

FLAVOR MODULATING COMPOSITIONS**TECHNICAL FIELD**

- 5 The present invention relates to novel flavor modulating substances, compositions, and methods that may be used to improve the organoleptic properties of non-animal protein containing consumables, such as dairy analogues.

BACKGROUND

10 The flavor of foodstuffs and beverages consists of two parts: the aroma and the taste. In general, what is perceived through the olfactory epithelium in the nasal cavity is referred to as “aroma”, whereas the term “taste” is generally used to describe the sensory impact that is perceived via the mouth, especially the tongue.

15 Compounds for modifying the flavor 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 are used to provide desirable benefits, such as enhanced mouthfeel, or masking undesirable characteristics of other ingredients, such as the distinctive
20 tastes and textures perceived as unappealing of products containing non-animal protein.

The use of non-animal proteins in foodstuffs to replace animal raw materials such as egg or milk, but also meat is becoming increasingly important due to the benefits of protein in the diet. While consumers expect their food and beverage products to have multi-functional benefits, consumers
25 still have high expectations that those products deliver great taste along with efficacy in terms of health benefits. Because each type of protein has its own inherent taste, formulating protein into food and beverage products can produce distinctive tastes perceived as unappealing. For example, products made from plant proteins, e.g., leguminous plants, such as soy or pea, display a flavor profile described as grassy, beany, green, earthy, nutty and/or bitter. Particular off-notes
30 often mentioned in relation to soy protein and pea protein are “beany” and “bitter” attributes. Beany and bitter tastes usually signal repulsive taste sensations, leading to rejection.

Non-dairy alternatives are increasingly desired by health-conscious nonvegetarians, vegetarians, vegans, persons following religious dietary restrictions, persons seeking reduction of animal-

derived products in their diet, and others seeking to reduce consumption of animal-derived products for other ethical or nutritional reasons. Non-dairy alternatives include, for example, dairy-alternative foods and dairy-alternative milk beverages that contain non-animal ingredients, such as plant-based fats and proteins, instead of animal-derived fats and proteins. However, non-dairy alternatives typically exhibit an unpleasant mouthfeel, an unpleasant lingering aftertaste, beany and bitter off-notes, and an undesired astringency.

There remains a need for new flavor and/or mouthfeel improving substances and compositions to be added to flavorist's palette which can modulate the organoleptic properties of non-animal protein containing consumables.

SUMMARY

The present disclosure relates to flavor modulating compositions for non-animal protein containing consumables and methods of producing and using such compositions. The flavor modulating compositions improve the organoleptic properties of non-animal protein, including improving body/mouthfeel characteristics and mitigating lingering aftertaste and bitter off-notes. The flavor modulating compositions according to the present disclosure comprise a combination of certain magnesium salts and calcium salts present in amounts sufficient to improve the organoleptic properties of non-animal protein containing consumables.

In accordance with a first aspect of the present invention, there is provided the use of a composition comprising magnesium salts and calcium salts for improving the organoleptic properties of non-animal protein containing consumables.

In accordance with a second aspect of the present invention, there is provided the use of a composition comprising magnesium chloride and calcium chloride for improving the organoleptic properties of non-animal protein containing consumables.

In accordance with a third aspect of the present invention, there is provided a flavor modulating composition comprising magnesium salts and calcium salts in amounts effective to impart a flavor modulating effect on non-animal protein containing consumables.

In accordance with a fourth aspect of the present invention, there is provided a flavor modulating composition comprising magnesium chloride and calcium chloride in amounts effective to impart a flavor modulating effect on non-animal protein containing consumables.

- 5 In accordance with a fifth aspect of the present invention, there is provided a non-animal protein containing consumable comprising a flavor modulating composition comprising magnesium salts and calcium salts in amounts effective to impart a flavor modulating effect on non-animal protein in the consumable.
- 10 In accordance with a sixth aspect of the present invention, there is provided a non-animal protein containing consumable comprising a flavor modulating composition comprising magnesium chloride and calcium chloride in amounts effective to impart a flavor modulating effect on non-animal protein in the consumable.
- 15 The invention also relates to methods of making the disclosed flavor modulating composition and non-animal protein containing consumables containing the disclosed flavor modulating composition. In various aspects, the non-animal protein containing consumable can be a beverage, a food or a nutraceutical.
- 20 The invention also relates to methods to confer, enhance, improve, complement or modify the flavor and/or mouthfeel properties of non-animal protein containing consumables by using the disclosed flavor modulating compositions.

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

- 25
- modulation, in particular positive modulation, of mouthfeel and creaminess perception,
 - reduction of sweet, lingering aftertaste,
 - reduction of beany, bitter off-notes,
 - enhanced perception of pleasant mineralic taste,
- 30
- reduction of astringency, and
 - enhanced drinkability of beverages.

The details, examples and preferences provided in relation to any particular one or more of the stated aspects of the present invention will be further described herein and apply equally to all aspects of the present invention. Any combination of the embodiments, examples and preferences described herein in all possible variations thereof is encompassed by the present invention unless
5 otherwise indicated herein, or otherwise clearly contradicted by context.

DETAILED DESCRIPTION

The present invention is based on the surprising finding that a composition comprising the
10 combination of certain magnesium salts and calcium salts exhibits excellent flavor and/or mouthfeel modulating properties to non-animal protein. The present invention is also based on the surprising finding that a composition comprising magnesium chloride and calcium chloride exhibits superior flavor and/or mouthfeel modulating properties to non-animal protein, as compared to different inorganic salts, alone or in combination. In particular, the examples show
15 that a composition comprising magnesium chloride and calcium chloride exhibited a superior flavor modulating effect on non-animal protein containing consumables, as compared to compositions comprising different inorganic salts. There is therefore provided a use of a composition comprising certain magnesium salts and calcium salts as a flavor and/or mouthfeel modulating composition.

20

In certain embodiments, the flavor modulating composition comprises magnesium chloride and calcium chloride. In certain embodiments, the flavor modulating composition comprises inorganic salts consisting essentially of magnesium chloride and calcium chloride. In certain
25 embodiments, the flavor modulating composition consists essentially of magnesium chloride and calcium chloride.

In certain embodiments, provided is a beverage comprising non-animal protein and a flavor modulating composition comprising magnesium chloride at a concentration of from about 10 ppm to about 5,000 ppm and calcium chloride at a concentration of from about 10 ppm to about
30 5,000 ppm.

In certain embodiments, provided is a beverage comprising non-animal protein and a flavor modulating composition comprising inorganic salts consisting essentially of magnesium chloride

at a concentration of from about 10 ppm to about 5000 ppm and calcium chloride at a concentration of from about 10 ppm to about 5,000 ppm.

5 In certain embodiments, provided is a beverage comprising non-animal protein and a flavor modulating composition consisting essentially of magnesium chloride at a concentration of from about 10 ppm to about 5,000 ppm and calcium chloride at a concentration of from about 10 ppm to about 5,000 ppm.

10 In certain embodiments, provided is a beverage comprising non-animal protein and a flavor modulating composition comprising inorganic salts consisting of magnesium chloride at a concentration of from about 10 ppm to about 5,000 ppm and calcium chloride at a concentration of from about 10 ppm to about 5,000 ppm.

As used herein, the phrase “inorganic salt” refers to a salt that lacks carbon-hydrogen bonds. 15 Salts in general are composed of a metal ion (cation) and a non-metal ion (anion) in simple binary salts, such as sodium chloride (NaCl). In certain embodiments, the flavor modulating composition is free of inorganic salts having a cation selected from the group consisting of sodium, potassium, zinc and combinations thereof. In certain embodiments, the flavor modulating composition is free of sodium salts. In certain embodiments, the flavor modulating 20 composition is free of potassium salts. In certain embodiments, the flavor modulating composition is free of zinc salts. In certain embodiments, the flavor modulating composition comprises a magnesium salt, such as magnesium chloride.

In certain embodiments, the magnesium and calcium salts have the same counterion/anion. In 25 certain embodiments, the magnesium and calcium salts have different counterions/anions. In certain embodiments, the magnesium and calcium salts independently contain an anion selected from the group consisting of gluconate, lactate, chloride, sulfate, nitrate and combinations thereof. In certain embodiments, the magnesium and calcium salts both contain a chloride anion. In certain embodiments, the flavor modulating composition is free of inorganic salts having an 30 anion selected from the group consisting of carbonate, citrate, sulfate, phosphate, and combinations thereof.

In certain embodiments, disclosed is a non-animal protein containing consumable, such as a dairy analogue beverage, comprising a flavor modulating composition comprising certain magnesium

salts and calcium salts, wherein the magnesium salts and calcium salts of the flavor modulating composition may be present at a concentration of about 10 ppm to about 5,000 ppm. In a further aspect, the total concentration of magnesium salts and calcium salts taken together can be from about 20 ppm to about 4,000 ppm, about 30 ppm to about 4,000 ppm, about 50 ppm to about 4,000 ppm, about 70 ppm to about 4,000 ppm, about 80 ppm to about 4,000 ppm, about 90 ppm to about 4,000 ppm, about 100 ppm to about 4,000 ppm, about 40 ppm to about 2,500 ppm, about 50 ppm to about 2,500 ppm, about 60 ppm to about 2,500 ppm, about 70 ppm to about 2,500 ppm, about 80 ppm to about 2,500 ppm, about 90 ppm to about 2,500 ppm, about 100 ppm to about 2,500 ppm, about 40 ppm to about 2,000 ppm, about 50 ppm to about 2,000 ppm, about 60 ppm to about 2,000 ppm, about 70 ppm to about 2,000 ppm, about 80 ppm to about 2,000 ppm, about 90 ppm to about 2,000 ppm, about 100 ppm to about 2,000 ppm, about 30 ppm to about 1,500 ppm, about 50 ppm to about 1,500 ppm, about 60 ppm to about 1,500 ppm, about 70 ppm to about 1,500 ppm, about 80 ppm to about 1,500 ppm, about 90 ppm to about 1,500 ppm, about 100 ppm to about 1,500 ppm, about 030 ppm to about 1,000 ppm, about 50 ppm to about 1,000 ppm, about 60 ppm to about 1,000 ppm, about 70 ppm to about 1,000 ppm, about 80 ppm to about 1,000 ppm, about 90 ppm to about 1,000 ppm, about 100 ppm to about 1,000 ppm; or concentration ranges or specific concentration within these ranges.

In certain embodiments, the concentration of magnesium salts can be from about 10 ppm to about 3,000 ppm, about 20 ppm to about 1,000 ppm, about 30 ppm to about 1,000 ppm about 40 ppm to about 1,000 ppm, about 50 ppm to about 1,000 ppm, about 60 ppm to about 1,000 ppm, about 70 ppm to about 1,000 ppm, about 80 ppm to about 1,000 ppm, about 90 ppm to about 1,000 ppm, about 100 ppm to about 1,000 ppm, about 10 ppm to about 900 ppm, about 20 ppm to about 900 ppm, about 30 ppm to about 900 ppm, about 40 ppm to about 900 ppm, about 50 ppm to about 900 ppm, about 60 ppm to about 900 ppm, about 70 ppm to about 900 ppm, about 80 ppm to about 900 ppm, about 90 ppm to about 900 ppm, about 100 ppm to about 900 ppm, about 10 ppm to about 800 ppm, about 20 ppm to about 800 ppm, about 30 ppm to about 800 ppm, about 40 ppm to about 800 ppm, about 50 ppm to about 800 ppm, about 60 ppm to about 800 ppm, about 70 ppm to about 800 ppm, about 80 ppm to about 800 ppm, about 90 ppm to about 800 ppm, about 100 ppm to about 800 ppm, about 10 ppm to about 700 ppm, about 20 ppm to about 700 ppm, about 30 ppm to about 700 ppm, about 40 ppm to about 700 ppm, about 50 ppm to about 700 ppm, about 60 ppm to about 700 ppm, about 70 ppm to about 700 ppm, about 80 ppm to about 700 ppm, about 90 ppm to about 700 ppm, about 100 ppm to about 700 ppm, about 10 ppm to about 600 ppm, about 20 ppm to about 600 ppm, about 30 ppm to about 600 ppm, about 40

ppm to about 600 ppm, about 50 ppm to about 600 ppm, about 60 ppm to about 600 ppm, about 70 ppm to about 600 ppm, about 80 ppm to about 600 ppm, about 90 ppm to about 600 ppm, about 100 ppm to about 600 ppm, about 10 ppm to about 500 ppm, about 20 ppm to about 500 ppm, about 30 ppm to about 500 ppm, about 40 ppm to about 500 ppm, about 50 ppm to about 500 ppm, about 60 ppm to about 500 ppm, about 70 ppm to about 500 ppm, about 80 ppm to about 500 ppm, about 90 ppm to about 500 ppm, about 100 ppm to about 500 ppm, about 10 ppm to about 400 ppm, about 20 ppm to about 400 ppm, about 30 ppm to about 400 ppm, about 40 ppm to about 400 ppm, about 50 ppm to about 400 ppm, about 60 ppm to about 400 ppm, about 70 ppm to about 400 ppm, about 80 ppm to about 400 ppm, about 90 ppm to about 400 ppm, about 100 ppm to about 400 ppm, about 10 ppm to about 300 ppm, about 20 ppm to about 300 ppm, about 30 ppm to about 300 ppm, about 40 ppm to about 300 ppm, about 50 ppm to about 300 ppm, about 60 ppm to about 300 ppm, about 70 ppm to about 300 ppm, about 80 ppm to about 300 ppm, about 90 ppm to about 300 ppm, about 100 ppm to about 300 ppm; or concentration ranges or specific concentration within these ranges.

15

In certain embodiments, the concentration of calcium salts can be from about 10 ppm to about 3,000 ppm, about 20 ppm to about 1,000 ppm, about 30 ppm to about 1,000 ppm about 40 ppm to about 1,000 ppm, about 50 ppm to about 1,000 ppm, about 60 ppm to about 1,000 ppm, about 70 ppm to about 1,000 ppm, about 80 ppm to about 1,000 ppm, about 90 ppm to about 1,000 ppm, about 100 ppm to about 1,000 ppm, about 10 ppm to about 900 ppm, about 20 ppm to about 900 ppm, about 30 ppm to about 900 ppm, about 40 ppm to about 900 ppm, about 50 ppm to about 900 ppm, about 60 ppm to about 900 ppm, about 70 ppm to about 900 ppm, about 80 ppm to about 900 ppm, about 90 ppm to about 900 ppm, about 100 ppm to about 900 ppm, about 10 ppm to about 800 ppm, about 20 ppm to about 800 ppm, about 30 ppm to about 800 ppm, about 40 ppm to about 800 ppm, about 50 ppm to about 800 ppm, about 60 ppm to about 800 ppm, about 70 ppm to about 800 ppm, about 80 ppm to about 800 ppm, about 90 ppm to about 800 ppm, about 100 ppm to about 800 ppm, about 10 ppm to about 700 ppm, about 20 ppm to about 700 ppm, about 30 ppm to about 700 ppm, about 40 ppm to about 700 ppm, about 50 ppm to about 700 ppm, about 60 ppm to about 700 ppm, about 70 ppm to about 700 ppm, about 80 ppm to about 700 ppm, about 90 ppm to about 700 ppm, about 100 ppm to about 700 ppm, about 10 ppm to about 600 ppm, about 20 ppm to about 600 ppm, about 30 ppm to about 600 ppm, about 40 ppm to about 600 ppm, about 50 ppm to about 600 ppm, about 60 ppm to about 600 ppm, about 70 ppm to about 600 ppm, about 80 ppm to about 600 ppm, about 90 ppm to about 600 ppm, about 100 ppm to about 600 ppm, about 10 ppm to about 500 ppm, about 20 ppm to about 500

ppm, about 30 ppm to about 500 ppm, about 40 ppm to about 500 ppm, about 50 ppm to about 500 ppm, about 60 ppm to about 500 ppm, about 70 ppm to about 500 ppm, about 80 ppm to about 500 ppm, about 90 ppm to about 500 ppm, about 100 ppm to about 500 ppm, about 10 ppm to about 400 ppm, about 20 ppm to about 400 ppm, about 30 ppm to about 400 ppm, about 40 ppm to about 400 ppm, about 50 ppm to about 400 ppm, about 60 ppm to about 400 ppm, about 70 ppm to about 400 ppm, about 80 ppm to about 400 ppm, about 90 ppm to about 400 ppm, about 100 ppm to about 400 ppm, about 10 ppm to about 300 ppm, about 20 ppm to about 300 ppm, about 30 ppm to about 300 ppm, about 40 ppm to about 300 ppm, about 50 ppm to about 300 ppm, about 60 ppm to about 300 ppm, about 70 ppm to about 300 ppm, about 80 ppm to about 300 ppm, about 90 ppm to about 300 ppm, about 100 ppm to about 300 ppm; or concentration ranges or specific concentration within these ranges.

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 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 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 substances and compositions of the present invention described herein possess flavor and/or mouthfeel modulating properties of non-animal protein. For example, the substances and compositions can enhance the following in non-animal protein containing consumables: enhanced mouthfeel and creaminess perception, and/or reduce sweet, lingering aftertaste, and/or reduce beany, bitter off-notes; and/or reduce astringency, and/or enhance drinkability of beverages.

In general terms, “mouthfeel” refers to the complexity of perceptions experienced in the mouth as influenced by the aroma, taste, and texture qualities of food and beverage products. From a technical perspective, however, mouthfeel sensations are specifically associated with physical

(e.g. tactile, temperature) and/or chemical (e.g. pain) characteristics perceived in the mouth via the trigeminal nerve. Accordingly, they are a consequence of oral-tactile stimulations and involve mechanical, pain and temperature receptors located in the oral mucosa, lips, tongue, cheeks, palate and throat.

- 5 Mouthfeel perceptions include, for example, one or more of texture - astringent, burning, cold, tingling, thick, biting, fatty, oily, slimy, foamy, melting, sandy, chalky, watery, acidic, lingering, metallic, body, body sweet, carbonation, cooling, warming, hot, juicy, mouth drying, numbing, pungent, salivating, spongy, sticky, fullness, cohesiveness, density, fracturability, graininess, grittiness, gumminess, hardness, heaviness, moisture absorption, moisture release,
- 10 mouthwatering, mouthcoating, roughness, slipperiness, smoothness, uniformity, uniformity of bite, uniformity of chew, viscosity, fast-diffusion, full body, salivation and retention.

By “improvement of mouthfeel” it is meant that any one or more of desired mouthfeel perceptions is/are enhanced and/or that any one or more undesirable mouthfeel perceptions is/are

15 reduced.

The term “off-note” refers to an unpleasant after taste that develops over time after consumption of consumables. One of the most important criterion for consumer acceptance of foods is flavor. Proteins have little flavor of their own, but influence flavor perception. Protein ingredients both

20 transmit undesirable off-notes to foods and reduce perceived impact of desirable flavorants. In response, Applicant has developed a composition that makes it possible to provide non-animal protein ingredients and products containing non-animal proteins with an improved flavor profile with reduced off-notes.

25 As used herein, the term “flavor modulating composition” refers to a composition capable of altering, improving or modulating the taste impact of non-animal protein contained in a consumable, including bitterness and/or beany off-notes.

As used herein, the term “non-animal protein” refers to protein preparations made from raw

30 materials including, but not limited to, grain (rice, millet, maize, barley, wheat, oat, sorghum, rye, teff, triticale, amaranth, buckwheat, quinoa); legume or pulses (soybean, sesame, mung beans, chickpeas, garbanzo, peas, fava beans, lentils, lima beans, lupins, peanuts, pigeon peas, runner beans, kidney beans, navy beans, pinto beans, azuki beans, cowpea, black-eyed peas); seed and oilseed (black mustard, India mustard, rapeseed, canola, safflower, sunflower seed, flax seed,

hemp seed, poppy seed, pumpkin, chia, sesame); nut (almond, walnut, Brazil, Macadamia, cashews, chestnuts, hazelnuts, pine, pecans, pistachio and ginkgo); algal (kelp, wakame, spirulina, chlorella); mycoprotein or fungal protein; insects and leaf protein.

- 5 It was found that the flavor modulating composition is capable, in the presence of non-animal protein, of imparting highly appreciated taste sensations to the products in which they are incorporated, such as “creaminess”. Because of this, the present flavor modulating composition can be employed to improve the flavor (including “mouthfeel”) of foodstuffs and beverages containing non-animal protein.

10

In certain embodiments, the consumable is selected from the group consisting of non-dairy milk, non-dairy milk beverages, non-dairy coffee creamer, non-dairy cream, almond milk, oat milk, pea milk, rice milk, soy milk, non-dairy lassi, non-dairy yoghurt beverages, non-dairy yoghurt drinks, non-dairy drinking yoghurt beverages, non-dairy probiotic drinking yoghurt beverages, non-dairy yoghurt smoothies, the like, and combinations thereof.

15

According to other embodiments, the flavor modulating composition may be used to reduce or eliminate off-notes imparted by dairy analog products containing non-animal protein. A “dairy analog” is a consumable that approximates the aesthetic qualities and/or chemical characteristics of certain types of dairy products.

20

In certain embodiments, a non-animal protein containing consumable is provided which includes a high concentration of non-animal protein. The total amount of non-animal protein may be between about 2% by weight and about 20% by weight, or between about 2% and about 15% by weight, or between about 3% and about 10% by weight, or between about 4% and about 8% by weight, between about 5% and about 7% by weight, or between about 6.4% to 6.5%, or about 6.4% protein by weight, or greater than 3% by weight, greater than 4% by weight, greater than 5% by weight, or greater than 6% by weight of the high protein beverage composition, or any percentage ranges or specific percentages within these ranges.

25

In another aspect of the present invention, there is further provided a plant-based consumable comprising the flavor modulating composition and a product base. By “product base” is meant the combination of all the usual art-recognized ingredients required for the particular consumable composition.

30

The flavor modulating composition may suitably be prepared in the form of a liquid, a paste or a powder. For example, the flavor modulating composition is a free-flowing powder.

5 In certain embodiments, the flavor modulating composition is in the form of a powder and comprises magnesium chloride or calcium chloride in an amount of 100%, based on the total weight of the flavor modulating composition. In certain embodiments, the flavor modulating composition is in the form of a powder and comprises magnesium chloride and/or calcium chloride in an amount about 10% to about 90%, or about 10% to about 80%, or about 10% to
10 about 70%, or about 10% to about 60%, or about 10% to about 50%, or about 10% to about 40%, or any percentage ranges or specific percentages within these ranges, based on the total percent of the flavor modulating composition.

In certain embodiments, a flavor modulating composition in accordance with the present
15 disclosure may comprise an aqueous component in one example, water is a basic solvent of the aqueous component, typically being the vehicle or primary liquid portion in which the remaining ingredients are dissolved, emulsified, suspended or dispersed.

Purified water can be used in the manufacture of certain embodiments of the flavor modulating
20 composition, and water of a standard beverage quality can be employed in order not to adversely affect taste, odor, or appearance. The water typically will be clear, colorless, free from objectionable minerals, tastes and odors, free from organic matter, low in alkalinity and of acceptable microbiological quality based on industry and government standards applicable at the time of production.

25 Other exemplary solvents include, but are not limited to, glycerol, arabitol erythritol, isomalt, lactitol, maltitol, mannitol, sorbitol, xylitol, vegetable oils, propylene glycol, ethanol and triacetin. In certain embodiments, a solvent is present at a level of from about 70% to about 99%, or from about 75% to about 95%, or from about 80% to about 90%, by weight of the flavor
30 modulating composition. In certain embodiments, the solvent is heated to about 40°C to about 60°C. In a subsequent step, magnesium chloride and calcium chloride are added to the solvent in an amount of about 5% to about 50%, or about 10% to about 40%, or about 20% to about 30%, or about 10% to about 20%, by weight of the flavor modulating composition.

In certain embodiments, the flavor modulating composition is in the form of a liquid and comprises magnesium chloride in an amount of about 10% to about 50%, or about 10% to about 40%, or about 10% to about 30%, or about 10% to about 20%, or any percentage ranges or specific percentages within these ranges, based on the total percent of the flavor modulating composition.

In certain embodiments, one or more amino acids are added to the solvent in an amount of about 1% to about 10%, or about 2% to about 8%, or about 3% to about 7%, or about 4% to about 6%, by weight of the flavor modulating composition. According to this embodiment, the flavor modulating composition may comprise at least four non-polar amino acids. The at least four non-polar amino acids are present in equal molar concentrations. The flavor modulating composition may further comprise at least one polar amino acid. This combination of non-polar and polar amino acids was found to generate improved or increased perception of saltiness, sweetness and/or umami, which could not be achieved by any other compositions known in the art.

Applicant has found that mixtures of amino acids, or amino acid “blocks” can help to improve the taste perception of non-animal protein containing consumables. These positive attributes help to reduce the off-note perception imparted by non-animal protein containing consumables. In particular, Applicant has found that a mixture of aliphatic/non-polar amino acids can bring some sweet notes that reduce the off-note perception imparted by non-animal protein.

In one embodiment, the flavor modifying composition according to the present disclosure may include at least four non-polar amino acids. Suitable non-polar amino acids include, for example, glycine, alanine, valine, proline, leucine, isoleucine, methionine, proline, phenylalanine, and tryptophan. In another embodiment, the flavor modifying composition may include at least five non-polar amino acids, and in another embodiment at least six non-polar amino acids.

In certain embodiments, the flavor modifying composition includes from about 10% to about 50%, or about 20% to about 40%, or about 25% to about 35% of non-polar amino acids, by dry weight of the flavor modifying composition.

In certain embodiments, the non-polar amino acids may be present in equal molar concentrations. In another embodiment, the non-polar amino acids may be present in equal ratios by weight/mass.

In another embodiment, the non-polar amino acids may be present in any ratio of non-polar amino acids to one another.

In certain embodiments, the flavor modifying composition according to the present disclosure may also include at least one polar amino acid selected from the group consisting of tyrosine,
5 serine, threonine, cysteine, glutamine, asparagine, aspartic acid, glutamic acid, lysine, histidine, arginine, and mixtures thereof.

In certain embodiments, the flavor modifying composition includes from about 1% to about 10%, or about 2% to about 8%, or about 3% to about 6%, or about 4% to about 5% of the at least one
10 polar amino acid, or any individual number within the range of the at least one polar amino acid, by dry weight of the flavor modifying composition, and depending upon the particular application desired.

The flavor modulating composition of the present invention can be used in flavor compositions in
15 conjunction with one or more ingredients or excipients conventionally used in flavor compositions beside flavoring substances, for example carrier materials and other auxiliary agents commonly used in the art. Suitable 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, flavor
20 agents, coloring agents, preservatives, antioxidants, emulsifiers, stabilisers, flavor-enhancers, anti-caking agents, and the like.

Examples of such carriers or diluents for flavor compositions may be found in for example, "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
25 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.

Other suitable and desirable ingredients of flavor compositions are described in standard texts, such as "Handbook of Industrial Chemical Additives", ed. M. and I. Ash, 2nd Ed., (Synapse
30 2000).

The flavor modulating composition obtained by and/or obtainable by the methods described herein may be added to non-animal protein containing consumables, such as dairy analogue

beverages, to improve mouthfeel and/or reduce/mask off-notes imparted by non-animal protein in the consumable. As used herein, the term "dairy analogue" or "dairy analog" refers to a non-dairy or vegan product.

According to other embodiments, the disclosed flavor modulating composition may be used to
5 reduce or eliminate off-notes imparted by non-animal protein such as plant protein. Exemplary plant proteins include soy protein and pea protein. As used herein, soy includes all consumables containing soy in any form, including soybean oil used either alone, in combination, for example as a nutraceutical, or as a medicament, soy bean curd, soy milk, soy butter or soy paste. The plant protein may comprise algae (such as spirulina), beans (such as black beans, canelli beans, kidney
10 beans, lentil beans, lima beans, pinto beans, soy beans, white beans), broccoli, edamame, nuts (such as almonds, brazil nuts, cashews, peanuts, pecans, hazelnuts, pine nuts, walnuts), peas (such as black eyed peas, chickpeas, green peas), potatoes, oatmeal, seeds (such as chia, flax, hemp, pumpkin, sesame, sunflower), grain (rice, millet, maize, barley, wheat, oat, sorghum, rye, teff, triticale, amaranth, buckwheat, quinoa), seitan (i.e., wheat gluten-based), tempeh, tofu,
15 mycoprotein or fungal protein; insects and leaf protein and mixtures thereof.

The disclosed flavor modulating composition may be prepared by heating a solvent, such as water and/or propylene glycol to approximately 55-65°C; adding a magnesium salt and/or calcium salt and optionally amino acids to the solvent to form a mixture; wherein the magnesium salt or
20 calcium salt is present in an amount of about 10-50% based on the total weight of the mixture; agitating the mixture until the magnesium salt, calcium salt, and amino acids are sufficiently dissolved; allowing the mixture to cool to approximately 15-25°C. The resulting flavor modulating composition can be added to a consumable in the any suitable form, such as a liquid, a paste or a powder.

25

If the flavor modulating composition is presented in the form of a powder, the powder form can be produced by a dispersive evaporation process, such as a spray drying process. Spray drying techniques and apparatus are well known in the art and need no detailed discussion herein. The powder form may be prepared by subjecting a liquid formulation containing the flavor
30 modulating composition to a dispersive evaporation process. The liquid formulation may comprise a solution, suspension or emulsion comprising the flavor modulating composition. The liquid formulation may contain other ingredients such as a carrier material and/or an adjuvant.

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.

5

Example 1

The organoleptic properties of a soy-protein based milk analogue (Reference Sample) was evaluated by a panel of six experienced flavorists. The panel concluded that Reference Sample exhibited an unpleasant taste, was too salty, and also exhibited a bitter aftertaste.

10

Example 2

The organoleptic properties of a rice-protein based milk analogue sweetened with sucrose and flavored with a vanilla flavor (Reference Sample) was evaluated by a panel of six experienced flavorists. The panel concluded that Reference Sample exhibited an unpleasant taste, was too salty, and also unpleasant licorice notes.

15

Example 3

20

A flavor modulating composition according to the present invention comprising 300 ppm magnesium chloride and 300 ppm calcium chloride was added to a soy-protein based milk analogue (Inventive Sample). A panel of six experienced flavorists evaluated the organoleptic properties of the soy-protein based milk analogue without the flavor modulating composition (Reference Sample) compared to the modified soy-protein based milk analogue containing the inventive flavor modulating composition. The entire panel overwhelmingly concluded that “the overall taste performance was clearly better than the reference”. In particular, the panel concluded that:

25

- 30 • The unpleasant sweet, lingering taste present in the Reference Sample was reduced in the Inventive Sample.
- The beany and bitter off-notes present in the Reference Sample were reduced in the Inventive Sample.
- The Inventive Sample exhibited an improved pleasant mineralic taste, as compared to the
- 35 Reference Sample.

- The Inventive Sample exhibited increased pleasant mouthfeel and creaminess, as compared to the Reference Sample.
- The Inventive Sample exhibited decreased unpleasant astringency, as compared to the Reference Sample.
- 5 • The Inventive Sample exhibited enhanced drinkability, as compared to the Reference Sample.

Example 4

10 A flavor modulating composition according to the present invention comprising 200 ppm magnesium chloride and 100 ppm calcium chloride was added to a rice-protein based milk analogue (Inventive Sample). A panel of six experienced flavorists evaluated the organoleptic properties of the rice-protein based milk analogue without the flavor modulating composition (Reference Sample) compared to the modified rice-protein based milk analogue containing the
15 inventive flavor modulating composition. The entire panel overwhelmingly concluded that “the overall taste performance was clearly better than the reference”. In particular, the panel concluded that:

- The unpleasant sweet, lingering taste present in the Reference Sample was reduced in the
20 Inventive Sample.
- The Inventive Sample exhibited increased pleasant mouthfeel and creaminess, as compared to the Reference Sample.
- The Inventive Sample exhibited enhanced drinkability, as compared to the Reference Sample.

25

Example 5

A flavor modulating composition according to the present invention comprising 300 ppm
30 magnesium chloride and 300 ppm calcium chloride was added to a soy-protein based milk analogue (Inventive Sample). A different composition comprising 300 ppm magnesium chloride, 300 ppm calcium chloride, and 700 ppm potassium chloride was added to a soy-protein based milk analogue (Comparative Sample). A panel of six experienced flavorists evaluated the organoleptic properties of the Inventive Sample and the Comparative Sample. The entire panel
35 overwhelmingly concluded that Comparative Sample “was not performing at all”. In particular,

the panel concluded that the Comparative Sample exhibited a disturbing increased bitterness, as compared to the Inventive Sample. The panel also concluded that the Inventive Sample exhibited a balanced flavor, whereas the balance of flavor was lost in the Comparative Sample. These results demonstrate that the disclosed flavor modulating composition exhibits superior flavor and/or mouthfeel modulating properties to non-animal protein, as compared to a different combination of inorganic salts.

Example 6

10 An unsweetened pea-protein based yoghurt was obtained from a local supermarket. 80 ppm of magnesium chloride and 70 ppm calcium chloride was mixed into the yoghurt. The product was evaluated by a panel of 4 experienced tasters with the original product as the reference. The panel agreed that the overall performance of the yoghurt containing the magnesium chloride and calcium chloride improved significantly, as compared to the reference sample. In particular, the
15 lingering beany off-notes were less noticeable in inventive sample and the lingering bitterness of the inventive sample was reduced, as compared to the reference sample.

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
20 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.

What is claimed is:

1. A consumable comprising:
a non-animal protein; and
5 a flavor modulating composition comprising magnesium chloride at a concentration of from 10 ppm to 3,000 ppm and calcium chloride at a concentration of from 10 ppm to 3,000 ppm, wherein the flavor modulating composition is free of potassium salts.
- 10 2. The consumable of claim 1, wherein the flavor modulating composition comprises inorganic salts consisting essentially of magnesium chloride and calcium chloride.
3. The consumable of claim 1, wherein the flavor modulating composition comprises is free of sodium salts.
- 15 4. The consumable of claim 1, wherein the flavor modulating composition is free of anions selected from the group consisting of phosphate, citrate, carbonate, sulfate, and combinations thereof.
- 20 5. The consumable of claim 1, wherein the flavor modulating composition further comprises amino acids.
6. The consumable of claim 5, wherein the flavor modulating composition comprises at least four non-polar amino acids.
- 25 7. The consumable of claim 6, wherein the at least four non-polar amino acids are present in equal molar concentrations.
8. The consumable of claim 6, wherein the at least four non-polar amino acids are selected
30 from the group consisting of glycine, alanine, valine, proline, leucine, isoleucine, methionine, proline, phenylalanine, tryptophan and mixtures thereof.
9. The consumable of claim 6, wherein the flavor modulating composition further comprises at least one polar amino acid.

35

10. The consumable of claim 9, wherein the at least one polar amino acid is selected from the group consisting of tyrosine, serine, threonine, cysteine, glutamine, asparagine, aspartic acid, glutamic acid, lysine, histidine, arginine and mixtures thereof.
- 5 11. The consumable of claim 1, wherein the consumable is plant-based.
12. The consumable of claim 11, wherein the plant-based consumable is a beverage or yoghurt.
- 10 13. The consumable of claim 1, wherein the consumable is selected from the group consisting of a dairy analogue, a cheese analogue, a cream cheese analogue, a cream analogue, a buttermilk analogue, a butter analogue, a margarine analogue, and combinations thereof.
14. The consumable of claim 1, wherein the non-animal protein is selected from the group consisting of soy protein, pea protein, rice protein, almond protein, oat protein, and combinations thereof.
- 15 15. The consumable of claim 1, wherein the magnesium chloride is present at a concentration of from 100 ppm to 1,000 ppm and the calcium chloride is present at a concentration of from 10 ppm to 1,000 ppm.
- 20 16. The consumable of claim 1, wherein the magnesium chloride is present at a concentration of from 100 ppm to 500 ppm and the calcium chloride is present at a concentration of from 100 ppm to 500 ppm.
- 25 17. A flavor modulating composition for the improving the flavor of a consumable comprising non-animal protein, wherein the composition comprises from 10% to 50% magnesium chloride and 10% to 50% calcium chloride, based on the total dry weight of the flavor modifying composition.
- 30 18. The flavor modulating composition according to claim 17 comprising from 10% to 20% magnesium chloride and 10% to 20% calcium chloride, based on the total dry weight of the flavor modifying composition.
- 35 19. The use of the flavor modulating composition according to claim 17 to improve the mouthfeel of non-animal protein containing consumables.

20. A method of improving the flavor and/or mouthfeel of a consumable comprising non-animal protein, comprising the step of adding to the consumable from 10 ppm to 3,000 ppm magnesium chloride and calcium chloride.