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(54) Title: FOOD PRODUCT CONTAINING TWO SECTIONS WHICH CONTAIN A BITTER TASTING COMPOUND AT DIFFERENT CONCENTRATIONS, AND METHOD FOR REDUCING BITTERNESS EMPLOYING SAID FOOD PRODUCT

(57) Abstract: The aim of the present invention is to prevent food products, which have an increased content of a healthy ingredient which has a bitter taste, from having negative taste attributes. The present invention provides such food products containing two sections, wherein the two sections are visually the same, and wherein the two sections contain a bitter tasting compound at different concentrations in the two sections. The ratio of concentrations of the bitter compound in the first and second section is between 1:1.1 to 1:20 based on the weight of the bitter tasting compound.



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FOOD PRODUCT CONTAINING TWO SECTIONS WHICH CONTAIN A BITTER TASTING COMPOUND AT DIFFERENT CONCENTRATIONS, AND METHOD FOR REDUCING BITTERNESS EMPLOYING SAID FOOD PRODUCT

5 The present invention relates to food products containing two sections, wherein the two sections are visually the same, and wherein the two sections contain a bitter tasting compound. The invention further relates to a product comprising said food product and instructions for consumption of that product. The invention further relates to a method for consumption of the said food product. The invention further relates to a method for
10 reduction of bitterness of food products. The invention further relates to a method for production of said food products.

Background of the invention

Food product manufacturers often wish to decrease the amount of some of the
15 ingredients of their food products, without compromising on the taste and liking of the products. As an example, reduction of the salt (kitchen salt, sodium chloride) level of food products would be advantageous for the health of the consumer, as high sodium intake may increase blood pressure. Also sugar reduction would be advantageous, because sugar contributes to the caloric value of a food product, and possibly to
20 obesity of the consumer. Replacing sugar by (artificial) sweeteners is often undesired, as these sweeteners may be perceived as unnatural by the consumer, or may contribute to an off-taste of the food product. Similarly replacing kitchen salt by alternatives likes potassium chloride may lead to off-taste of the food products, due to bitterness or metallic taste of potassium chloride.

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On the contrary to sugar and salt, it is often desired to increase the concentration of some bitter compounds in food products, as many compounds that are considered to be beneficial for health happen to taste bitter. For example, polyphenolics from red wine or olive oil are antioxidants with potential health benefits, and also taste bitter. As
30 another example, methylated xanthine derivatives (methylxanthines, which includes caffeine, paraxanthine, theophylline, theobromine and isocaffeine) are known to potentially affect the mood when ingested, and additionally have other beneficial effects like improved brain function, higher alertness, and appetite suppression. Also the methylxanthines taste bitter. There is a general desire in the food industry to enrich
35 food products with bitter tasting compounds like methylxanthines and also other

compounds, in order to achieve the beneficial effects of these compounds when consumed as ingredient of a food product.

Caffeine is a well-known constituent of food products like tea and coffee, and also of
5 chocolate. Theobromine naturally occurs in cocoa (at a level of about 2% by weight),
and is also present in chocolate, especially dark chocolate. Theophylline is naturally
found in tea, in small quantities. Typical caffeine levels of some food products per unit
amount serving range from about 8 mg in milk chocolate, up to about 150 mg in a cup
of coffee. The theobromine amount per unit amount serving of chocolate ranges from
10 about 60 to 180 mg. In general theobromine and caffeine levels vary widely in the
various natural sources of these compounds.

When food products are enriched with methylxanthines in order to deliver the positive
effects of these compounds by consuming these foods, these compounds may
15 increase the bitterness of the food product, which is for many consumers not
favourable. Caffeine and theobromine are compounds that are well-known for their
bitterness. Therefore many companies and institutions are working on the development
of foods containing bitter compounds like the methylxanthines, without having the bitter
taste profile.

20

Food products containing different sections with different concentrations of tastant are
known. At the 9th International Multisensory Research Forum (IMRF) in Hamburg,
Germany, 16th to 19th July 2008, the present inventors presented a paper wherein it
was disclosed that in spite of variations in food flavours over mouthfuls, we rarely
25 acknowledge or even perceive such variations. The consumer experiences a
contiguous food flavour despite obvious variation in sensory signals. A cookie model-
food-stimulus was developed, containing two sections, and whose two halves
sometimes differed in levels of sugar (0%, 33% and 67% sugar quantity differences)
but were visually indistinguishable (to ensure the assumption of a contiguous cookie).
30 When starting to eat the cookie at the half with the highest sugar concentration,
followed by eating (in a next bite) the half with a lower sugar concentration, sweetness
ratings for 0% and 33% cookie halves were indistinguishable, while the sweetness
difference between the halves of the '67% cookie' was observed. This effect can mask
flavour variation, but whose effects seem to be modulated by increasing exposure to
35 discrepant stimuli.

US 2007/0231430 A1 discloses candies containing different sections. These sections contain a different concentration of sour ingredients, leading to increasing sour intensity experience when eating the sections after each other. The eating of the candy is
5 finished with an extinguisher section, in order to douse the sourness. When consuming this candy the consumer perceives a difference in taste between the various sections.

Solutions as proposed for reduction of sugar level in the prior art are not suitable to be used as such for increasing the amount of healthy bitter compounds. Several reasons
10 for this are listed here.

Firstly the concentration of sugar needs to be reduced, while for a bitter compound the requirement is to increase the concentration.

15 The second reason relates to the different processes that occur in the mouth to sweet and bitter foods. On the tongue there is one type of sweet receptor but 25 types of bitter receptors. Bitter lingers in the mouth over several minutes whilst sweet rapidly disappears.

20 Thirdly sweet and bitter foods fundamentally differ in terms of liking. For example children have an unlearned preference for sweet tastes whilst bitter tastes are avoided (Birch et al. 1998; Paediatrics, 101, 539-549). Bitter tastes require repeated exposures and eventually become an acquired taste. Bitter conveys danger or another undesired cue (Glendinning J. I. 1994; Physiology & Behavior, 56, 1217-1227) which influences
25 the way a bitter tasting compound is experienced as compared to a sweet tasting compound. Variations in bitterness are more readily observed and are more memorable than that of sweetness or sour variation (Koster M. A. et al. 2004; Chemical Senses, 29, 441-453).

30 Fourth, disliked (bitter) and liked (sweet) activate different brain regions. Small D.M. et al. (Neuron, 39, 701-711, 2003) demonstrate that different brain areas respond to liked tasted like sweetness (right caudolateral orbital frontal cortex) and disliked tastes like bitterness (left dorsal anterior insula/operculum). Zald D.H. et al. (J. Neurophysiol., 87, 1068-1075, 2002) demonstrate that unpleasant tastes (quinine, which tastes bitter)
35 activated different regions (left amygdala, portions of anterior orbital frontal cortex and

inferior frontal pole) than a pleasant taste (sucrose solution, which tastes sweet). Based on this it cannot be concluded that a taste expectation, affecting the perception of sweetness, would affect the perception of bitterness, as both sensations do not share neurological circuitry.

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Concluding it cannot be assumed that what affects a liked stimulus will affect a disliked stimulus, and all these reasons make it more difficult to mask a bitter taste than a sweet taste.

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Summary of the invention

In spite of the many solutions that have been proposed, for example for reduction of sugar level in food products, there still is a need for food products which have an increased content of ingredients which are generally not especially appreciated by the consumer because of their bitter taste, but may be considered to be healthy when consumed in a suitable amount (here termed 'healthy ingredients'), or a combination of reduction of 'unhealthy' and increase of 'healthy' ingredients, without compromising on taste of the food products which contain concentrations of 'healthy' and 'unhealthy' ingredients in normal amounts. 'Normal amounts' should be understood to mean that the concentration of the tastant is what the consumer expects and likes. Bitterness especially is considered to be a difficult taste to mask, and good solutions to increase the concentration have not been found until now.

Hence it is an object of the present invention to provide food products which have an increased concentration of 'healthy' ingredients with a bitter taste, without compromising on the taste, flavour, feeling, mouthfeel and liking of these products as compared to similar products which do not have the increased level of bitter compound.

We have now found that the concentration of 'healthy' bitter tasting ingredients can be increased, while the consumer does not observe the increase of the bitter compound. The consumer perceives the food product to be homogeneous with regard to taste and of the same quality as food products without the increased content of bitter compound. This is achieved by distributing the bitter tasting compound across at least two sections in different concentrations, wherein the at least two sections have the same visual appearance (e.g. colour, structure, texture, or any other obviously and directly

perceivable property without tasting or smelling), such that the at least two sections of the food product appear to be having the same composition and that the food product is a homogeneous composition. These at least two sections are consumed in different bites or different sips. Due to the homogeneous appearance of the food product, the consumer expects a constant tasting food product, and the consumer does not detect the increase of the bitter ingredient. During the consumption of the food product, for example when having consumed the first section, and starting with the second section, the consumer still perceives the food product to be homogeneous, as the visual appearance of the second section is the same as that of the first section.

10

The first section (which is taken in first when consuming the food product) contains a relatively low concentration of the bitter tasting compound, while the second section (which is consumed directly after finishing the first section) contains a higher concentration of the bitter tasting compound. In general terms, if the sections would be eaten as single sections (not as part of a coherent food product comprising both sections), the consumer will like the first section more than the second section. That is because the first section contains a normal concentration (which means an amount that the consumer expects) of the bitter tasting compound, or a very low concentration of the bitter tasting compound. The first section of the food product is as the consumer likes it and expects it. The second section though contains a higher concentration of the bitter tasting compound, and the bitterness of the second section is higher than of the first section, and generally higher than the consumer would prefer.

Due to the homogeneous visual appearance, the consumer expects a homogeneously tasting product, and will indeed experience this when consuming the food product. The concentration difference of the bitter tasting compound between the two sections is not observed, and consequently the amount of bitter healthy compound can be increased, without the consumer noticing this. This may have beneficial health effects for the consumer.

30

Accordingly in a first aspect the present invention provides a food product containing two sections, wherein the two sections are visually the same, wherein the two sections contain a bitter tasting compound at different concentrations in the two sections, wherein the ratio of concentrations of the bitter tasting compound in the first section and second section is between from 1:1.1 to 1:20 based on weight of the bitter tasting

35

compound, wherein the two sections are consumable in discrete portions, and wherein the volume of each of the two sections is equal to or larger than a natural single bite or single sip.

- 5 In a second aspect the invention provides a product comprising said food product, and instructions for consumption of the food product, wherein the instructions define that the first section having the lower concentration of bitter tasting compound should be consumed first, immediately followed by consumption of the section having the higher concentration of bitter tasting compound.

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In a third aspect the invention provides a method for consumption of the said food product, wherein the first section having the lower concentration of bitter tasting compound is consumed first, immediately followed by consumption of the second section having the higher concentration of bitter tasting compound.

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In a fourth aspect the invention provides a method to reduce the bitterness of food products, by consuming said food product.

And finally in a fifth aspect the present invention provides a method for the production
20 of a food product comprising a bitter tasting compound, wherein the prepared food product contains two sections,
wherein the two sections are visually the same,
wherein the two sections contain a bitter tasting compound at different concentrations
in the two sections,

25 comprising the steps of:

- preparing a first mixture of food ingredients comprising the bitter tasting compound to form a first section;
- preparing a second mixture of food ingredients comprising the bitter tasting compound at a higher concentration to form a second section,
- 30 - combining the two mixtures and preparing the food product,
and wherein the ratio of concentrations of the bitter tasting compound in the first section and second section is between from 1:1.1 to 1:20 based on weight of the bitter tasting compound,
wherein the two sections are consumable in discrete portions,

and wherein the volume of each of the two sections is equal to or larger than a natural single bite or single sip.

5 DETAILED DESCRIPTION

Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art.

The term 'unhealthy ingredients' should be understood to relate to ingredients which
10 are not unhealthy as such, and they may also be ingredients which are consumed on a day to day basis as part of the normal diet. Such ingredients may become unhealthy for individual consumers when consumed in high quantities, wherein 'high' depends on the individual consumer and the specific diet of that consumer. Thus 'high' for one consumer may be a correct amount for another consumer. An example of such an
15 ingredient is salt (kitchen salt, sodium chloride), as a high sodium intake may lead to increased blood pressure. Another example is sugar, as sugar contributes to the caloric value of a food product, and therewith possibly to obesity of the consumer if that consumer takes in more calories than used when being active or by the metabolism.

20 The term 'healthy ingredients' should be understood to relate to ingredients which are considered to be healthy when consumed, however usually these are not yet part of the normal diet, or if they are part of the diet, they are consumed in too low amounts to be effective for health of the individual consumer. If consumed in quantities which may lead to a beneficial health effect, these ingredients may contribute to negative taste
25 attributes which are not generally liked by consumers. Examples are bitter compounds, like the methylxanthines or polyphenolic compounds from grape, wine, or olives.

All percentages, unless otherwise stated, refer to the percentage by weight. The term 'wt%' refers to the percentage by weight.

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Preferred aspects disclosed in connection with the first, or second, or third, or fourth or fifth aspect of the present invention, may also be applicable to the other aspects of the present invention, mutatis mutandis. The various features and embodiments of the present invention, referred to in individual paragraphs above apply, as appropriate, to
35 other paragraphs, mutatis mutandis. Consequently features specified in one

paragraphs may be combined with features specified in other paragraphs, as appropriate. All publications mentioned in the specification are herein incorporated by reference. Various modifications and variations of the described methods and products of the invention will be apparent to those skilled in the art without departing from the scope of the invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments. Indeed, various modifications of the described modes for carrying out the invention which are apparent to those skilled in the relevant fields are intended to be within the scope of the claims.

Food products

In a first aspect the present invention provides a food product containing two sections, wherein the two sections are visually the same, wherein the two sections contain a bitter tasting compound at different concentrations in the two sections, wherein the ratio of concentrations of the bitter tasting compound in the first section and second section is between from 1:1.1 to 1:20 based on weight of the bitter tasting compound, wherein the two sections are consumable in discrete portions, and wherein the volume of each of the two sections is equal to or larger than a natural single bite or single sip.

The food product according to the invention contains at least two sections, wherein the two sections are visually the same. The phrase 'visually the same' is understood to mean that the at least two sections have the same visual appearance, which relates to the colour, structure, texture, or any other obviously and directly perceivable property without tasting or smelling, such that the at least two sections of the food product appear to be having the same composition for the observer of the food product.

The two sections are consumable in discrete portions, which is understood to mean that the portions are consumed in different bites or different sips, and wherein the discrete portions have a size which is a normal average single bite or single sip size for the specific food product. The volume of the at least two sections is equal to or larger than a natural single bite or single sip. For example the first section may be consumed in 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 natural bites or natural sips. This means that for various food products the two sections may have different natural sizes. If the food product is a bread or a nutritional bar, then the natural single bite size may be larger than when the

food product is an ice cream. If the preferred food product is an ice cream, then the volume of the first section will be at least the size of one natural bite. The volume of the first section may also be the size of two or three or more natural bites.

- 5 Preferably the food product according to the invention is a food product wherein the second section has a volume maximally equal to the first section. In that case the consumer will consume the second section with a clear memory of the first section, and will remember the good tasting first section. For example the volume of the second section may be the same as the volume of the first section, or it may be half the volume
- 10 of the first section, or it may be a quarter of the first section, or any other volume smaller than the first section. The volume of the second section is equal to or larger than a natural single bite or single sip. For example the first section may be consumed in 1, 2, 3, 4, or 5 natural bites or natural sips.
- 15 Preferably, the first aspect of the invention provides a food product, wherein the food product is solid or semi-solid. A solid or semi-solid food product is understood to mean a product which has a solid or semi-solid appearance. This may include food product which partly contain liquid or soft ingredients or elements and partly contain solid ingredients. Examples of such products include but are not limited to bread, ice cream,
- 20 chocolate, candy bars, and nutritional bars. Preferably the food product is designed such that the two sections are arranged in linear fashion, thus next to each other. In linear fashion may also be understood that the food product is curved. Alternatively the second section may be a core surrounded by the first section. Alternative layouts may be suitable as well.
- 25
- Preferably the food product is a product wherein the two sections are in contact with each other, which is understood to mean that the two sections may be affixed to each other as a continuous product, for example in a nutritional bar wherein the two sections may form a homogeneous food product which seemingly does not contain discrete
- 30 sections. This way the preferred food product according to the invention is considered to be a food product having a homogeneous composition, and does not appear to be a product having sections with a different concentration of the tastant over the various sections.

The food product may be a beverage or other liquid product (like soup), in which case the food product is packed in packaging material in which the sections are divided over different compartments. When the liquid food product is consumed from the packaging material directly, then the design is such that the first section is consumed first,

5 followed by consumption of the second section.

The sections of the food product contain the same bitter tasting compound, at a different concentration though. The concentration of the bitter tasting compound is higher in the second section than in the first section. This is understood to mean that

10 the bitter tasting compound is distributed as homogeneous as possible in the sections of the food product (natural little variations can be neglected). The concentration of the bitter tasting compound in each section should be considered across the section as a whole. There may be tiny spots in the section which contain locally a higher or lower concentration of the bitter tasting compound, due to natural variations, or due to the

15 composition of the section. For example the section may contain chunks of an ingredient, and inside these chunks the local concentration of the bitter tasting compound may be higher or lower than seen on the scale of the section as a whole.

The concentration of the bitter tasting compound in the second section may be from 1.1

20 to 20 times as high as in the first section, based on the weight of the bitter tasting compound. Natural variations in the concentration of a bitter tasting compound in a product, which are undesired and unplanned in designing and manufacturing the product and which may be due to natural variations, or due to incomplete mixing, are considered to be outside the scope of this invention.

25

Preferably the food product according to the invention is a food product, wherein the ratio of concentrations of the bitter tasting compound in the first section and second section is between from 1:1.2 to 1:15, preferably between from 1:1.3 to 1:10; preferably between from 1:1.4 to 1:5; preferably between from 1:1.5 to 1:3; based on the weight of

30 the bitter tasting compound.

Alternatively, the ratio of concentrations of the bitter tasting compound in the first section and second section is preferably between from 1:1.1 to 1:3, preferably between from 1:1.2 to 1:2.5, preferably between from 1:1.3 to 1:2; preferably between from 1:1.4

35 to 1:1.8; preferably between from 1:1.5 to 1:1.6.

The present invention may be suitable for many kind of food products. Preferred though are products like soup, bread, baked dough products, cookies, biscuits, baked pastry products, ice cream, nutritional bars, chocolate, and condiments. More preferred

5 the food product is chosen from the group of soup, bread, baked dough products, baked pastry products, ice cream, and nutritional bars.

Preferred food products comprising methylxanthines

In a preferred embodiment, the food product according to the invention comprises a

10 bitter tasting compound, is a methylxanthine. Preferably the methylxanthine is chosen from one or more of the group consisting of caffeine, theobromine, theophylline, paraxanthine, and isocaffeine. Preferably the food products according to the present invention comprise a total amount of from 100 to 3,000 milligram of methylxanthines per unit amount of the food product. Preferably the methylxanthine is chosen from one

15 or more of the group consisting of caffeine, theobromine, theophylline, and paraxanthine. Preferably the food products according to the invention comprise at least 200 mg, more preferably at least 300 mg methylxanthines per unit amount of the food product.

20 More preferably the food product according to the invention comprises a bitter tasting compound, comprising theobromine or caffeine or a mixture of these. A mostly preferred food product according to the invention is an ice cream that contains theobromine as the bitter tasting compound. Preferably the concentration of theobromine in the first section is between 300 and 700 mg per kg product based on

25 the weight of the first section, and the concentration of theobromine in the second section is between 4,000 and 12,000 mg per kg product based on the weight of the second section. More preferred the concentration of theobromine in the first section is between 400 and 600 mg per kg product based on the weight of the first section. More preferred the concentration of theobromine in the second section is between 5,000 and

30 10,000 mg per kg product based on the weight of the second section, mostly preferred between 5,500 and 9,000 mg per kg product based on the weight of the second section. Mostly preferred a food product according to the invention is an ice cream that contains these ranges of theobromine.

Preferably the food product according to the invention comprises caffeine in an amount from 20 to 500 milligram per unit amount of the food product, more preferably comprises caffeine in an amount from 50 to 200 milligram, most preferably from 70 to 150 milligram per unit amount of the food product.

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Another preferred food product according to the invention comprises theobromine in an amount from 80 to 2,980 milligram per unit amount of the food product. More preferred the food product according to the invention comprises theobromine in an amount from 250 to 1,200 milligram per unit amount of the food product, even more preferred in an
10 amount of 300 to 1,000 milligram, more preferably from 400 to 800 milligram, and mostly preferred from 600 to 800 milligram per unit amount of the food product.

These ranges as separately indicated for the preferred methylxanthines caffeine and theobromine may be combined in a single food product.

15

A preferred food product of the present invention is a food product that comprises caffeine in an amount from 20 to 500 milligram and theobromine in an amount from 80 to 2,980 milligram per unit amount of the food product. More preferred a food product according to the present invention comprises from 30 to 300 milligram caffeine and
20 from 200 to 1,200 milligram theobromine per unit amount of the food product. Most preferred a food product according to the present invention comprises from 40 to 200 milligram caffeine and from 300 to 1,000 milligram theobromine per unit amount of the food product.

25 A unit amount of a food product is a quantity of a food product which is usually consumed as a single serving. The unit amount or serving size of such food products depends on the specific product. A few non-limiting examples of typical serving sizes are:

milk, yoghurt: 200 mL

30 natural cheese: 43 gram

processed cheese: 57 gram

fruit juice: 177 mL

soft drink: 200 mL

bread: 1 slice, 35 gram

35 coffee: 125 mL

tea: 150 mL

cereal bar, candy bar: 50 gram

chocolate: 30 gram

ice cream: 100 mL

5 spread: 15 gram

soup: 250 mL

cocoa beverage: 200 mL

A unit amount of a food product in the context of the present invention may be packed
10 and sold as a single portion. For example, ice cream may be packed as individual
units, therewith making such an individual portion a unit amount in the context of the
present invention. The actual weight or volume of such an individually packed product
may be higher or lower than indicated above for a standard serving size. For example
some ice creams sold as single portions in single packs have a volume of 150 mL or
15 more.

The food product may be dried and contain less than 40% water by weight of the
composition, preferably less than 25%, more preferably from 1 to 15%. Alternatively,
the food may be substantially aqueous and contain at least 40% water by weight of the
20 composition, preferably at least 50%, more preferably from 65 to 99.9%.

The food product preferably comprises nutrients including carbohydrate (including
sugars and/or starches), protein, fat, vitamins, minerals, phytonutrients (including
terpenes, phenolic compounds, organosulfides or a mixture thereof) or mixtures
25 thereof. The food may be low calorie (e.g. have an energy content of less than 100
kCal per 100 g of the composition) or may have a high calorie content (e.g. have an
energy content of more than 100 kCal per 100 g of the composition, preferably
between 150 and 1,000 kCal). The food may also contain salt, flavours, colours,
preservatives, antioxidants, non-nutritive sweetener or a mixture thereof.

30

Preferred additional tastants

A preferred aspect of the invention is a food product according to the first aspect of the
invention, wherein the two sections additionally contain a tastant at different
concentrations in the two sections, wherein the tastant is a sweet tastant, or a sour
35 tastant, or a salty tastant, or an umami tastant, or a combination of two or more of

these tastants, and wherein the ratio of concentrations of the additional tastant in the first section and second section is between from 20:1 to 1.1:1 or between from 1:1.1 to 1:20 based on weight of the tastant.

- 5 The food products according to the invention preferably additionally contain a sweet tastant, or a sour tastant, or a salty tastant, or an umami tastant, or a combination of two or more of these tastants. If in a preferred embodiment the food production comprises a combination of tastants within the context of the invention, then the first tastant may be reduced in the second section as compared to the first section (e.g. sugar), and the bitter tasting compound is increased in the second section as compared to the first section (e.g. theobromine). It may also be the case that the food product comprises two additional tastants which both have a decreased concentration in the second section, as compared to the first section. Or alternatively the other way around: tastants which both have an increased concentration in the second section, as compared to the first section.

As indicated before, especially sugar and salt are compounds for which there is a desire to decrease the concentration in the food product, without noticing by the consumer. Hence preferably the food product according to the invention additionally contains a sweet tastant or a salty tastant, or a combination of these. Preferably the sweet tastant is sugar (sucrose), preferably the salty tastant is kitchen salt (sodium chloride). For these preferred tastants the concentration of the tastant in the first section is higher than the concentration of the tastant in the second section. In that case the amount of sweet or salty tastant can be reduced as compared to a conventional food product.

In case a reduction of an additional tastant is desired (e.g. salt, sugar), the first section (which is taken in first when consuming the food product) contains a normal concentration of the tastant, while the second section (which is consumed directly after finishing the first section) contains a lower concentration of the tastant. In general terms, if the sections would be eaten as single sections (not as part of a coherent food product comprising both sections), the consumer will like the first section more than the second section. That is because the first section contains a normal concentration (which means an amount that the consumer expects) of the additional tastant, for example in case of sugar the sweetness of the first section is as the consumer likes it

and expects it. The second section though contains a lower concentration of the tastant, and again in case of sugar, the sweetness of the second section is lower than of the first section, and generally lower than the consumer would prefer.

- 5 In case the additional tastant is a sweet tastant, the additional tastant preferably is sugar (sucrose). A preferred food product according to the invention then is chosen from the group consisting of cookies, biscuits, baked dough products, baked pastry products, ice cream, nutritional bars, chocolate, and condiments. An example of a nutritional bar according to the invention would be a bar having a base of a biscuit-like
10 composition, wherein the base consists of three sections, arranged in linear fashion. Thus a first section is affixed to a second section, which is affixed to a third section. The first and third sections of this preferred product contain a normal amount of sugar, while the second section contains a lower amount of sugar. The base seems to form a homogeneous base, the consumer does not observe a difference between the
15 sections. The entire base may be covered by a kind of fruit layer, or jelly or fruit puree layer.

In case the additional tastant is a salty tastant, the additional tastant preferably is kitchen salt (sodium chloride). A preferred food product according to the invention then
20 is chosen from the group consisting of soup, bread, baked dough products, baked pastry products, and nutritional bars.

Different additional tastants may have different preferred concentration ranges between the sections. For example if the tastant is a sweet tasting compound, then preferably
25 the concentration in the second section is lower than in the first section. The ratio of the concentration of the additional sweet tastant between the first section and the second section is preferably between from 20:1 to 1.1:1, preferably between from 15:1 to 1.2:1, preferably between from 10:1 to 1.3:1, preferably between from 5:1 to 1.4:1, preferably between from 3:1 to 1.5:1. Alternatively, the ratio is preferably between from 3:1 to
30 1.1:1, preferably between from 2.5:1 to 1.2:1, preferably between from 2:1 to 1.3:1, preferably between from 1.8:1 to 1.4:1; preferably between from 1.6:1 to 1.5:1 or between from 1:1.5 to 1:1.6.

If the additional is a salty tasting compound, then preferably the concentration in the
35 second section is lower than in the first section. In case the additional tastant is a salty

tasting compound, the ratio of the concentration of the additional salty tastant between the first section and the second section is preferably between from 20:1 to 1.1:1, preferably between from 15:1 to 1.2:1, preferably between from 10:1 to 1.3:1, preferably between from 5:1 to 1.4:1, preferably between from 3:1 to 1.5:1.

- 5 Alternatively, the ratio is preferably between from 3:1 to 1.1:1, preferably between from 2.5:1 to 1.2:1, preferably between from 2:1 to 1.3:1, preferably between from 1.8:1 to 1.4:1; preferably between from 1.6:1 to 1.5:1 or between from 1:1.5 to 1:1.6.

10 *Optional further sections*

Preferably the food product may contain more than two sections, and the concentration of the bitter tasting compound in possible third, fourth or other sections will be adapted to the concentration in the first and second sections. Hence preferably the food product according to the invention is a food product additionally containing a third section,

- 15 wherein the three sections are visually the same, wherein the ratio of concentrations of the bitter tasting compound in the first section and third section is between from 1.1:1 and 1:1.1 based on weight of the bitter tasting compound, wherein the three sections are consumable in discrete portions, and wherein the volume of each of the three sections is equal to or larger than a natural single bite or single sip. The concentration
20 of the bitter tasting compound in the third section is similar to the concentration of the bitter tasting compound in the first section, small natural variations (which are part of a common food manufacturing process) excluded. Alternatively an optional third section may contain a concentration of the bitter tasting compound which is up to 1.5 times higher or up to 1.5 times lower than the concentration of the bitter tasting compound in
25 the second section. A preferred third section, may 'rinse' the higher bitterness perception which may have been brought about by the second section, leading to the perception that the product as a whole contains a normal concentration of the bitter tasting compound, while in fact it has been reduced.

- 30 Preferably the optional third section is in contact with the second section and not with the first section. This may be understood to mean that the three sections of the food product are arranged in a linear fashion, wherein the second section is located between the first and third sections. 'In linear fashion' may also be understood that the food product is not straight, but may be curved. Alternatively the third section forms a
35 core, surrounded by a shell of the second section, which again is covered by a shell of

the first section. The three sections together appear to form a homogeneous food product, wherein no concentration difference of the bitter tasting compound seems to occur. Preferably the volume of the third section is about equal to the volume of the first section. Alternatively the volume of the third section is smaller than the volume of the first section, or it is larger than the volume of first section. The volume of the optional third section is equal to or larger than a natural single bite or single sip. For example the third section may be consumed in 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10 natural bites or natural sips.

- 10 When consuming a preferred food product according to the invention having three discrete sections, usually the consumer starts with the first section having a normal concentration of the bitter tasting compound, followed by eating the second section in a next bite having an increased or decreased (as applicable) concentration of the bitter tasting compound. Subsequently the third section is consumed, again having a normal concentration of the bitter tasting compound. Hence the consumer ends the consumption of the section of the preferred food product that has a normal concentration of the bitter tasting compound, which is the concentration of the bitter tasting compound that the consumer likes. Therefore the impression that the consumer gets from consumption of this product is that the product is homogeneous, and the section having an increased or decreased concentration of the bitter tasting compound is not observed.

An optional third section again preferably contains a concentration of the bitter tasting compound similar to the first section. Also additional tastants which may be present in the third section preferably have a similar concentration as in section 1. A preferred food product according to the invention additionally may contain a fourth section in addition to the three sections, wherein the four sections are visually the same, wherein the ratio of concentrations of the bitter tasting compound in the second section and fourth section is between from 1.1:1 and 1:1.1 based on weight of the bitter tasting compound, wherein the four sections are consumable in discrete portions, and wherein the volume of each of the four sections is equal to or larger than a natural single bite or single sip. The concentration of the bitter tasting compound in the fourth section is similar to the concentration of the bitter tasting compound in the second section, small natural variations (which are part of a common food manufacturing process) excluded. Preferably the optional fourth section is in contact with the third section and not with the

- first or second section. This may be understood to mean that the four sections of the food product are arranged in a linear fashion, wherein the second and third sections are located inbetween the first and fourth sections. 'In linear fashion' may also be understood that the food product is not straight but curved. Alternatively the fourth
- 5 section forms a core, surrounded by a shell of the third section, which again is covered by a shell of the second section, which again is covered by a shell of the first section. The four sections together appear to form a homogeneous food product, wherein no concentration difference of the bitter tasting compound seems to occur. Preferably the volume of the fourth section is about equal to the volume of the second section.
- 10 Alternatively the volume of the fourth section is smaller than the volume of the first section, or it is larger than the volume of first section. The volume of the optional fourth section is larger than a natural single bite or single sip. For example the fourth section may be consumed in 1, 2, 3, 4, or 5, natural bites or natural sips.
- 15 An optional fifth section is similar to the optional third section, mutatis mutandis. An optional sixth section is similar to the optional fourth section, mutatis mutandis. The food product also may contain more sections, as applicable. The same considerations as for the ratios of concentration of the bitter tasting compound in the sections, can be applied mutatis mutandis to the additional tastants, which may be a sweet tasting
- 20 compound or a salty tasting compound.

Instructions for consumption of the food product and method for consumption of the food product

- 25 The food product comprises a tastant which is a bitter tasting compound, and the second section contains a higher concentration of that tastant than the first section and an optional third section (and mutatis mutandis more sections having the corresponding concentrations might be included). The second aspect of the invention hence provides a product comprising said food product, and instructions for
- 30 consumption of the food product, wherein the instructions define that the first section having the lower concentration of bitter tasting compound should be consumed first, immediately followed by consumption of the section having the higher concentration of bitter tasting compound, and optionally immediately followed by consumption of the third section having the lower concentration of bitter tasting compound. Optional further
- 35 sections are preferably consumed subsequently. The instructions may be printed on

the pack in which an individual item or multiple items of the food product according to the invention is packed. Alternatively the instructions may be implicit, in the sense that the product has been designed in such a way as to leaving the consumer no choice than eating the product section by section.

5

In a third aspect the invention provides a method for consumption of the said food product, wherein the first section having the lower concentration of bitter tasting compound is consumed first, immediately followed by consumption of the second section having the higher concentration of bitter tasting compound, and optionally
10 immediately followed by consumption of the third section having the lower concentration of bitter tasting compound. Optional further sections are preferably consumed subsequently. The method for consumption of the food product may be followed by the consumer by adhering to the earlier described instructions. Alternatively the design of the food product may be such that the consumer automatically is directed
15 to consuming the first section first, followed by the second section, and followed by an optional third section. For example, in case of an ice cream which is at the base affixed to a wooden stick, the first section is the top of the ice cream which is eaten firstly, and the second section is then eaten after finishing the first section. An optional third section is then eaten as the last section. Also the package design and way of opening
20 the package may lead the consumer to eating the first section first, followed by the second section, followed by the second section and optional further sections.

In a fourth aspect the invention provides a method for reduction of the bitterness of food products, by consuming the food product according to the first aspect of the
25 invention. In spite of a relative high concentration of the bitter tastant in the second section (and optional further sections), the food product is not considered to taste bitter, according to the consumer who eats that food product.

In case the food product additionally comprises a tastant which is a sweet tasting
30 compound, then the second section contains a lower concentration of that tastant than the first section and an optional third section (and mutatis mutandis more sections having the corresponding concentrations might be included). By the method for consumption of the said product according to the third aspect of the invention, the concentration of the sweet tasting compound can be reduced, without compromising on
35 the quality of the food product. The consumer will not notice the difference in

concentration of the sweet compound. Hence the present invention also provides a method for reduction of the concentration of a sweet tastant, by consuming said preferred food product. In spite of a relative low concentration of the sweet tastant in the second section (and optional further sections), the food product is not considered to
5 taste less sweet, according to the consumer who eats that food product.

In case the food product additionally comprises a tastant which is a salty tasting compound, then the second section contains a lower concentration of that tastant than the first section and an optional third section (and mutatis mutandis more sections
10 having the corresponding concentrations might be included). By the method for consumption of the said product according to the third aspect of the invention, the concentration of the salty tasting compound can be reduced, without compromising on the quality of the food product. The consumer will not notice the difference in concentration of the sweet compound. Hence the present invention also provides a
15 method for reduction of the concentration of a salty tastant, by consuming said preferred food product. In spite of a relative low concentration of the salty tastant in the second section (and optional further sections), the food product is not considered to taste less salty, according to the consumer who eats that food product.

20

Production of the food products

In a fifth aspect the present invention provides a method for the production of a food product comprising a bitter tasting compound, wherein the prepared food product contains two sections, wherein the two sections are visually the same, wherein the two
25 sections contain a bitter tasting compound at different concentrations in the two sections, comprising the steps of:

- preparing a first mixture of food ingredients comprising the bitter tasting compound to form a first section;
 - preparing a second mixture of food ingredients comprising the bitter tasting
30 compound at a higher concentration to form a second section,
 - combining the two mixtures and preparing the food product,
- and wherein the ratio of concentrations of the bitter tasting compound in the first section and second section is between from 1:1.1 to 1:20 based on weight of the bitter tasting compound, wherein the two sections are consumable in discrete portions, and

wherein the volume of each of the two sections is equal to or larger than a natural single bite or single sip.

Preferably the method according to the fourth aspect of the invention for the production
5 of a food product comprising a bitter tasting compound, wherein the prepared food product contains a third section containing a bitter tasting compound, comprises the additional step of preparing a third mixture of food ingredients comprising the bitter tasting compound to form a third section, and combining the third section with the first section and the
10 second section, and wherein the ratio of concentrations of the bitter tasting compound in the first section and third section is between from 1:1:1 and 1:1.1 based on weight of the bitter tasting compound, wherein the three sections are consumable in discrete portions,
15 and wherein the volume of each of the three sections is equal to or larger than a natural single bite or single sip.

Preferred aspects disclosed in connection with the first aspect of the present invention, may also be applicable to the fifth aspect of the present invention, *mutatis mutandis*.

20

The method for production depends on the actual food product according to the invention. For example if the food product is an ice cream, then the preparation method involves a freezing step. Or another example if the food product is a biscuit, then the preparation method involves a baking step.

25

EXAMPLES

The following non-limiting example illustrates the present invention.

30 Example 1: Ice cream containing theobromine

Two different types of ice creams containing theobromine were made, wherein the difference consisted in the distribution of theobromine in the sections.

The two ice cream types each had a slightly tapered cylindrical shape, with a length of
35 about 10 cm, and a diameter of about 2 cm (total volume about 33 milliliter). The ice

cream had a wooden stick on one end, in the longitudinal direction of the ice cream, in order to be able to hold the ice cream and eat it.

The first ice cream (according to the invention) consisted of three sections, each
5 section having a cylindrical shape and a volume of about 11 milliliter, and having a diameter of about 2 cm, and a length of about 3.5 cm. These three sections were connected to each other, and had the same visual appearance, such that the ice cream appeared to have a homogeneous composition and had a cylindrical shape. The concentration of theobromine in the two outer sections was 514 mg per kg, based on
10 the weight of the section. The concentration in the middle section was 6,000 mg per kg product, based on the weight of the section. The total amount of theobromine in this first ice cream was 81 milligram. As the orientation of the wooden stick was longitudinal to the length of the ice cream, and connected to the centre of the third section, the ice cream was consumed by eating the first outer section having low theobromine content,
15 followed by the second middle section having a high concentration of theobromine, and finally followed by the third other outer section attached to the wooden stick, having a low theobromine concentration again. Each section was consumable in about 3 bites.

The second ice cream was a comparative example, having a homogeneous
20 composition. The theobromine was distributed homogeneously in the ice cream, at a concentration of 2314 mg per kg product, based on the weight of the ice cream. The total amount of theobromine in this second ice cream was also 81 milligram.

The ice creams were formulated from the premix as indicated in table 1.

Table 1 *Formulation of the premix used to make the ice creams.*

ingredients	concentration [wt%]
water	33.7
cream 40%	24
sucrose	15.2
guar gum	0.1
carrageenan	0.01
condensed skimmed milk	22
sugared egg yolk	1
glucose syrup	1.5
flavour vanilla	0.5
cocoa powder	2

The desired quantities of water, sugar, milk powders, cocoa powder, fat, stabilisers, emulsifiers and flavours were manually weighed and dosed into a mixing vessel where

5 these ingredients were blended together to form a premix. Cocoa powder was added to the mix and dispersed using a Silverson mixer. Theobromine, where added, was also added to the mix and dispersed using a Silverson mixer. The premix was filtered before further processing by homogenisation, to break-up and disperse fat droplets, high temperature short time (HTST) pasteurisation and cooling to produce an ice cream mix.

10 After HTST pasteurisation, the mix was rapidly cooled (within 2 minutes) to 6-9°C and transferred to a storage tank where its temperature was maintained at lower than 5°C.

Products were made using moulds, which are slightly tapered cylindrical shapes of approximately 40 milliliter volume. The mould was partially submerged in a brine bath

15 at -27°C. The premix was normally added, and after approximately 5 minutes, sticks were inserted. After a further 15-20 minutes, the mould was removed from the brine solution and partially submerged in warm water. The products melted around the edges and were then released from the mould. They were then placed in waxed bags and put in storage at -20°C until consumed.

20

The first ice creams according to the invention having three sections were made by filling the mould with smaller quantities, in separate sections having different

theobromine concentrations, allowing 5 minutes to partially freeze the section before the next one was added. Sticks were inserted in the final section.

The second ice creams (homogeneous, comparative examples) were also made in
5 three sections (each section having the same composition), so that any visual cue, due to sections, will be present in these samples also.

The two ice cream types were tasted by 5 persons, and these persons were not aware of the difference between the two ice creams. They perceived the first ice cream having
10 three sections with different theobromine concentrations as less bitter as compared to the product containing the same total amount of theobromine but distributed homogeneously in the three sections. This shows that a food product according to the invention is perceived to be less bitter than a comparative product wherein a bitter
15 tastant is distributed homogeneously.

Example 2: Four ice creams containing theobromine in time-intensity test

In the same way as in example 1, and with the same premixes, four ice creams were prepared, each with 3 sections. The sections had various theobromine levels, as
20 indicated in the following table. The volumes and sizes of the sections of the ice creams in this example were the same as in example 1, so each ice cream had a slightly tapered cylindrical shape, with a length of about 10 cm, and a diameter of about 2 cm (total volume about 33 milliliter). The ice cream had a wooden stick on one end, in the longitudinal direction of the ice cream, in order to be able to hold the ice cream and
25 eat it. Each section had a cylindrical shape and a volume of about 11 milliliter, with a diameter of about 2 cm, and a length of about 3.5 cm. These three sections were connected to each other, and had the same visual appearance, such that the ice cream appeared to have a homogeneous composition and had a cylindrical shape.

30 The layout of the four ice creams and the concentration of theobromine in the various sections have been schematically indicated in the following table.

Table 2: Schematic layout and theobromine concentrations in the individual sections of the four ice creams.

	<i>ice cream A (comparative) 'low'</i>	<i>ice cream B (comparative) 'high'</i>	<i>ice cream C (according to the invention) 'layered'</i>	<i>ice cream D (comparative) 'mean'</i>
<i>section 1 (outer) theobromine conc. [mg/kg] in section</i>	1,000	9,900	1,000	4,000
<i>section 2 (middle) theobromine conc. [mg/kg] in section</i>	1,000	9,900	9,900	4,000
<i>section 3 (outer, connected to stick) theobromine conc. [mg/kg] in section</i>	1,000	9,900	1,000	4,000
<i>total theobromine content per total ice cream [mg]</i>	35	346.5	140	140

Ice cream A was an ice cream having a relatively low theobromine content,

5 homogeneously distributed.

Ice cream B was an ice cream having a relatively high theobromine content,
homogeneously distributed.

Ice cream C was an ice cream having a theobromine between A and B, and distributed
in 3 sections, according to the invention.

10 Ice cream D was an ice cream having the same total theobromine content as ice cream
C, distributed homogeneously.

Time-intensity measurements

The experiment's aim was to measure the overall perception and the lingering

15 perception of bitterness that consumers would get while eating the different variants of
ice cream (see table 2). In this method, panellists were asked to eat the ice creams and
to evaluate the bitterness of the ice creams throughout its consumption.

The time-intensity test was carried out by letting panellists eat 3 bite-sizes of ice cream, to measure the bitterness perception of the sequence of the 3 sections with different levels as in a whole ice cream according to the invention. So, for example, to simulate ice cream A panellists received 3 x 5 gram bites of ice cream having a theobromine concentration of 1000 mg/kg based on the section. To simulate ice cream C, panellists received 5 grams of ice cream having a theobromine concentration of 1000 mg/kg based on the section, 5 grams of ice cream having a theobromine concentration of 9,900 mg/kg based on the section and then 5 grams of ice cream having a theobromine concentration of 1,000 mg/kg based on the section again to finish.

In order to simulate the speed at which consumers would eat such product, a time interval of 30 seconds was fixed between each bite. Panellists tasted the 3 x 5 grams as follows: taste the first bite on 0 seconds, the second bite on 30 seconds, the third bite on 60 second, swallow after 90 seconds and measure the bitterness intensity of the sample during 10 minutes.

Twelve panellists trained to time-intensity measurements performed the test. Bitterness intensity as function of time was scored on a relative scale, to compare the four ice creams.

Table 3: Bitterness intensity data in relative units for the four ice creams tasted in time-intensity test.

<i>time in test [sec]</i>	<i>ice cream A (comparative) 'low' [unit]</i>	<i>ice cream B (comparative) 'high' [unit]</i>	<i>ice cream C (according to the invention) 'layered' [unit]</i>	<i>ice cream D (comparative) 'mean' [unit]</i>
0	0	0	0	0
32	28			
35		40		40
38			36	
76	50		64	
78		71		71
92	57			
95			72.1	
98		78.8		78.4
160	27			
208			36	
230	0			
235				40
242		39.5		
350			0	
395				0
425		0		

Three parameters were determined from the bitterness intensity data to determine

5 bitterness intensity of the ice cream samples:

1. the maximum intensity, which indicates the maximum bitterness intensity perceived for each sample;
2. the time it takes for lingering, meaning how long it takes before a bitter taste has completely disappeared from the mouths of the panellists;
- 10 3. the area under the curve: giving the total perceived bitterness of a sample as determined from the total area of bitterness intensity as function of time.

The following table indicates for the four icecreams these three parameters. Note that the third section was swallowed at a time of 90-91 seconds.

Table 4: Bitterness intensity and lingering time for the four ice creams tasted in time-
5 intensity test.

	<i>maximum bitterness intensity [relative unit]</i>	<i>maximum reached at time in test [sec]</i>	<i>time in test when intensity is zero [sec]</i>	<i>bitterness lingering time (from max to zero) [sec]</i>	<i>area under the curve (total bitterness) [unit]</i>
<i>ice cream A - 'low'</i> (comparative)	57% [#]	92	230	138	2,547 [#]
<i>ice cream B – 'high'</i> (comparative)	78.8% ^{&}	98	425	327	5,755 ^{&}
<i>ice cream C – 'layered'</i> (according to the invention)	72.1% [*]	95	350	255	4,229 [*]
<i>ice cream D – 'mean'</i> (comparative)	78.4% ^{&}	98	395	297	5,302 ^{&}

[#] statistically significant different than ice creams B, C, D

[&] statistically significant different than ice creams A, C

^{*} statistically significant different than ice creams A, B, D

- 10 The lowest maximum intensity and the shortest bitter lingering effect are obtained with ice cream A, which contains least theobromine. Strongest effects are obtained for ice creams B and D, which contain different amounts of theobromine, which are homogeneously distributed though. The total bitterness perceived of sample B can be explained by that sample B contains most theobromine. Interestingly the ice cream C
- 15 (layered product according to the invention) showed better results than product D which contains the same total amount of theobromine. Nevertheless the bitterness intensity, total bitterness and the lingering effect are lower for ice cream C than for ice

cream D. This shows that a product according to the invention shows lower bitterness than a comparative example having the same total amount of theobromine, which is homogeneously distributed in the product.

CLAIMS

1. A food product containing two sections,
wherein the two sections are visually the same,
wherein the two sections contain a bitter tasting compound at different concentrations
in the two sections,
wherein the ratio of concentrations of the bitter tasting compound in the first section
and second section is between from 1:1.1 to 1:20 based on weight of the bitter tasting
compound,
wherein the two sections are consumable in discrete portions,
2and wherein the volume of each of the two sections is equal to or larger than a natural
single bite or single sip.
2. A food product according to claim 1, wherein the second section has a volume
maximally equal to the first section.
3. A food product according to claim 1 or 2, wherein the food product is solid or
semi-solid.
4. A food product according to any of claims 1 to 3, wherein the two sections are in
contact with each other.
5. A food product according to any of claims 1 to 4, wherein the ratio of
concentration of the bitter tasting compound in the first section and second section is
between from 1:1.2 to 1:15, based on the weight of the bitter tasting compound.
6. A food product according to any of claims 1 to 5, wherein the food product is
chosen from the group consisting of soup, bread, baked dough products, cookies,
biscuits, baked pastry products, ice cream, nutritional bars, chocolate, and condiments.
7. A food product according to any of claims 1 to 6, wherein the tastant comprises
theobromine or caffeine or a mixture of these.

8. A food product according to claim 7,
wherein the concentration of theobromine in the first section is between 300 and 700 mg per kg product based on the weight of the first section,
and the concentration of theobromine in the second section is between 4,000 and 12,000 mg per kg product based on the weight of the second section.
9. A food product according to any of claims 1 to 8, wherein the two sections additionally contain a tastant at different concentrations in the two sections,
wherein the tastant is a sweet tastant, or a sour tastant, or a salty tastant, or an umami tastant, or a combination of two or more of these tastants,
and wherein the ratio of concentrations of the additional tastant in the first section and second section is between from 20:1 to 1:1:1 or between from 1:1.1 to 1:20 based on weight of the tastant.
10. A food product according to any of claims 1 to 9, additionally containing a third section,
wherein the three sections are visually the same,
wherein the ratio of concentrations of the bitter tasting compound in the first section and third section is between from 1.1:1 and 1:1.1 based on weight of the bitter tasting compound,
wherein the three sections are consumable in discrete portions,
and wherein the volume of each of the three sections is equal to or larger than a natural single bite or single sip.
11. A food product according to claim 10, wherein the third section is in contact with the second section and not with the first section.
12. A product comprising a food product according to any of claims 1 to 11, and instructions for consumption of the food product,
wherein the instructions define that the first section having the lower concentration of bitter tasting compound should be consumed first,
immediately followed by consumption of the section having the higher concentration of bitter tasting compound,
and optionally immediately followed by consumption of the third section having the lower concentration of bitter tasting compound.

13. A method for consumption of the food product according to any of claims 1 to 11, wherein the first section having the lower concentration of bitter tasting compound is consumed first, immediately followed by consumption of the second section having the higher concentration of bitter tasting compound, and optionally immediately followed by consumption of the third section having the lower concentration of bitter tasting compound.

14. A method for reduction of the bitterness of food products, by consuming a food product according to any of claims 1 to 11.

15. A method for the production of a food product comprising a bitter tasting compound, wherein the prepared food product contains two sections, wherein the two sections are visually the same, wherein the two sections contain a bitter tasting compound at different concentrations in the two sections, comprising the steps of:

- preparing a first mixture of food ingredients comprising the bitter tasting compound to form a first section;
- preparing a second mixture of food ingredients comprising the bitter tasting compound at a higher concentration to form a second section,
- combining the two mixtures and preparing the food product,

and wherein the ratio of concentrations of the bitter tasting compound in the first section and second section is between from 1:1.1 to 1:20 based on weight of the bitter tasting compound, wherein the two sections are consumable in discrete portions, and wherein the volume of each of the two sections is equal to or larger than a natural single bite or single sip.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER

INV. A23L1/30 A23G9/48 A23G9/42
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A23G A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, BIOSIS, FSTA, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P	"Multisensory processing in flavour perception. Satellite symposium of the 9th International Multisensory Research Forum 2008 (Hamburg, Germany), pages 1-39, 134-135, 286-294" XP002592506 Retrieved from the Internet: URL: http://imrf.mcmaster.ca/IMRF/2008/pdf/FullProgramIMRF08.pdf [retrieved on 2010-07-19] pages 9,39,134	1-15
A	WO 2007/042745 A (ZUMBE ALBERT [GB]) 19 April 2007 (2007-04-19) the whole document ----- -/--	1-15

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
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- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- "&" document member of the same patent family

Date of the actual completion of the international search

23 July 2010

Date of mailing of the international search report

12/08/2010

Name and mailing address of the ISA/

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Authorized officer

Heirbaut, Marc

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2010/058457

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2007/231430 A1 (BROWN MATTHEW P [US] ET AL) 4 October 2007 (2007-10-04) the whole document -----	1-15
A	WO 2006/034463 A (HERBALIFE INTERNATIONAL INC [US]; YATCILLA MICHAEL [US]; KRUMHAR KIM []) 30 March 2006 (2006-03-30) the whole document -----	1-15
A	EP 2 036 446 A (KAO CORP [JP]) 18 March 2009 (2009-03-18) the whole document -----	1-15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2010/058457

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2007042745 A	19-04-2007	NONE	
US 2007231430 A1	04-10-2007	AU 2007250184 A1	22-11-2007
		CA 2642746 A1	22-11-2007
		EA 200870187 A1	27-02-2009
		EP 1993374 A2	26-11-2008
		JP 2009524433 T	02-07-2009
		KR 20080105047 A	03-12-2008
		WO 2007133303 A2	22-11-2007
WO 2006034463 A	30-03-2006	NONE	
EP 2036446 A	18-03-2009	WO 2008004339 A1	10-01-2008
		JP 2008029321 A	14-02-2008
		KR 20090076801 A	13-07-2009
		US 2009191311 A1	30-07-2009