*Bocha*), and *Mecha*. Examples of the semi-fermented tea leaves include leaves of oolong teas such as *Tieguanyin* tea. Examples of the fermented tea leaves include leaves of black teas such as Darjeeling tea and Assam tea. Of these, use of green tea leaves or a green tea leaf extract (green tea extract) is preferred because the non-polymer catechin content is high. The green tea extract may be a green tea extract liquid or a green tea concentrate. One type may be used alone, or two or more types may be used in combination. Any green tea extract produced by an ordinary method may be used. Herein, the term "green tea extract liquid" refers to an extract which is obtained from green tea leaves with an extraction solvent (preferably, water) and which is not concentrated or purified. The green tea concentrate is a product whose non-polymer catechin concentration is increased by removing a portion of the solvent from the green tea extract liquid, for example. Any concentration method may be used. A commercially available green tea concentrate may be used.

Examples of the purified product of the tea extract include purified green tea, which is a purified product of a green tea extract. The purified green tea is a green tea extract liquid or a green tea concentrate that is purified to increase the purity of non-polymer catechins. The purified green tea may be a commercially available catechin preparation.

[0017]

The non-polymer catechins are preferably derived from tea leaves, and are more preferably derived from green tea leaves. The non-polymer catechins derived from tea leaves
5 may be added in the form of a plant extract containing non-polymer catechins (e.g., a tea extract) to the composition, or may be added in the form of tea leaves containing non-polymer catechins (preferably, green tea leaves) to the composition. The tea leaves can be added in powder form or
10 the like. In one embodiment, in the oral composition of the present invention, preferably, non-polymer catechins are added in the form of tea leaves containing non-polymer catechins. Non-polymer catechins to be added in the form of tea leaves may constitute a part or all of the non-
15 polymer catechins contained in the composition. In one embodiment, the non-polymer catechins contained in the oral composition of the present invention are preferably tea leaves (preferably, tea leaf powder) containing non-polymer catechins, more preferably green tea leaves (preferably,
20 green tea leaf powder). When the oral composition contains tea leaves (preferably, green tea leaf powder), the unpleasant flavor derived from the mulberry leaf extract can be further reduced. In addition, when the oral composition contains tea leaves, the increase in bitterness
25 derived from the non-polymer catechins can be reduced. This makes the flavor of the oral composition more suitable for ingestion.

[0018]

In the oral composition of the present invention, the
30 weight ratio of the non-polymer catechin content to the mulberry leaf extract content in terms of solid matter is 0.04 to 0.5. When the weight ratio of the non-polymer catechin content to the mulberry leaf extract content in terms of solid matter (non-polymer catechins/mulberry leaf
35 extract (in terms of solid matter)) is 0.04 or more, the

unpleasant grassy flavor derived from the mulberry leaf extract is reduced. While non-polymer catechins are effective in reducing the unpleasant flavor derived from the mulberry leaf extract, the bitterness tends to increase
5 as the non-polymer catechin content increases. When the weight ratio is 0.5 or less, the oral composition is easy to ingest because the bitterness derived from the non-polymer catechins is not too strong. In order to further reduce the grassy flavor derived from the mulberry leaf
10 extract, the weight ratio of the non-polymer catechin content to the mulberry leaf extract content in terms of solid matter is preferably 0.05 or more, more preferably 0.07 or more, and is preferably 0.4 or less, more preferably 0.3 or less. In one embodiment, the weight
15 ratio of the non-polymer catechin content to the mulberry leaf extract content in terms of solid matter is preferably 0.05 to 0.4, more preferably 0.07 to 0.3.

[0019]

Preferably, the oral composition of the present
20 invention has a non-polymer catechin content of 0.1 to 20 wt% in the solid matter. When the non-polymer catechin content is in the above range, a beverage with a good flavor can be obtained. The non-polymer catechin content is more preferably 1 wt% or more and is more preferably 17
25 wt% or less, still more preferably 15 wt% or less, particularly preferably 10 wt% or less in the solid matter. In one embodiment, preferably, tea leaves containing non-polymer catechins are added to the oral composition such that the oral composition has a non-polymer catechin
30 content in the above range. In one embodiment, the non-polymer catechin content is more preferably 0.1 to 17 wt%, still more preferably 1 to 15 wt%, particularly preferably 1 to 10 wt% in the solid matter.

[0020]

35 If desired, the oral composition of the present

invention can contain one or more additives including acidulants, sweeteners, excipients (e.g., starch, starch decomposition products such as dextrin, fructo-oligosaccharide, cellulose, and silicon dioxide), and
5 binders (e.g., hydroxypropyl methylcellulose, hydroxypropyl cellulose, gelatin, pregelatinized starch, polyvinylpyrrolidone, polyvinyl alcohol, pullulan, methyl cellulose, and hydrogenated oil). The types and amounts of additives can be selected according to the composition form
10 or the like.

In one embodiment, preferably, the oral composition of the present invention contains fructo-oligosaccharide and/or dextrin.

[0021]

15 When the oral composition of the present invention is in solid form such as powder or granular form, preferably, the oral composition contains an excipient. In one embodiment, the oral composition of the present invention can be used to suppress an increase in blood sugar levels
20 by inhibiting sugar absorption in the small intestine. For example, when the oral composition of the present invention is used to suppress an increase in blood sugar levels, preferably, the composition of the present invention does not contain a component that leads to an increase in blood
25 sugar levels. Preferred excipients that do not affect blood sugar levels include fructo-oligosaccharide and/or dextrin. Of these, fructo-oligosaccharide is more preferred because an aroma improving effect can be expected. When the oral composition of the present
30 invention is provided in a granular dosage form, fructo-oligosaccharide and/or dextrin, which also contributes as a binder to promote granule formation, can be suitably used also for ease of production.

[0022]

35 In one embodiment, more preferably, the oral

composition of the present invention contains fructo-oligosaccharide because it can impart an aroma with full-body (richness).

[0023]

5 When the oral composition of the present invention contains fructo-oligosaccharide and/or dextrin, the content is not limited as long as products can be produced. For example, the oral composition has a total fructo-oligosaccharide and dextrin content of preferably 5 to 60
10 wt%, more preferably 20 to 50 wt% in the solid matter. In one embodiment, when the oral composition is provided in granular form containing fructo-oligosaccharide, the oral composition has a fructo-oligosaccharide content of preferably 5 to 60 wt%, more preferably 20 to 50 wt% in the
15 solid matter.

[0024]

 Specific examples of the oral composition of the present invention include food or beverages including beverages (beverages in solid form, concentrated beverages,
20 ready-to-drink beverages, etc.) and general foods (e.g., confectionary such as snacks, biscuits, and rice crackers). The oral composition can also be provided as a health food (a nutritionally functional food, a food for specified health uses, a dietary supplement, a health supplement, a
25 supplement, etc.), a pharmaceutical product, or a quasi-pharmaceutical product. The oral composition is preferably a beverage because the effect of the present invention can be easily achieved. The beverage may be a liquid beverage or may be a beverage in solid form such as granular or
30 powder form (solid beverage). The beverage may be one used as a health food.

[0025]

 The beverage in solid form is diluted with a potable solvent such as water, whereby it is converted into a
35 liquid beverage for drinking. The beverage in solid form

can also be referred to as an "instant beverage". The beverage in solid form also encompasses granules and powders which are dissolved or suspended when in use for drinking. The beverage in solid form is preferably a granular beverage. The beverage in granular form is preferred because it is easily dispersible in a potable solvent. The beverage is more preferably a tea beverage. The tea beverage is a beverage containing tea leaves as ingredients. For example, a beverage containing one or more tea extracts, tea leaf powders (preferably, a green tea leaf powder), or the like is preferred.

The ready-to-drink beverage refers to a beverage to be drunk as is without dilution. The concentrated beverage refers to a beverage to be drunk as a beverage by being diluted with a potable solvent. Any drinkable liquid can be used as a potable solvent for diluting the beverage in solid form or the concentrated beverage. Examples of the potable solvent include water, carbonated water, milk, and soy milk. The liquid may have any temperature.

[0026]

When the oral composition of the present invention is a liquid beverage, the mulberry leaf extract concentration in terms of solid matter in the beverage is preferably 0.04 to 1 wt%, more preferably 0.1 to 0.5 wt%, in order to reduce the flavor derived from the mulberry leaf extract. When the oral composition of the present invention is a beverage in solid form or a concentrated beverage, preferably, the mulberry leaf extract concentration in terms of solid matter is in the above preferred range when the beverage is diluted with a potable solvent such as water to a concentration for drinking.

[0027]

When the oral composition of the present invention is a beverage in solid form, an individually packaged beverage (e.g., a stick-type beverage) is preferred. The volume of

each individual package can be suitably set (e.g., 0.5 to 10 g). One to several individual packages can be used by being dispersed or dissolved in an appropriate amount (e.g., 50 ml to 500 ml) of a potable solvent. The individual packages can be made of a known packaging material. For example, a packaging material made of an aluminum vapor-deposited film or the like can be used to package the oral composition of the present invention.

[0028]

10 The oral composition of the present invention may be produced by any method. For example, a mulberry leaf extract is mixed with one or more non-polymer catechins and/or a tea leaf powder containing the same, as well as other optional components, and the weight ratio of the non-
15 polymer catechin content to the mulberry leaf extract content in terms of solid matter (non-polymer catechins/mulberry leaf extract (in terms of solid matter)) is adjusted, whereby the oral composition can be produced. The order of mixing the components is not limited. Any
20 mixing method may be used, and a known mixing device can be used. The oral composition can be provided as a granular product by a known granulation method. Any granulation method may be used. For example, spray granulation, fluidized bed granulation, compression granulation, rolling
25 granulation, stirring granulation, extrusion granulation, or powder coating granulation can be used. Granulation conditions can be suitably selected according to the granulation method.

[0029]

30 A mulberry leaf extract has an action that suppresses an increase in blood sugar levels, and is useful, for example, for preventing or reducing postprandial hyperglycemia. The oral composition of the present invention can be used to suppress an increase in blood
35 sugar levels because it contains a mulberry leaf extract.

The oral composition of the present invention may be an oral composition for suppressing an increase in blood sugar levels, or an oral composition for suppressing an increase in blood sugar levels after eating. The oral composition
5 of the present invention may be a composition for suppressing an increase in blood sugar levels, the composition containing a mulberry leaf-derived iminosugar (at least one selected from the group consisting of 1-deoxynojirimycin, 2-O- α -D-galactopyranosyl-1-
10 deoxynojirimycin, and fagomin, preferably, three of these) as an active ingredient. In one embodiment, the oral composition of the present invention is suitably used to suppress an increase in blood sugar levels by inhibiting sugar absorption in the small intestine. The mulberry
15 leaf-derived iminosugar is considered to be correlated with the grassy smell of mulberry leaves.

[0030]

When the oral composition of the present invention is used to inhibit sugar absorption in the small intestine,
20 preferably, the oral composition is provided in granular form which is a dosage form that is easily dispersed in a liquid and thus quickly reaches the upper part of the small intestine. Also when the oral composition of the present invention is used as a beverage in solid form, it is
25 particularly preferred to provide the oral composition in granular form (a granular beverage) having excellent dispersibility in water.

[0031]

The intake of the oral composition of the present
30 invention is not limited. For example, in order for a human (adult) to obtain an effect of suppressing an increase in blood sugar levels, preferably, the mulberry leaf extract is ingested in an amount that provides the effect (effective amount). It has been confirmed that
35 ingestion of a mulberry leaf-derived iminosugar in an

amount of 2.42 mg per day provides the effect of suppressing an increase in blood sugar levels after eating (Japanese Pharmacology & Therapeutics; 48:859-865. (2020)). In one embodiment, ingestion of the oral composition in an amount corresponding to the mulberry leaf-derived iminosugar intake of 2.42 mg or more is preferred for an adult per day. In one embodiment, preferably, the oral composition of the present invention contains a mulberry leaf extract in an amount corresponding to the mulberry leaf-derived iminosugar content of 2.42 mg or more per human (adult) daily intake. The intake of mulberry leaf-derived iminosugar and the content thereof are each the total mulberry leaf-derived iminosugar content. The composition for suppressing an increase in blood sugar levels of the present invention may be ingested at any timing. Yet, the oral composition is preferably ingested before or during eating in order to obtain the effect of suppressing an increase in blood sugar levels. In one embodiment, when the oral composition of the present invention is in granular form, preferably, the oral composition is ingested at the above timing. For example, when the oral composition in granular form is dissolved or dispersed in water for ingestion, the components of the composition quickly reach the upper part of the small intestine. Thus, a high effect of suppressing an increase in blood sugar levels can be expected from ingestion of the oral composition in granular form at the above timing.

The oral composition of the present invention may be ingested by any subject, preferably a human, more preferably a human needing or wanting to suppress an increase in blood sugar levels.

[0032]

The oral composition of the present invention may be labeled with function claims based on the action that suppresses an increase in blood sugar levels. For example,

the oral composition of the present invention may be labeled with at least one function claim selected from the group consisting of "suppressing an increase in blood sugar levels after eating", "moderating an increase in blood sugar levels after eating ", "slowing down an increase in blood sugar levels", "reducing absorption of sugar in meal", "for those who are concerned about blood sugar levels", "for those who are concerned about blood sugar levels after eating", and "reducing predisposition to an increase in blood sugar levels".

The above labels may be ones indicating use of the composition for obtaining the above functions.

[0033]

For the sake of clarity, any numerical range expressed herein by a lower limit and an upper limit, i.e., "a lower limit to an upper limit" includes the lower limit and the upper limit. For example, a range expressed 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.

All academic literature and patent literature cited herein are incorporated herein by reference.

EXAMPLES

[0034]

Examples that more specifically describe the present invention are given below. The present invention is not limited to these examples.

[0035]

A mulberry leaf extract powder used below consists of granules having a mulberry leaf extract content (content in the solid matter) of 80 wt% (Toyotama Healthy Food Co., Ltd.). A catechin preparation used below is a preparation having an epigallocatechin gallate content of 94.0 wt% or more (Taiyo Kagaku Co., Ltd.).

[0036]

<Example 1>

A mulberry leaf extract powder (300 mg) and a catechin preparation were mixed to obtain a composition in powder form. The catechin preparation was used in an amount that provides an amount of non-polymer catechins (epigallocatechin gallate in Example 1) shown in Table 1. The resulting composition was mixed with water (100 g), whereby samples 1 to 4 were prepared.

The numerical value in a parenthesis after each amount of the mulberry leaf extract powder in Table 1 is the amount of the mulberry leaf extract in terms of solid matter, which was added as the mulberry leaf extract powder. Table 1 also shows the weight ratio of the non-polymer catechin content to the mulberry leaf extract content in terms of solid matter (non-polymer catechins/mulberry leaf extract (in terms of solid matter)) in each sample. Control A was prepared by mixing the mulberry leaf extract powder and water in amounts shown in Table 1.

[0037]

[Table 1]

		Control A	Sample 1	Sample 2	Sample 3	Sample 4
Amount	Mulberry leaf extract powder (mulberry leaf extract) (mg)	300 (240)	300 (240)	300 (240)	300 (240)	300 (240)
	Non-polymer catechins (mg)	0	15	30	60	150
	Water (g)	100	100	100	100	100
Non-polymer catechins/mulberry leaf extract (in terms of solid matter)		0	0.0625	0.125	0.25	0.625

[0038]

The flavor (grassy smell) and the bitterness derived from the mulberry leaf extract of each of samples 1 to 4 were subjected to sensory evaluation by four panelists who were experts in sensory evaluation. In the sensory evaluation, each panelist placed a sample in the mouth,

swallowed the sample, and then evaluated the intensity of the grassy smell derived from the mulberry leaf extract. The intensity of the bitterness was also evaluated at the same time. When evaluating a different sample, each
5 panelist rinsed the mouth with water until the taste in the mouth disappeared. The samples shown in Table 1 were evaluated in terms of the intensity of the grassy smell and the bitterness derived from the mulberry leaf extract at the following four levels. Then, the scores given by the
10 panelists were averaged.

[0039]

Criteria for grassy smell derived from mulberry leaves

1 point: Perceived

2 points: Moderately perceived

15 3 points: Only slightly perceived

4 points: Not perceived at all

[0040]

Criteria for bitterness

1 point: Perceived

20 2 points: Moderately perceived

3 points: Only slightly perceived

4 points: Not perceived at all

[0041]

A catechin preparation was mixed with water to
25 prepare a solution having an epigallocatechin gallate concentration of 150 mg/100 mL, whereby control B was obtained. Reference points of grassy smell evaluation were set as follows: 1 point for the intensity of grassy smell of control A; and 4 points for the intensity of the grassy
30 smell of water (water containing no mulberry leaf extract and no non-polymer catechins). Reference points of bitterness evaluation were set as follows: 4 points for the intensity of the bitterness of water (water containing no mulberry leaf extract and no non-polymer catechins); and 1
35 point for the intensity of the bitterness of control B

(epigallocatechin gallate aqueous solution containing no mulberry leaf extract).

[0042]

Table 2 shows the average scores of the grassy smell and bitterness.

[0043]

[Table 2]

		Control A	Sample 1	Sample 2	Sample 3	Sample 4	Control B
Non-polymer catechins/mulberry leaf extract (in terms of solid matter)		0	0.0625	0.125	0.25	0.625	-
Evaluation (score)	Grassy smell	1.0	1.8	2.3	3.0	4.0	4.0
	Bitterness	4.0	3.3	2.5	2.0	1.0	1.0

[0044]

The grassy smell derived from the mulberry leaf extract was not perceived in sample 4. However, in sample 4, the bitterness derived from non-polymer catechins was strongly perceived. The grassy smell derived from the mulberry leaf extract was reduced in samples 1 to 3 as compared to control A. The bitterness was also not too strong, and the flavor was suitable for ingestion. In sample 3, both the grassy smell and the bitterness derived from the mulberry leaf extract were reduced, resulting in a favor particularly suitable for ingestion.

[0045]

<Example 2>

A mulberry leaf extract powder and a tea leaf powder were mixed in amounts according to Table 3. The resulting composition in powder form was mixed with water (100 g), whereby samples 5 to 10 were prepared. The tea leaf powder used was commercially available matcha having a non-polymer catechin content of 10 wt%.

The non-polymer catechin content of each sample was determined from the non-polymer catechin content of tea leaf powder. Table 3 shows the following values of each

sample: the mulberry leaf extract content in terms of solid matter (mg), the non-polymer catechin content (mg), and the weight ratio of the non-polymer catechin content to the mulberry leaf extract content in terms of solid matter (non-polymer catechins/mulberry leaf extract (in terms of solid matter)).

[0046]

[Table 3]

		Sample 5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10
Amount	Mulberry leaf extract powder (mg)	300	300	300	300	300	300
	Tea leaf powder (mg)	150	300	600	900	1200	1500
	Water (g)	100	100	100	100	100	100
Content (mg)	Mulberry leaf extract (in terms of solid matter)	240	240	240	240	240	240
	Non-polymer catechins	15	30	60	90	120	150
Content of solid matter (wt%)	Mulberry leaf extract	53.33	40.00	26.67	20.00	16.00	13.33
	Non-polymer catechins	3.33	5.00	6.67	7.50	8.00	8.33
Non-polymer catechins/mulberry leaf extract (in terms of solid matter)		0.0625	0.125	0.25	0.375	0.5	0.625

10 [0047]

The grassy smell and the bitterness of samples 5 to 10 were evaluated based on the same criteria used for the sensory evaluation in Example 1. The grassy smell derived from the mulberry leaf extract was more reduced in samples 5 to 7 than in control A of Example 1. No bitterness was perceived in samples 5 to 8.

15 The grassy smell derived from the mulberry leaf extract was not perceived at all in samples 8 to 10. The bitterness was moderately perceived in sample 9. The bitterness was perceived in sample 10.

[0048]

<Example 3>

Tea beverages in granular form each having a different weight ratio of the non-polymer catechin content to the mulberry leaf extract content in the solid matter (non-polymer catechins/mulberry leaf extract (in terms of

25

solid matter)) were prepared according to the formulations shown in Table 4 (Production Examples 1 to 5).

The tea leaf powder (matcha) used was commercially available matcha having a non-polymer catechin content of 9.6 wt%. Commercially available fructo-oligosaccharide, dextrin, and crystalline cellulose were used.

[0049]

[Table 4]

	Component name	Production Example 1	Production Example 2	Production Example 3	Production Example 4	Production Example 5
Mixing ratio (wt%)	Mulberry leaf extract powder	25.0	25.0	25.0	15.0	12.0
	Tea leaf powder	9.0	10.5	15.0	40.0	50.0
	Fructo-oligosaccharide	30.0	60.0	45.0	30.0	5.0
	Dextrin	30.0	0.0	0.0	0.0	0.0
	Crystalline cellulose	6.0	4.5	15.0	15.0	33.0
	Total	100.0	100.0	100.0	100.0	100.0
Content in solid matter (wt%)	Mulberry leaf extract	20.0	20.0	20.0	12.0	9.6
	Non-polymer catechins	0.86	1.01	1.4	3.8	4.8
Non-polymer catechins/mulberry leaf extract (in terms of solid matter)		0.043	0.050	0.072	0.32	0.5

[0050]

A mixed powder (about 300 g) containing components at a mixing ratio shown in Table 4 was granulated by a fluidized bed granulation machine. The mixed powder was fed into the machine and mixed for five minutes. Subsequently, water was sprayed at a rate of 1 to 2 g/min for 10 to 30 minutes for granulation (product temperature: 24°C to 30°C; intake air temperature: 30°C to 40°C), followed by drying for 5 to 10 minutes in the same machine, whereby a granular product (granules) was obtained. The resulting granular product was divided into aliquots of 2 g in individual stick packs, whereby an individually packaged

granular tea beverages were obtained. Each granular tea beverage had a good production suitability in terms of granulation properties and filling properties.

5 The granular tea beverage in a single stick pack was dispersed in water (150 mL), whereby a tea beverage was obtained. Each tea beverage had a good dispersibility in water.

10 The resulting tea beverage was evaluated based on the same criteria used for the sensory evaluation in Example 1. None of these tea beverages had an unpleasant grassy smell derived from the mulberry leaves, and no bitterness was perceived from the non-polymer catechins. These tea beverages were confirmed as tea beverages with a good aroma and also as oral compositions that are easy to ingest
15 continuously on a daily basis. In the tea beverages obtained in Production Examples 2 to 4, a full-body (richness) taste was perceived, with a particularly good aroma.
[0051]

20 In EXAMPLES, the non-polymer catechin content was measured by the following method. The solvent used was a solvent for LC-MS.

(Method of measuring non-polymer catechins)

(Preparation of measurement samples)

25 A 50% methanol aqueous solution (1 mL) was added to a test sample (1 mg). Then, ultrasonication (20 minutes) was performed. The test sample was taken out once during ultrasonication and stirred in a vortex mixer. Subsequently, the supernatant was separated from the
30 residue by centrifugation (8500 rpm, 1 min). The supernatant was taken and diluted 10-fold with a 50% methanol aqueous solution. The diluted solution was filtered through a 0.45- μ m filter, whereby a measurement sample was obtained.

35 The measurement sample was analyzed by liquid

chromatography mass spectrometry (LC-MS) under the following conditions.

[0052]

(LC-MS analysis conditions)

5 LC-MS device: device name: LCMS-8050, available from Shimadzu Corporation

(LC analysis conditions)

Column: Capcell Pak C18 type AQ 4.6 mm I.D. × 150 mm (Osaka Soda Co., Ltd.)

10 Mobile phase

Solvent A: 0.1% formic acid in aqueous solution

Solvent B: 0.1% formic acid in acetonitrile solution

Gradient conditions (concentration of solvent B):

0 min: 5 vol%

15 10 min: 5 vol%

40 min: 70 vol%

40.01 min: 100 vol%

50 min: 100 vol%

50.01 min: 5 vol%

20 60 min: 5 vol%

Pressure:

Solvent A: 5.6 MPa

Solvent B: 5.7 MPa

Column temperature: 40°C

25 Flow rate: 0.5 mL/min

Injection volume: 1 µL

[0053]

(MS analysis conditions)

Ionization method: ESI

30 Nebulizer gas flow rate: 3 L/min

Heating gas flow rate: 10 L/min

Interface temperature: 300°C

DL temperature: 250°C

Heat block temperature: 400°C

35 Drying gas flow rate: 10 L/min

Quantitative ion: catechin [M-H]⁻ (m/z 289.00 > 245.05),
epicatechin [M-H]⁻ (m/z 289.00 > 245.10), gallocatechin [M-
H]⁻ (m/z 305.00 > 125.05), epigallocatechin [M-H]⁻ (m/z
305.00 > 125.00), catechin gallate [M-H]⁻ (m/z 441.00 >
5 169.10), epicatechin gallate [M-H]⁻ (m/z 441.00 > 169.05),
gallocatechin gallate [M-H]⁻ (m/z 457.00 > 169.05),
epigallocatechin gallate [M-H]⁻ (m/z 457.00 > 169.10)
[0054]

The total amount of catechin, gallocatechin, catechin
10 gallate, gallocatechin gallate, epicatechin,
epigallocatechin, epicatechin gallate, and epigallocatechin
gallate was determined as the non-polymer catechin content.

CLAIMS

Claim 1. An oral composition comprising:
a mulberry leaf extract; and
5 at least one of non-polymer catechins,
wherein a weight ratio of a non-polymer catechin
content to a mulberry leaf extract content in terms of
solid matter is 0.04 to 0.5.

10 Claim 2. The oral composition according to claim 1,
wherein the oral composition has a mulberry leaf
extract content of 1 to 80 wt% in the solid matter.

Claim 3. The oral composition according to claim 1 or
15 2,
wherein the oral composition has a non-polymer
catechin content of 0.1 to 20 wt% in the solid matter.

Claim 4. The oral composition according to claim 1 or
20 2,
wherein the non-polymer catechins are derived from
tea leaves.

Claim 5. The oral composition according to claim 1 or
25 2,
wherein a part or all of the non-polymer catechins
are added in the form of non-polymer catechin-containing
tea leaves.

30 Claim 6. The oral composition according to claim 1 or
2, further containing at least one of fructo-
oligosaccharide or dextrin.

Claim 7. The oral composition according to claim 1 or
35 2,

wherein the oral composition is a beverage.

Claim 8. The oral composition according claim 1 or 2,
wherein the oral composition is a tea beverage.

5

Claim 9. The oral composition according to claim 1 or
2,
wherein the oral composition is in granular or powder
form.

10

Claim 10. The oral composition according to claim 1
or 2,
wherein the oral composition is a granular beverage.

15

Claim 11. The oral composition according to claim 1
or 2 for use in suppressing an increase in blood sugar
levels.

20

Claim 12. The oral composition according to claim 1
or 2 for use in suppressing an increase in blood sugar
levels by inhibiting sugar absorption in small intestine.

25

Claim 13. The oral composition according to claim 1
or 2,
wherein the oral composition is labeled with at least
one function claim selected from the group consisting of
"suppressing an increase in blood sugar levels after
eating", "moderating an increase in blood sugar levels
after eating", "slowing down an increase in blood sugar
levels", "reducing absorption of sugar in meal", "for those
30 who are concerned about blood sugar levels", "for those who
are concerned about blood sugar levels after eating", and
"reducing predisposition to an increase in blood sugar
levels".