

COMPOSITIONS COMPRISING HONEY TRUFFLE PROTEIN

TECHNICAL FIELD

The present disclosure relates to compositions and methods, which use sweet proteins
5 derived from honey truffle in combination with sweetness modifiers or positive allosteric
modulators, in flavor compositions and consumables, to improve the taste quality and/or the
mouthfeel of sweet-tasting substances.

BACKGROUND

10 Compounds for modifying the taste of consumable products, that is, products taken orally
either for ingestion or spitting out, such as foodstuffs, beverages, confectionery, oral care
products and the like are widely used. They do not themselves add flavor to the consumable, but
they provide desirable ancillary benefits, such as enhanced mouthfeel and/or sweetness, or
masking undesirable characteristics of other ingredients, such as the distinctive tastes and textures
15 perceived as unappealing of products containing sugar replacers.

In the case of sugar replacers, the tastes they impart can present different temporal
profiles, flavor-profiles or adaptation behaviors compared with the sugars which they replace, in
whole or in part. For example, the sweet taste of natural and synthetic high-intensity sweeteners
(HIS), is generally slower in onset and longer in duration than the sweet taste produced by sugar
20 (sweet, short-chain, soluble carbohydrates, including glucose, fructose, sucrose, maltose and
lactose) or high fructose corn syrups (HFCS) which is known as a replacement for sugar, and this
can change the taste balance of an edible composition containing them. This can create
unbalanced temporal taste profiles. In addition to the difference in temporal profile, high-intensity
sweeteners generally exhibit a lower maximal response than sugar; off-tastes including bitter,
25 metallic, cooling, astringent, licorice-like taste and/or sweetness, which diminishes on iterative
tasting.

However, all high-intensity sweeteners have undesirable after-taste in the form of off-
notes, such as liquorice-like after-taste, and/or lingering sweetness. In the particular case of Reb
A, this takes the form of a combination of an undesirable lingering sweetness and a liquorice-like
30 after-taste. This after-taste detracts from the desired sugar-like sweetness, and thus effectively
masking undesirable tastes or off-tastes in edible compositions is key to consumer acceptance of
many edible compositions.

Accordingly, there remains a need to provide flavor compositions in order to improve the
taste quality and/or the mouthfeel of sweet-tasting substances.

SUMMARY

In one illustrative embodiment, a flavor composition comprises honey truffle protein and at least one sweetness modifier selected from the group consisting of steviol glycosides, mogrosides, dihydrochalcones and combinations thereof.

5 In another illustrative embodiment, a consumable comprises at least one sweetener; and a flavor composition including honey truffle protein; and at least one sweetness modifier selected from the group consisting of steviol glycosides, mogrosides, dihydrochalcones and combinations thereof. The at least one sweetener is present in a sweetening amount.

10 In another illustrative embodiment, a flavor composition comprises honey truffle protein and a positive allosteric modulator.

In another illustrative embodiment, a consumable comprises at least one sweetener; and a flavor composition including honey truffle protein and a positive allosteric modulator.

15 In yet another illustrative embodiment, a method is disclosed for imparting a more sugar-like temporal profile, flavor profile and/or taste profile to a consumable by adding the flavor compositions disclosed herein to the consumable, thereby providing a consumable having a more sugar-like temporal profile, flavor profile and/or taste profile.

In another embodiment, the more sugar-like temporal profile is a reduced sweetness linger, as compared to a consumable to which the flavor composition disclosed herein had not been added.

20 In a further embodiment, the more sugar-like flavor profile is an improved mouthfeel (for example, increased body or fullness), as compared to a consumable to which the flavor composition disclosed herein had not been added.

In yet another illustrative embodiment, a consumable is provided. The consumable includes at least one sweetener and a flavor composition according to the present disclosure comprising brazzein. The at least one sweetener is present in a sweetening amount.

25 Certain embodiments of any aspect of the present disclosure may provide one or more of the following advantages:

- increased sweetness in a composition;
- enhanced sweetness in a composition including at least one sweetener;
- 30 - decrease in the amount of caloric sweetener required to obtain desired sweetness;
- improvement of one or more sweetness characteristics to make sweet taste more similar to sugar (sucrose);
- weakening of lingering sweetness (e.g., decreasing the length of time the sweet taste remains and/or decreasing the intensity of the sweet taste more rapidly);

- weakening of bitter taste and/or liquorice taste and/or metallic taste;
- weakening of the sensory perceptions of dryness and/or astringent mouthfeel;
- improvement in sweetness impact (e.g., increasing the maximum intensity of the sweet taste and/or decreasing the length of time for the sweet taste to be detected) (e.g.,
5 decreasing the lingering sweetness).

These and other features, aspects and advantages of specific embodiments will become evident to those skilled in the art from a reading of the present disclosure.

DETAILED DESCRIPTION

10 The following text sets forth a broad description of numerous different embodiments of the present disclosure. The description is to be construed as exemplary only and does not describe every possible embodiment since describing every possible embodiment would be impractical, if not impossible. It will be understood that any feature, characteristic, component, composition, ingredient, product, step or methodology described herein can be deleted, combined
15 with or substituted for, in whole or part, any other feature, characteristic, component, composition, ingredient, product, step or methodology described herein. Numerous alternative embodiments could be implemented, using either current technology or technology developed after the filing date of this patent, which would still fall within the scope of the claims. All publications and patents cited herein are incorporated herein by reference.

20 The present disclosure relates to the surprising finding that flavor compositions including honey truffle protein in combination with sweetness modifiers and/or positive allosteric modulators improve the taste quality and/or the mouthfeel of sweet-tasting substances.

Mouthfeel (or “mouth feel”) refers to the physical sensations experienced or felt in the mouth that are created by food and beverages, or compositions added to food or beverages.
25 Mouthfeel may refer to textures that come into contact with the tongue, roof of the mouth, teeth, gums, or throat. Mouthfeel is considered to be distinct from taste/flavor, but is considered to have an equal or even greater impact on a person’s enjoyment or preference for certain foods over others. Typical mouthfeel descriptors used to describe perceived sensations include acidity (metallic, citrusy, bright), density (close, airy), dryness (arid, scorched), graininess (particulate,
30 powdery, dusty, grainy, chalky), gumminess (chewy, tough), hardness (crunchy, soft), heaviness (full, weighty), irritation (prickly, stinging), mouth coating (oily, buttery), roughness (abrasive, textured), slipperiness (slimy, stringy), smoothness (satiny, velvety), uniformity (even, uneven) and viscosity (full-bodied, light-bodied).

Honey truffle proteins were recently identified from fungal proteins, for example, *M. terfezoides* gleba, also called “Myd polypeptides” according to US Patent Application No. 2021/0401013, the entirety of which is incorporated herein by reference. This honey truffle is found in Hungary and grows mainly on the sandy soils near the Danube. Like the other sweet proteins discovered in plants, it is extremely sweet and has been compared to commonly used sweeteners like saccharin.

According to certain embodiments, the amount of honey truffle protein present in the flavor composition may be in a concentration of from about 100 ppm to about 50,000 ppm, in another embodiment from about 100 ppm to about 40,000 ppm, such as, for example, from about 100 ppm to about 30,000 ppm, from about 100 ppm to about 25,000 ppm, from about 100 ppm to about 20,000 ppm, from about 100 ppm to about 15,000 ppm, from about 100 ppm to about 10,000 ppm, and from about 100 ppm to about 5,000 ppm.

The sweetness modifiers may comprise one or more of a wide variety of compounds. According to certain illustrative embodiments, the sweetness modifiers are selected from the group consisting of steviol glycosides, mogrosides, dihydrochalcones and combinations thereof. The term “sweetness modifier”, as used herein, refers to a compound that modifies, enhances, amplifies or potentiates the perception of sweetness of a consumable when the compound is present in the consumable in a concentration at or below the compound’s sweetness recognition threshold, i.e., a concentration at which the compound does not contribute any noticeable sweet taste in the absence of additional sweetener(s). This means that the sweetness modifiers are not present in a sweetening amount. The particular concentration of the sweetness modifier will vary based on the identity of the particular modifier and the type of matrix or consumable.

According to certain embodiments, the amount of sweetness modifiers present in the flavor composition may be in a concentration of from about 1,000 ppm to about 200,000 ppm, in another embodiment from about 2,000 ppm to about 100,000 ppm, and in another embodiment from about 5,000 ppm to about 50,000 ppm.

The term “sweetness recognition threshold concentration,” as used herein, is the lowest known concentration of a compound that is perceivable by the human sense of taste as sweet.

In one embodiment, the sweetness modifier is a steviol glycoside(s). Examples of steviol glycosides include, for example, stevioside (CAS: 57817-89-7), rebaudioside A (CAS: 58543-16-1), rebaudioside B (CAS: 58543-17-2), rebaudioside C (CAS: 63550-99-2), rebaudioside D (CAS: 63279-13-0), rebaudioside E (CAS: 63279-14-1), rebaudioside F (CAS: 438045-89-7), rebaudioside G (CAS: 127345-21-5), rebaudioside H, rebaudioside I (CAS: 1220616-34-1), rebaudioside J, rebaudioside K, rebaudioside L, rebaudioside M (CAS: 1220616-44-3),

rebaudioside N (CAS: 1220616-46-5), rebaudioside O (CAS: 1220616-48-7), dulcoside A (CAS: 64432-06-0), dulcoside B (CAS: 63550-99-2), rubusoside (CAS: 64849-39-4) and Naringin Dihydrochalcone (CAS: 18916-17-1).

In another embodiment, the steviol glycoside may be a glucosylated steviol glycoside.

- 5 The glucosylated steviol glycoside included in the composition may be selected from any one or more steviol glycosides capable of having one or more glucose units added to the molecule by a glucosylation reaction. By way of example, but not in limitation, the glucosylated steviol glycoside included in the sweetness modifying composition may be selected from glucosylated stevioside, glucosylated rebaudioside A, glucosylated rebaudioside B, glucosylated rebaudioside
- 10 C, glucosylated rebaudioside D, glucosylated rebaudioside E, glucosylated rebaudioside F, glucosylated rebaudioside G, glucosylated rebaudioside H, glucosylated rebaudioside I, glucosylated rebaudioside J, glucosylated rebaudioside K, glucosylated rebaudioside L, glucosylated rebaudioside M, glucosylated rebaudioside N, glucosylated rebaudioside O, glucosylated dulcoside A, glucosylated dulcoside B, glucosylated rubusoside, any other
- 15 glucosylated steviol glycosides derived from an extract of *Stevia rebaudiana*, and mixtures thereof.

The glucosylated steviol glycosides may have different degrees of glucosylation. The glucosylated steviol glycoside of the composition may therefore comprise a blend of the same type of glucosylated steviol glycoside and having different or varying degrees of glucosylation.

- 20 The glucosylated steviol glycoside of the composition may also comprise a blend of one or more different types of glucosylated steviol glycoside having the same degree of glucosylation. The glucosylated steviol glycoside of the composition may further comprise a blend of one or more of different types of glucosylated steviol glycoside with each type having different or varying degrees of glucosylation.

- 25 The glucosylated steviol glycosides may comprise a blend of at least one glucosylated steviol glycoside and at least one residual steviol glycoside. A residual steviol glycoside refers to an unreacted steviol glycoside that has not been glucosylated. The residual steviol glycoside may include residual stevioside, residual rebaudioside A, residual rebaudioside B, residual rebaudioside C, residual rebaudioside D, residual rebaudioside E, residual rebaudioside F,
- 30 residual rebaudioside G, residual rebaudioside H, residual rebaudioside I, residual rebaudioside J, residual rebaudioside K, residual rebaudioside L, residual rebaudioside M, residual rebaudioside N, residual rebaudioside O, residual dulcoside A, residual dulcoside B, residual rubusoside, any other residual steviol glycosides derived from an extract of *Stevia rebaudiana*, and mixtures thereof. The blend of the at least one glucosylated steviol glycoside and the at least one residual

steviol glycoside may comprise about 1 percent and 15 percent of the at least one residual steviol glycoside. According to certain embodiments, the blend of the at least one glucosylated steviol glycoside and the at least one residual steviol glycoside may comprise between about 1 percent and 10 percent, or about 1 percent to about 8 percent, or about 1 percent to about 6 percent, or
5 about 1 percent to about 4 percent, or about 1 percent to about 2 percent, of the at least one residual steviol glycoside.

The glucosylated steviol glycosides may be prepared by preparing a reaction mixture of one or more steviol glycosides, a source of glucose units to be added to the steviol glycoside molecules, an enzyme to catalyze the glucosylation reaction, and a suitable solvent. According to
10 certain embodiments, the glucosylated steviol glycosides are prepared by preparing a reaction mixture of one or more steviol glycosides, a starch as the source of glucose units to be added to the steviol glycoside molecules, CGTase (cyclodextrin glucano-transferase) to catalyze the glucosylation reaction, and water as the solvent. The glucosylation reaction is carried out on the reaction mixture, and the resulting product is purified and dried. By way of example, the
15 glucosylated steviol glycosides may be prepared in accordance with the disclosure of JP2001-120218 A, the entirety of which is incorporated herein by reference. The alpha-glycosyl steviol glycosides (alpha-GS) are prepared by the alpha-addition of glucose by means of cyclodextrin glucosyl-transferase to a stevia extract that contains at least 1.5 times as much RebA as stevioside.

20 In another embodiment, the sweetness modifier may be one or more mogroside(s). Mogrosides are a group of triterpene glycosides and may be obtained from the fruit Luo Han Guo (*Siraitia grosvenorii*), also known as arhat fruit or longevity fruit or swingle fruit. Mogrosides make up approximately 1% of the flesh of the fresh fruit. Through extraction, an extract in the form of a powder containing up to 80% mogrosides can be obtained. Examples of mogrosides
25 include, for example, grosvenorine II, grosvenorine I, 11-O-mogroside II (I), 11-O-mogroside II (II), 11-O-mogroside II (III), mogroside II (I), mogroside II (II), mogroside II (III), 11-dehydroxy-mogroside III, 11-O-mogroside III, mogroside III (I), mogroside III (II), mogroside IIIe, mogroside IIIx, mogroside IV (I) (siamenoside), mogroside IV (II), mogroside IV (III), mogroside IV (IV), deoxymogroside V (I), deoxymogroside V (II), 11-O-mogroside V (I), mogroside V
30 isomer, mogroside V, iso-mogroside V, 7-O-mogroside V, 11-O-mogroside VI, mogroside VI (I), mogroside VI (II), mogroside VI (III) (neomogroside) and mogroside VI (IV). The mogroside(s) may, for example, be obtained or obtainable from Luo Han Guo extracts.

In another embodiment, the sweetness modifier may be one or more dihydrochalcones. Examples of dihydrochalcones include, for example, trilobatin (1-[4-(beta-D-

glucopyranosyloxy)-2,6-dihydroxyphenyl]-3-(4-hydroxyphenyl)-1-propanone is also known as p-Phlorizin, Phloretin 4'-glucoside, Phloretine-4'-glucoside, Prunin dihydrochalcone, or p-Phloridzin); HDG or hesperitin dihydrochalcone (4''-beta-D-glucoside is also known as 1-[4-(-D-glucopyranosyloxy)-2,6-dihydroxyphenyl]-3-(3-hydroxy-4-methoxyphenyl)-1-propanone);

5 naringin dihydrochalcone (NarDHC, is also known as 1-[4-[[2-O-(6-Deoxy-alpha-L-mannopyranosyl)-beta-D-glucopyranosyl]oxy]-2,6-dihydroxyphenyl]-3-(4-hydroxyphenyl)-1-propanone); neohesperidin dihydrochalcone (NHDC, E959); HDC or hesperetin dihydrochalcone (1-[2,6-dihydroxy-4-[3,4,5-trihydroxy-6-[(3,4,5-trihydroxy-6-methyloxan-2-yl)oxymethyl]oxan-2-yl]oxyphenyl]-3-(3-hydroxy-4-methoxyphenyl)propan-1-one).

10 Trilobatin is a natural dihydrochalcone type sweetener that occurs in the Chinese sweet tea plant *Lithocarpus polystachyus*, the leaves of which have been consumed as sweet tea in the south of China for centuries. HDG is present in peels/fruit of *Citrus sinensis* L. (Rutaceae), commonly known as sweet orange and *C. reticulata*, commonly known as tangerine or mandarin. The synthesis of HDG may be performed by reduction of hesperidin in dilute alkali which yields

15 hesperidin dihydrochalcone, followed by partial hydrolysis, either by acid or by a dissolved or immobilized enzyme, to form HDG, for example as described in US 3,429,873.

In another embodiment, examples of additional sweetness modifiers include, for example, rubusoside, rubus extract, glyphiline, mukurozioside lib, (+)-hernandulcin, 4β-hydroxyernandulcin, baiyunoside, flomisoside I, bryonychoid, bryoside abrusosides AE,

20 cyclocarioside A, cyclocarioside I, albiziasaponins AE, glycyrrhizin, araboglycyrrhizin, perianthdrines I-V, pterocariosides A and B, osladine, polypodosides A and B, telosmosis A8-18, filodulcin, 3-hanguine acetox-5,7-dihydroxy-4'-methoxy flavone, 3-O-acetate (2R, 3R)-dihydroquercetin, dihydroquercetin 4'-methyl ether, Selliguesin A, Cinnamtannin B-1 and D-1, extensumside C-I, Millettiasaponin A, Derrisaponin A Hematoxylin and gaudichaudioside A,

25 Huangqioside E, Neoastilbin, Aspalathin and Nothofagin, curculin, mabinline, monelin, neoculin, pentadine, thaumatin or their combinations.

Importantly, according to the present disclosure, the sweetness modifier is not present in a sweetening amount. Rather, the sweetness modifier is present in a concentration at or below the compound's sweetness recognition threshold. The particular concentration of the sweetness

30 modifier will vary based on the identity of the sweetness modifier and the consumable.

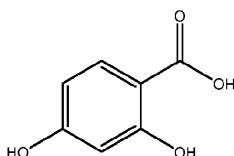
According to certain illustrative embodiments, a composition may comprise honey truffle protein in combination with a positive allosteric modulator.

Positive allosteric modulators (also known in the art as "PAMs") of the human sweet taste receptor are compounds that enhance the sweet receptor activity and sweetness taste perception,

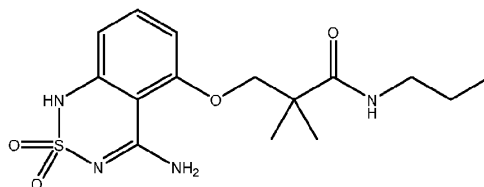
and have been used for reduced sugar/reduced calorie consumable applications. There are clear disadvantages to the use of PAMs in reduced sugar consumables, namely, the PAMs have a different temporal quality as compared to sugar and they lack a desired sugar-like mouthfeel.

Without limitation, and only by way of illustration, the positive allosteric modulator
 5 component of the flavor composition may be selected from any one or more compounds disclosed in WO 2008/154,221, U.S. Patent Application Publication No. U.S. 2014/0235624 A1, U.S. Patent Application Publication No. U.S. 2018/0086751 A1, and U.S. Patent Application Publication No. US 2017/0354175, each of which are incorporated herein by reference in their respective entireties.

10 According to certain illustrative embodiments, the positive allosteric modulator component of the flavor composition is selected from one or more of the following compounds:

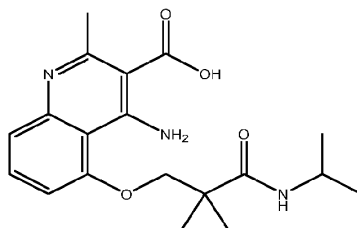


2,4-dihydroxyl Benzoic acid (CAS:89-86-1),

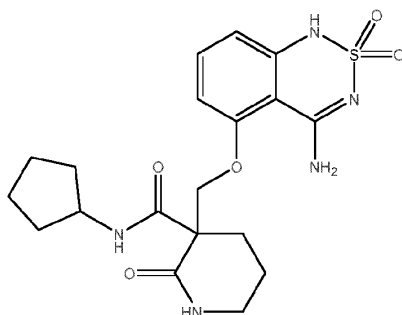


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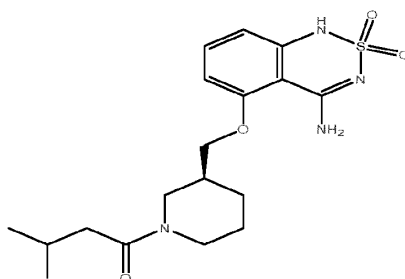
Propanamide, 3-[(4-amino-2,2-dioxido-1H-2,1,3-benzothiadiazin-5-yl)oxy]-2,2-dimethyl-N-propyl- (CAS:1093200-92-0),



20 3-Quinolinecarboxylic acid, 4-amino-5-[2,2-dimethyl-3-[(1-methylethyl)amino]-3-oxopropoxy]-2-methyl- (CAS:1359963-68-0),

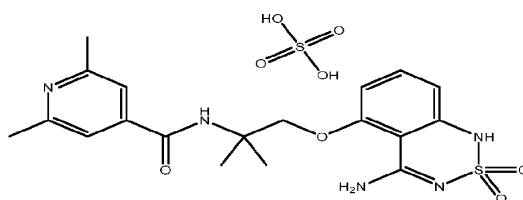


3-Piperidinecarboxamide, 3-[[[(4-amino-2,2-dioxido-1H-2,1,3-benzothiadiazin-5-yl)oxy]methyl]-N-cyclopentyl-2-oxo- (CAS:1446687-20-2),

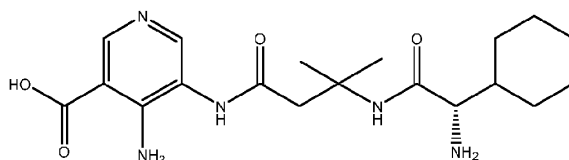


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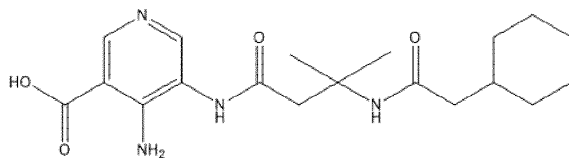
1-Butanone, 1-[(3S)-3-[[[(4-amino-2,2-dioxido-1H-2,1,3-benzothiadiazin-5-yl)oxy]methyl]-1-piperidinyl]-3-methyl- (CAS:1469426-64-9),



10 4-Pyridinecarboxamide, N-[2-[[[(4-amino-2,2-dioxido-1H-2,1,3-benzothiadiazin-5-yl)oxy]-1,1-dimethylethyl]-2,6-dimethyl- sulfamate salt (CAS:2079034-28-7),



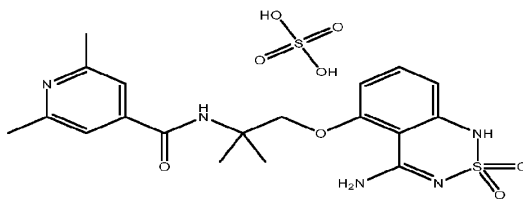
3-Pyridinecarboxylic acid, 4-amino-5-[[3-[[[(2S)-2-amino-2-cyclohexylacetyl]amino]-3-methyl-1-oxobutyl]amino]- (CAS:2242529-79-7),



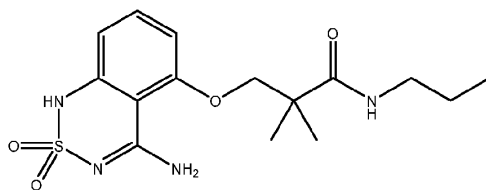
- 5 3-Pyridinecarboxylic acid, 4-amino-5-[[3-[(2-cyclohexylacetyl)amino]-3-methyl-1-oxobutyl]amino]- (CAS: 2242529-82-2),

and combinations thereof.

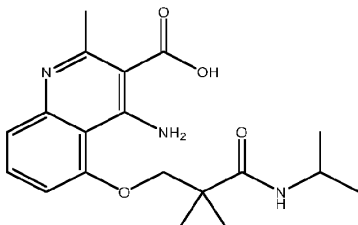
- 10 According to certain illustrative embodiments, the positive allosteric modulator component of the flavor composition is the following compound:



- 15 According to certain illustrative embodiments, the positive allosteric modulator component of the flavor composition is the following compound:



According to certain illustrative embodiments, the positive allosteric modulator component of the flavor composition is the following compound:



According to certain embodiments, the positive allosteric modulator may be present in the
 5 flavor composition in an amount of about 10 ppm to about 20,000 ppm. According to other
 embodiments, the positive allosteric modulator may be present in an amount of about 20 ppm to
 about 18,000 ppm; in another embodiment from about 30 ppm to about 16,000 ppm; in another
 embodiment from about 40 ppm to about 14,000 ppm; in another embodiment from about 50
 ppm to about 12,000 ppm; in another embodiment from about 60 ppm to about 10,000 ppm; in
 10 another embodiment from about 70 ppm to about 8,000 ppm; in another embodiment from about
 80 ppm to about 6,000 ppm; in another embodiment from about 90 ppm to about 4,000 ppm; and
 in another embodiment from about 100 ppm to about 2,000 ppm.

According to certain illustrative embodiments, a flavor composition may comprise honey
 truffle protein in combination with at least one sweetness modifier and at least one positive
 15 allosteric modulator.

The flavor composition described herein may modify and/or modulate the taste of at least
 one sweetener. The at least one sweetener can be any known sweetener, for example, a natural
 sweetener, a natural high potency sweetener or a synthetic sweetener.

The at least one sweetener is present in a sweetening amount. "Sweetening amount", as
 20 used herein, refers to the amount of compound required to provide detectable sweetness when
 present in a consumable, e.g., a beverage.

As used herein, the phrase "natural high potency sweetener" refers to any sweetener found
 naturally in nature and characteristically has a sweetness potency greater than sucrose, fructose,
 or glucose, yet has less calories. The natural high potency sweetener can be provided as a pure
 25 compound or, alternatively, as part of an extract. As used herein, the phrase "synthetic sweetener"
 refers to any composition which is not found naturally in nature and characteristically has a
 sweetness potency greater than sucrose, fructose, or glucose, yet has less calories.

In other embodiments, the at least one sweetener is a carbohydrate sweetener. Suitable
 carbohydrate sweeteners are selected from, but not limited to, the group consisting of sucrose,

glyceraldehyde, dihydroxyacetone, erythrose, threose, erythrulose, arabinose, lyxose, ribose, xylose, ribulose, xylulose, allose, altrose, galactose, glucose, gulose, idose, mannose, talose, fructose, psicose, sorbose, tagatose, mannoheptulose, sedoheltulose, octulose, fucose, rhamnose, turanose, cellobiose, sialose and combinations thereof. In other embodiments, the at least one
 5 sweetener does not comprise a carbohydrate sweetener.

In another embodiment, the additional sweetener is a rare sugar selected from sorbose, lyxose, ribulose, xylose, xylulose, D-allose, L-ribose, D-tagatose, L-glucose, L-fucose, L-arabinose, turanose and combinations thereof. Other sweeteners include Siamenoside I, monatin and its salts (monatin SS, RR, RS, SR), curculin, glycyrrhizic acid and its salts, thaumatin,
 10 monellin, mabinlin, tamatin, hemandulcin, phyllodulcin, glycyphyllin, trilobatin, baiyunoside, osladin, polypodoside A, pterocaryoside A, pterocaryoside B, mukurozioside, phlomisioside I, periandrin I, abrusoside A, steviolbioside and cyclocarioside I, sugar alcohols such as erythritol, sucralose, potassium acesulfame, acesulfame acid and salts thereof, aspartame, alitame, saccharin and salts thereof, hesperidin dihydrochalcone glucoside, neohesperidin dihydrochalcone,
 15 cyclamate, cyclamic acid and salts thereof, neotame, advantame, glucosylated steviol glycosides (GSGs) and combinations thereof.

In one embodiment, the sweetener is a caloric sweetener or mixture of caloric sweeteners. In another embodiment, the caloric sweetener is selected from sucrose, fructose, glucose, high fructose corn/starch syrup, a beet sugar, a cane sugar and combinations thereof.

20 In other embodiments, the sweetener comprises at least one steviol glycoside or mogroside, wherein the at least one steviol glycoside or mogroside is present in a sweetening amount.

Products

25 According to the present disclosure, honey truffle protein may be added to a sweetened consumable (i.e., a consumable having at least one sweetener therein), or may be provided as part of a flavor composition for consumables.

In one embodiment, honey truffle protein is present in the flavor composition in an amount such that, when the flavor composition is added to a sweetened consumable, the sucrose
 30 equivalence of the consumable is increased, as compared to the consumable in the absence of honey truffle protein.

When added to a consumable, honey truffle protein is included in an amount effective to modify the sweetness or mouthfeel of a sweetener without exhibiting any off-taste. According to certain embodiments, the amount of honey truffle protein present in the consumable may be in a

concentration of from about 0.1 ppm to about 50 ppm, in another embodiment from 0.1 ppm to about 40 ppm, such as, for example, from about 0.1 ppm to about 30 ppm, from about 0.1 ppm to about 25 ppm, from about 0.1 ppm to about 20 ppm, from about 0.1 ppm to about 15 ppm, from about 0.1 ppm to about 10 ppm and from about 0.1 ppm to about 5 ppm.

5 In another embodiment, flavor compositions may include honey truffle protein in combination with sweetness modifiers and/or positive allosteric modulators to improve the taste quality and/or the mouthfeel of sweet-tasting substances. According to certain embodiments, the amount of sweetness modifiers present in the consumable may be in a concentration of from about 1 ppm to about 200 ppm, in another embodiment from about 2 ppm to about 100 ppm, and
10 in another embodiment from about 5 ppm to about 50 ppm. According to certain embodiments, the amount of certain positive allosteric modulators present in the consumable may be in a concentration of from about 0.1 ppm to about 20 ppm, in another embodiment from about 0.5 ppm to about 10 ppm, and in another embodiment from about 1 ppm to about 5 ppm.

According to another embodiment, the amount of particular sweetness modifiers present
15 in a consumable may be in a concentration of from about 1 ppm to about 45 ppm for steviol glycosides, from about 1 ppm to about 150 ppm for glucosylated steviol glycosides, from about 1 ppm to about 30 ppm for mogrosides, and from about 1 ppm to about 60 ppm for monk fruit extract.

In one embodiment, the at least one sweetener described herein is present in the
20 consumable in a concentration from about 50 ppm to about 600 ppm, such as, for example, about 50 ppm to about 500 ppm, from about 50 ppm to about 400 ppm, from about 50 ppm to about 300 ppm, from about 50 ppm to about 200 ppm, from about 50 ppm to about 100 ppm, about 100 ppm to about 600 ppm, about 100 ppm to about 500 ppm, about 100 ppm to about 400 ppm, about 100 ppm to about 300 ppm, about 100 ppm to about 200 ppm, about 200 ppm to about 600
25 ppm, about 200 ppm to about 500 ppm, about 200 ppm to about 400 ppm, about 200 ppm to about 300 ppm, about 300 ppm to about 600 ppm, about 300 ppm to about 500 ppm, about 300 ppm to about 400 ppm, about 400 ppm to about 600 ppm, about 400 ppm to about 500 ppm and about 500 ppm to about 600 ppm. In another embodiment, for full and reduced sugar applications, the at least one sweetener may be present in the consumable in a concentration up to
30 1,000 ppm.

When expressed as “ppm”, the concentration is parts per million by weight based on the total weight of the consumable. It should be understood that when a range of values is described in the present disclosure, it is intended that any and every value within the range, including the end points, is to be considered as having been disclosed. It is to be understood that the inventors

appreciate and understand that any and all values within the range are to be considered to have been specified, and that the inventors have possession of the entire range and all the values within the range.

Flavor compositions may also contain one or more food grade excipient(s). Suitable
5 excipients for flavor compositions are well known in the art and include, for example, without limitation, solvents (including water, alcohol, ethanol, oils, fats, vegetable oil, and miglyol), binders, diluents, disintegrating agents, lubricants, flavoring agents, colouring agents, preservatives, antioxidants, emulsifiers, stabilisers, flavor-enhancers, sweetening agents, anti-caking agents, and the like. Examples of such carriers or diluents for flavors may be found e.g. in
10 "Perfume and Flavour Materials of Natural Origin", S. Arctander, Ed., Elizabeth, N.J., 1960; in "Perfume and Flavor Chemicals", S. Arctander, Ed., Vol. I & II, Allured Publishing Corporation, Carol Stream, USA, 1994; in "Flavourings", E. Ziegler and H. Ziegler (ed.), Wiley-VCH Weinheim, 1998, and "CTFA Cosmetic Ingredient Handbook", J.M. Nikitakis (ed.), 1st ed., The Cosmetic, Toiletry and Fragrance Association, Inc., Washington, 1988.

15 The flavor composition may have any suitable form, for example liquid or solid, wet or dried, or in encapsulated form bound to or coated onto carriers/particles or as a powder.

In the present disclosure, the term "about" used in connection with a value is inclusive of the stated value and has the meaning dictated by the context. For example, it includes at least the degree of error associated with the measurement of the particular value. One of ordinary skill in
20 the art would understand the term "about" is used herein to mean that an amount of "about" of a recited value produces the desired degree of effectiveness in the compositions and/or methods of the present disclosure. One of ordinary skill in the art would further understand that the metes and bounds of "about" with respect to the value of a percentage, amount or quantity of any component in an embodiment can be determined by varying the value, determining the
25 effectiveness of the compositions or methods for each value, and determining the range of values that produce compositions or methods with the desired degree of effectiveness in accordance with the present disclosure.

The consumable may include a base. As used herein, the term "base" refers to all the ingredients necessary for the consumable, apart from the flavor composition. These will naturally
30 vary in both nature and proportion, depending on the nature and use of the consumable or additive, but they are all well known to the art and may be used in art-recognized proportions. The formulation of such a base for every conceivable purpose is therefore within the ordinary skill of the art. For example, the base for a beverage according to the present disclosure may include 5% sucrose and 0.05% citric acid in water.

Without limitation, and only by way of illustration, suitable bases may include, anti-caking agents, anti-foaming agents, anti-oxidants, binders, colourants, diluents, disintegrants, emulsifiers, encapsulating agents or formulations, enzymes, fats, flavor-enhancers, flavoring agents, gums, polysaccharides, preservatives, proteins, solubilisers, solvents, stabilisers, sugar-
5 derivatives, surfactants, sweetening agents, vitamins, waxes, and the like. Solvents which may be used are known to those skilled in the art and include e.g., water, ethanol, ethylene glycol, propylene glycol, glycerine and triacetin. Encapsulants and gums include maltodextrin, gum arabic, alginates, gelatine, modified starch, other polysaccharides, and proteins.

Examples of excipients, carriers, diluents or solvents for flavor compounds may be found
10 e.g. in "Perfume and Flavour Materials of Natural Origin", S. Arctander, Ed., Elizabeth, N.J., 1960; in "Perfume and Flavour Chemicals", S. Arctander, Ed., Vol. I & II, Allured Publishing Corporation, Carol Stream, USA, 1994; in "Flavourings", E. Ziegler and H. Ziegler (ed.), Wiley-VCH Weinheim, 1998, and "CTFA Cosmetic Ingredient Handbook", J. M. Nikitakis (ed.), 1st ed., The Cosmetic, Toiletry and Fragrance Association, Inc., Washington, 1988.

15 Non-limiting examples of suitable flavor-providing ingredients include natural flavors, artificial flavors, spices, seasonings, and the like. These include synthetic flavor oils and flavoring aromatics and/or oils, oleoresins, essences, and distillates, and combinations thereof.

Ancillary ingredients may be present to provide other benefits such as enhanced stability, ease of incorporation into a consumable or additive and enhanced nutritional value. Non-limiting
20 typical examples of such ancillary ingredients include stabilizers, emulsifiers, preservatives, gums, starches, dextrans, vitamins and minerals, functional ingredients, salts, antioxidants, and polyunsaturated fatty acids. Particular examples are emulsifiers and carriers, useful in spray drying processes. Non-limiting examples of these are modified starches, such as CAPSULTM, and maltodextrin.

25 The additive may be a single ingredient or a blend of ingredients, or it may be encapsulated in any suitable encapsulant. The additive may be prepared by any suitable method, such as spray drying, extrusion and fluidized bed drying.

According to the present disclosure, the term "consumable" refers to products for consumption by a subject, typically via the oral cavity (although consumption may occur via non-
30 oral means such as inhalation), for at least one of the purposes of enjoyment, nourishment, or health and wellness benefits. Consumables may be present in any form including, but not limited to, liquids, solids, semi-solids, tablets, capsules, lozenges, strips, powders, gels, gums, pastes, slurries, solutions, suspensions, syrups, aerosols and sprays. The term also refers to, for example, dietary and nutritional, and health and wellness supplements. Consumables include compositions

that are placed within the oral cavity for a period of time before being discarded but not swallowed. It may be placed in the mouth before being consumed, or it may be held in the mouth for a period of time before being discarded.

Broadly, consumables include, but are not limited to, comestibles of all kinds, confectionery products, baked products, sweet products, savoury products, fermented products, 5 dairy products, non-dairy products, beverages, nutraceuticals and pharmaceuticals.

Non-limiting examples of consumables include: wet/liquid soups regardless of concentration or container, including frozen soups. For the purpose of this definition soup(s) means a food prepared from meat, poultry, fish, vegetables, grains, fruit and other ingredients, 10 cooked in a liquid which may include visible pieces of some or all of these ingredients. It may be clear (as a broth) or thick (as a chowder), smooth, pureed or chunky, ready-to-serve, semi-condensed or condensed and may be served hot or cold, as a first course or as the main course of a meal or as a between meal snack (sipped like a beverage), soup may be used as an ingredient for preparing other meal components and may range from broths (consomme) to sauces (cream or 15 cheese-based soups); dehydrated and culinary foods, including cooking aid products such as: powders, granules, pastes, concentrated liquid products, including concentrated bouillon, bouillon and bouillon like products in pressed cubes, tablets or powder or granulated form, which are sold separately as a finished product or as an ingredient within a product, sauces and recipe mixes (regardless of technology); meal solutions products such as: dehydrated and freeze dried soups, 20 including dehydrated soup mixes, dehydrated instant soups, dehydrated ready-to-cook soups, dehydrated or ambient preparations of ready-made dishes, meals and single serve entrees including pasta, potato and rice dishes; meal embellishment products such as: condiments, marinades, salad dressings, salad toppings, dips, breading, batter mixes, shelf stable spreads, barbecue sauces, liquid recipe mixes, concentrates, sauces or sauce mixes, including recipe mixes 25 for salad, sold as a finished product or as an ingredient within a product, whether dehydrated, liquid or frozen; beverages, including beverage mixes and concentrates, including but not limited to, alcoholic and non-alcoholic ready to drink and dry powdered beverages, carbonated and non-carbonated beverages, e.g., sodas, fruit or vegetable juices, alcoholic and non-alcoholic beverages, teas such as green tea and black tea, wine such as red wine; confectionery products, 30 e.g., cakes, cookies, pies, candies, chewing gums, gelatins, ice creams, sorbets, puddings, jams, jellies, salad dressings, and other condiments, cereal, and other breakfast foods, canned fruits and fruit sauces and the like.

Methods of enhancing the sweetness of a consumable and/or modulating one or more taste attributes of the sweetener to make the consumable taste more like a sucrose-sweetened consumable are provided.

The disclosure is further described with reference to the following non-limiting examples.

5

EXAMPLES

The following examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations of the invention are possible without departing from the spirit and scope of the present disclosure.

10 While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are within the scope of this invention.

15

Example 1

A Base (5% sucrose and 0.05% citric acid in water) for use in beverages was prepared. A combination of the Base with a sweetness modifier and a combination of the Base with a sweetness modifier and honey truffle protein were prepared and evaluated by experienced
20 flavorists for sweetness characteristics and sensory perceptions of mouthfeel.

The combination of the Base with a sweetness modifier (30 ppm Reb A) was described as follows: sweet, sour, medicinal, bitter, astringent, licorice, and mouthdrying.

The combination of the Base with a sweetness modifier (30 ppm Reb A) plus 20 ppm of honey truffle protein was described as follows: sweeter, less sour, more body, less-medicinal, less
25 astringent, more sugar-like mouthfeel, and improved stevia taste.

The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean
30 "about 40 mm".

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are
35 within the scope of this invention.

What is claimed is:

1. A flavor composition comprising:
 - a. honey truffle protein; and
 - 5 b. at least one sweetness modifier selected from the group consisting of steviol glycosides, mogrosides, dihydrochalcones, and combinations thereof.

2. The flavor composition of claim 1, wherein the steviol glycosides are selected from the group consisting of rebaudioside M, rebaudioside D, rebaudioside A, rebaudioside N,
 10 rebaudioside O, rebaudioside E, steviolmonoside, steviolbioside, rubusoside, dulcoside B, dulcoside A, rebaudioside B, rebaudioside G, stevioside, rebaudioside C, rebaudioside F, rebaudioside I, rebaudioside H, rebaudioside L, rebaudioside K, rebaudioside J, rebaudioside M2, rebaudioside D2, rebaudioside S, rebaudioside T, rebaudioside U, rebaudioside V, rebaudioside W, rebaudioside Z1, rebaudioside Z2, rebaudioside IX,
 15 enzymatically glucosylated steviol glycosides, and combinations thereof.

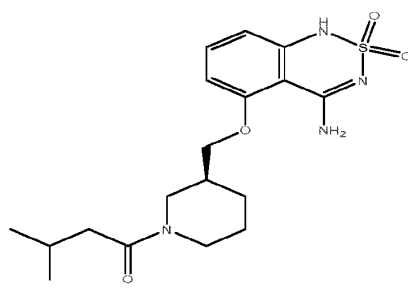
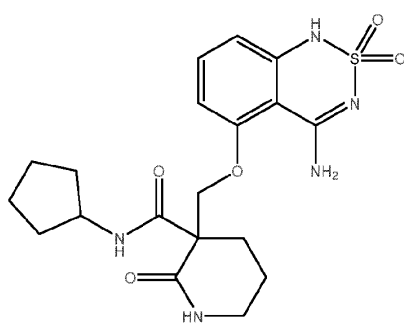
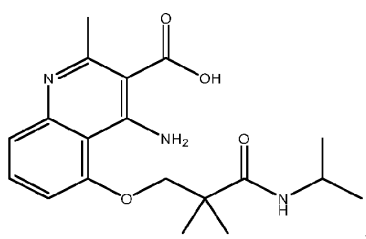
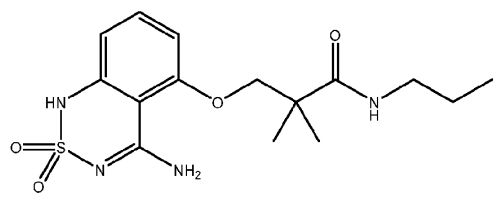
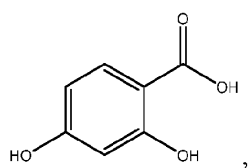
3. The flavor composition of claim 1, wherein the mogrosides are selected from the group consisting of grosmogroside I, mogroside IA, mogroside IE, 1 l-oxomogroside IA, mogroside II, mogroside II A, mogroside II B, mogroside II E, 7-oxomogroside II E,
 20 mogroside III, Mogroside Hie, 1 l-oxomogroside HIE, 11- deoxymogroside III, mogroside IV, Mogroside IVA 1 l-oxomogroside IV, 1 l-oxomogroside IV A, mogroside V, isomogroside V, 1 l-deoxymogroside V, 7-oxomogroside V, 11- oxomogroside V, isomogroside V, mogroside VI, mogrol, 1 l-oxomogrol, siamenoside I, and combinations thereof.

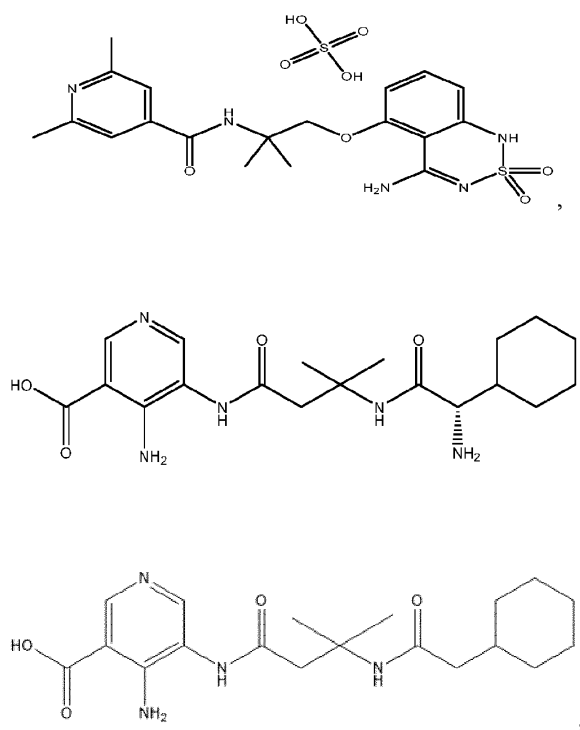
- 25 4. The flavor composition of claim 1, wherein the dihydrochalcones are selected from the group consisting of hesperetin, trilobatin, phloretin, thaumatin, neohesperidin dihydrochalcone, hesperetin dihydrochalcone, hesperetin dihydrochalcone 4''-beta-D-glucoside, and combinations thereof.

- 30 5. A consumable comprising:
 - a. at least one sweetener; and
 - 35 b. a flavor composition including honey truffle protein; and at least one sweetness modifier selected from the group consisting of steviol glycosides, mogrosides, dihydrochalcones, and combinations thereof;

wherein the at least one sweetener is present in a sweetening amount.

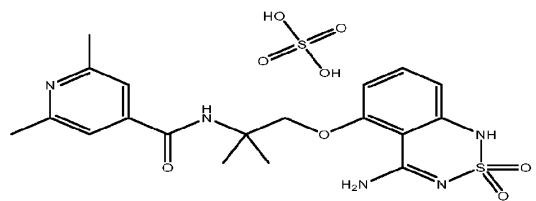
- 5 6. The consumable of claim 5, wherein the at least one sweetener is selected from the group consisting of sucrose, fructose, glucose, xylose, arabinose, rhamnose, tagatose, allulose, trehalose, isomaltulose, steviol glycosides, mogrosides, stevia, trilobatin, rubusoside, aspartame, advantame, agave syrup, acesulfame potassium (AceK), high fructose corn syrup, neotame, saccharin, sucralose, high fructose corn syrup, starch syrup, Luo Han Guo extract, neohesperidin dihydrochalcone, naringin dihydrochalcone, HDG, sugar alcohols cellobiose, psicose, cyclamate, tamatin, molasses, rice syrup, and combinations thereof.
- 10 7. The consumable of claim 5, wherein the at least one sweetness modifier is present in a concentration of from about 1 ppm to about 200 ppm.
- 15 8. The consumable of claim 5, wherein the steviol glycoside is present in a concentration of from about 1 ppm to about 45 ppm.
9. The consumable of claim 5, wherein the mogroside is present in a concentration of from about 1 ppm to about 30 ppm.
- 20 10. The consumable of claim 5, wherein the consumable is a beverage.
11. The consumable of claim 5, wherein the sweetener is a natural sweetener.
- 25 12. The consumable of claim 5, wherein the natural sweetener is selected from fructose and sucrose.
13. A flavor composition comprising honey truffle protein and a positive allosteric modulator.
- 30 14. The flavor composition of claim 13, wherein the honey truffle protein is present in an amount from about 100 ppm to about 50,000 ppm and the positive allosteric modulator is present in an amount from about 10 ppm to about 20,000 ppm.
15. The flavor composition of claim 13, wherein the positive allosteric modulator is selected from the group consisting of:



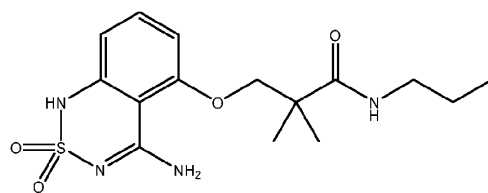


and combinations thereof.

16. The flavor composition of claim 15, wherein the positive allosteric modulator is



17. The flavor composition of clam 15, wherein the positive allosteric modulator is



18. The flavor composition of claim 15, wherein the positive allosteric modulator is

