

GERANYLAMINE DERIVATIVES AS FLAVOURING AGENTS

The present invention is concerned with organic compounds and their use as flavouring substances, in particular their use in creating, modifying or enhancing taste, in particular
5 umami-taste.

It is widely regarded that the flavour of a foodstuff consists of two parts, namely its aroma and its taste. In general, what is perceived olfactively in the nasal cavity is considered to be an aroma, whereas the term "taste" is used to describe a sensorial impact perceived in the
10 mouth, and more particularly the tongue. There are five generally recognised taste sensations: Sweet, bitter, sour, salt and umami.

Umami is now generally recognised as the 5th basic taste property, indeed receptors for umami have been discovered in taste buds on the tongue. Umami has qualities that
15 differentiate it from the other known taste sensations. The most common descriptors for umami are "savoury", "meaty" and "broth-like". Umami contributes to the flavour of foodstuffs, particularly in the savoury range.

By far the most used material to impart an umami-taste is mono-sodium glutamate (MSG).
20 MSG is used in practically all savoury industrial products to improve taste quality. However, although there is no scientific evidence supporting the theory, it is perceived by the public as being unhealthy. For this reason, work continues on the discovery of new strongly tasting umami molecules.

25 Flavour molecules that contain amide functionality have been known for a long time. Alkamides such as spilanthol and shanshool are known to create a prickling, tingling effect in the mouth. The same tingling, prickling sensation is characteristic of the unsaturated N-alkylamide – pellitorin. Structural modifications of pellitorin were described in DE 102006006123, however none were found to be umami-tasting.

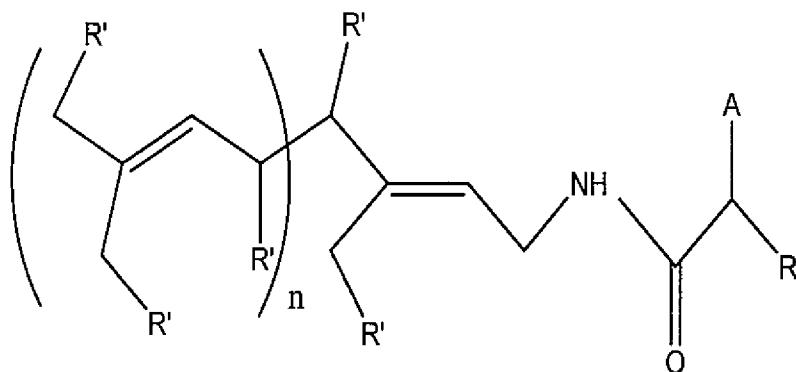
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Umami-tasting molecules have been described in EP1642886 and also in EP1989944.

There remains a need to provide improved compounds that create, enhance or modify taste, in particular umami-taste, in consumable products.

The invention provides in a first aspect a compound of the formula (I)

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wherein A is OH or a carbonyl group,

10 n is 0 or 1,

R is an alkyl radical having from 1 to 4 carbon atoms, in particular methyl, ethyl, n-propyl, iso-propyl, n-butyl or t-butyl; or a residue of a hydroxy carboxylic acid, in particular the residue $-\text{CH}(\text{OH})\text{COOH}$, $-\text{CH}(\text{OH})\text{CH}_2\text{COOH}$, $-\text{CH}_2\text{CH}(\text{OH})\text{COOH}$ or $-\text{CH}(\text{OH})\text{CH}(\text{OH})\text{COOH}$; and

15 R' is independently selected from H or OH.

Preferred compounds of the formula (I) are geranyl lactamide (that is, the compound wherein $n=1$, $A=\text{OH}$, $R=\text{methyl}$ and R' is H); and n-prenyl lactamide (that is, the compound wherein $n=0$, $A=\text{OH}$, $R=\text{methyl}$, and R' is H).

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The present invention further relates to a method for preparing a compound of formula (I).

The skilled person will immediately appreciate that the preparation of compounds of formula (I) can be achieved using straightforward synthetic procedures and readily

25 available starting materials.

By way of illustration, compounds of formula (I) may be prepared by the reaction of an amine, such as the geranyl or n-prenyl amine with an ester, acid chloride or anhydride containing appropriate A and R substituents. Having regard to the nature of the substituents
5 A and R, they may need to be protected during this reaction with appropriate protecting groups, particularly when it is an acid chloride or an anhydride that is reacted with the amine. Suitable protecting groups include tetrahydropyranyl (THP) or simple aliphatic ester groups.

- 10 The reaction conditions, that is, the choice of solvent, temperature, pH and the like, appropriate for affecting the chemical syntheses described above are well known in the art and require no further elaboration here. Particular reaction conditions are set forth in the examples below.
- 15 We have surprisingly found that compounds of the formula (I) can create, modify or enhance taste of consumable products to which they are added. In particular, compounds of formula (I) may create, enhance or modify umami-taste in consumable products.

By consumable products is meant products, such as beverages and foodstuffs, or personal
20 care products that are intended to be introduced into the oral cavity of a human or animal and remain there for a certain period of time before being ingested or removed from the mouth. Such compositions include compositions in their processed, partially processed or unprocessed state. They include materials that are added to food in their preparation, processing or handling. Particular consumable products wherein compounds of formula (I)
25 may find use are savoury products, such as soups, beverages, snack foods such as potato chips, pizza, fast foods and the like.

The compounds of formula (I) may also be used in reduced MSG or MSG-free consumer products as well as those containing the substance in customary amounts. MSG is
30 customarily employed in consumable products in amounts of 200 to 500ppm. Reduced MSG consumer products accordingly contain amounts lower amounts, such as 100 ppm to 200 ppm.

Accordingly, the invention provides in another of its aspects the use of a compound of the formula (I) as defined hereinabove for creating, enhancing or modifying taste, particularly an umami-taste, in consumable products.

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Another aspect of the invention concerns flavour compositions comprising or consisting of an effective amount of a compound of formula (I).

An effective amount may range from about 0.001% to 100% of the total weight of the
10 flavour composition. What constitutes an effective amount depends largely on the nature of the consumable product to which it is desired to add, modify or create flavour and the particular sensorial effect that is desired to be achieved for that consumable product. Typically, consumer products will contain from about 5 ppm to 50 ppm of a compound of the formula (I).

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Flavour compositions of the present invention may contain in addition to a compound of the formula (I) other flavour ingredients that will modify, enhance or create flavour in a consumer product that is to be flavoured.

20 In addition to additional flavour ingredients, a flavour composition may contain other ingredients useful as excipients such as carriers, diluents or bulking agents or the like, the purpose of which is to aid in the processing of a flavour composition or consumer product containing same, or otherwise impart a desirable property on the composition or consumer product. Examples of such ingredients may include carbohydrates and carbohydrate
25 polymers, e.g. polysaccharides, cyclodextrines, starches, starch hydrolysates, modified starches, modified celluloses, gums such as gum arabic, ghatti gum, traganth, karaya, carrageenan, guar, locust bean, alginates, pectin, inulin, or xanthan.

There now follows a series of examples that serve to illustrate the invention:

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Example 1Preparation of geranyl lactamide

Method 1: Reaction of geranyl amine with the lactate ester

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2g of geranylamine was added to a solution of 1,4g of ethyl lactate in 15ml of ethanol at room temperature. The reaction mixture was stirred at reflux for 5 hours. Then the solvent was removed on rotary evaporator to yield 2,8g of pale yellow oil. The purity was approximately 90% according to NMR analysis. The crude product was purified by flash
10 column chromatography (silica gel, ethyl acetate: pentane 7:3) to give quite pure geranyl lactamide according to NMR and TLC analysis.

¹H-NMR in CDCl₃: 1.65-1.75(9H, 2x s, 3x CH₃-C=C), 2.0(4H, m, 2x CH₂-CH=C), 3.8(2H, m, CH₂-NH), 5.2(1H, t, CH-CH₂-CH₂), 5.3(1H, t, CH-CH₂-NH), 9(1H, s, NH), 1.4(3H, s, CH₃-CHOH-CO), 4.1(1H, s, OH), 4.3(1H, q, -CHOH-CH₃)

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Method 2: Reaction of geranyl amine with acid chloride

Step 1: Preparation of the intermediate N-geranyl 2-acetoxypropionamide

20 To a cold solution of geranyl amine (7g) and triethyl amine (6g) in THF (50ml) was added dropwise a solution of 2-acetoxypropanoyl chloride (9g) in dichloromethane (15ml) at a temperature between 6°C and 13°C over a period of 20 minutes. Stirring was continued at room temperature for 2hrs. The white precipitate (triethylamine HCl salt) was filtered and the filtrate was evaporated. The residue was dissolved in DCM (100ml), washed twice with
25 50ml of aqueous 5 % HCl solution and twice with water (2x50ml) and evaporated to dryness to yield 12,6g of a colourless oil. The yield was 90 %, the purity was 95 % according to NMR analysis.

Step 2: Hydrolysis of N-geranyl 2-acetoxypropionamide

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A solution of N-geranyl 2-acetoxypropionamide (10 g) in THF (15ml) was added to a cold aqueous 10 % NaOH solution (60g). The resultant mixture was stirred at temperature

between 5 and 10°C for 2 hrs. Then the mixture was acidified to pH 1-2 and extracted twice with dichloromethane (2X100ml). The organic phases were combined and washed twice with water (2x50ml) and evaporated to dryness. The yield was 6 g of colourless oil. The purity was 80 % according to NMR.

- 5 ¹H-NMR in CDCl₃: 1.65-1.75(9H, 2x s, 3x CH₃-C=C), 2.0(4H, m, 2x CH₂-CH=C), 3.8(2H, m, CH₂-NH), 5.2(1H, t, CH-CH₂-CH₂), 5.3(1H, t, CH-CH₂-NH), 9(1H, s, NH), 1.4(C₃H, s, CH₃-CHOH-CON), 4.1(1H, s, OH), 4.3(1H, q, -CHOH-CH₃)

Preparation of N-prenyl lactamide

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A mixture of ethyl lactate (2g) and 3-methyl-2-buten-1-amine (2g) was stirred for 1 hour at 90°C and 1 hour at 120°C. During the reaction the formed ethanol was distilled off. The unreacted starting materials were removed under reduced pressure and the crude product was purified by Kugelrohr distillation. 2g of colourless oil was obtained. The product was

15 pure according to NMR analysis. The yield was 75%.

¹H-NMR in CDCl₃: 1.7(6H, s, 2x CH₃-C=C), 3.8(2H, d, CH₂-N), 5.3(1H, t, olefinic CH-CH₂), 9.0(1H, s, NH), 1.4(3H, s, CH₃-CHOH-COO), 4.1(1H, s, OH), 4.3(1H, q, -CHOH-CH₃)

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Example 2:

Two solutions were prepared:

A a solution of 0.3% NaCl

B a solution of 0.3% NaCl and 10 ppm geranyl lactamide

- 25 The samples were tasted by a trained sensory panel composed of 20 women aged between 30 and 60. The findings of the panel were summarized as:

Solution A : salty

Solution B : salty, umami

30 Example 3

Two solutions were prepared:

A a solution of 0.3% NaCl and 0.03% MSG

B a solution of 0.3% NaCl, 0.03% MSG and 10 ppm geranyl lactamide

The samples were tasted by a trained sensory panel composed of 20 women aged between 30 and 60. The findings of the panel were summarized as:

Solution A : salty, umami

- 5 Solution B : salty, umami, more bouillon-like, more complex, less sweet.

Example 4

A tomato soup mix was prepared from 9.4 g of sodium chloride, 1 g of mono sodium
10 glutamate, 0.08 g ribonucleotides (ex yeast), 32 g of tomato powder (ex Sprea), 25.1 g of
glucose, 21 g of starch (Ultrasperse 5 ex National Starch), 5 g of palm fat powder, 3 g of
yeast powder, 1 g of onion powder, 0.15 g of carrot powder, 0.05 g of ground white pepper,
0.3 g of celery extract powder, 0.05 g of ground laurel leaf powder, and 1.85 g of sucrose.
25 G of the well mixed ingredients was added to 250 g of boiling water and stirred until
15 completely dissolved.

The reference soup was compared with a batch of the same soup containing 15 ppm of
geranyl lactamide. A small group of flavourists (2 male, 2 female) tasted the soups and
agreed that the test soup was more umami, had a long-lasting savoury aspect, was more
20 salty and was more complex than the base soup.

Example 5

Plain potato chips were prepared.

One part was flavoured with 1.2 % sodium chloride (sample A)

- 25 One part was flavoured with 1.2 % sodium chloride and 0.3 % mono sodium glutamate
(sample b)

One part was flavoured with 1.2 % sodium chloride and 25 ppm geranyl lactamide (sample
C).

The samples were tasted by a trained sensory panel composed of 20 women aged between
30 30 and 60.

The panel agreed that sample C was preferred over the other two samples.

Sample was described as salty, sample B as salty and umami and sample C as salty, umami, long lasting, savoury, bouillon.

Example 6

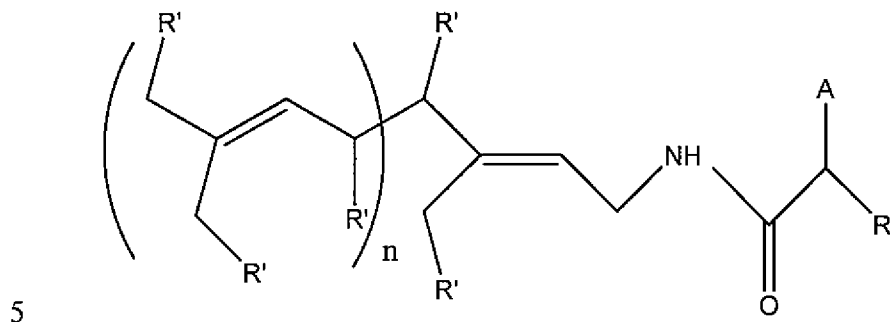
- 5 A tomato ketchup was prepared from 19 % tomato paste (28-30 % dry weight), 8 % of vinegar (15 %), 3 % of sodium chloride, 20 % of sugar and 50 % of water.

To one half of the batch was added 20 ppm of geranyl lactamide.

- A small group of flavourists (2 male, 2 female) tasted the ketchups and agreed that the test
10 ketchup tasted clearly more umami, more salty and had a pleasant savoury note compared with the base ketchup.

Claims:

1. A compound of the formula (I)



wherein

A is OH or a carbonyl group,

n is 0 or 1,

- 10 R is an alkyl radical having from 1 to 4 carbon atoms, in particular methyl, ethyl, n-propyl, iso-propyl, n-butyl or t-butyl; or a residue of a hydroxy carboxylic acid, in particular the residue $-\text{CH}(\text{OH})\text{COOH}$, $-\text{CH}(\text{OH})\text{CH}_2\text{COOH}$, $-\text{CH}_2\text{CH}(\text{OH})\text{COOH}$ or $-\text{CH}(\text{OH})\text{CH}(\text{OH})\text{COOH}$; and
- R' is independently selected from H or OH

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2. A compound according to claim 1 selected from the group consisting of geranyl lactamide and n-prenyl lactamide.
3. A flavour composition comprising a compound according to claim 1 or claim 2.
- 20 4. A consumable product comprising a composition according to claim 3.
5. A composition or product according to claim 3 or claim 4 that is MSG-free.
- 25 6. Use of a compound of formula (I) as defined in claim 1 or claim 2 to create, enhance or modify the taste of a consumer product.

7. Use according to claim 6 to create, modify or enhance an umami-taste.