IMPROVEMENTS IN OR RELATING TO ORGANIC COMPOUNDS

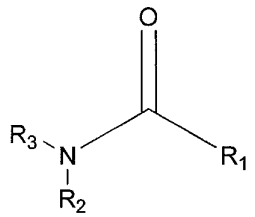
The invention is concerned with certain carboxylic acid-amino acid conjugates, flavour compositions containing said conjugates, and their use in edible compositions.

WO2009/141294 describes particular acylamino acids compounds in which the acyl group is unsaturated and contains a cis-double bond. These compounds are employed in sufficient quantity to exert a tingling sensation but with a concomitant reduced burning sensation. Such compounds are useful in food products as a replacement for conventional tastants such as chilli to address the needs of consumers who like spicy food, which should be delicately hot, but not cause an excessive burning sensation in the oral cavity.

The availability of such flavour ingredients in the toolbox of food scientists, which exert their very pronounced flavour characteristics to a food product is of niche value for particular types of food categories. However, there are myriad food applications in which a spicy, or tingling or hot flavour would be deemed incongruous or even offensive.

There is a need to provide flavour ingredients that to complement flavours of edible compositions in which they are incorporated in order to accentuate flavours and mouthfeel of said compositions, rather than exert their own particular taste characteristics; and so lend themselves to a very broad spectrum of use across a wide range of food and beverage categories.

The present invention provides in one of its aspects the use of a compound according to the formula (I) or edible salts thereof,



(1)

wherein

R_1 is an alkyl residue containing 6 to 20 carbon atoms, or an alkene residue containing from 9 to 25 carbon atoms with 1 to 6 double bonds, R_1 together with the carbonyl group to which it is attached is a residue of a carboxylic acid, and NR_2R_3 , in which R_3 is H or together with R_2 and the N-atom to which they are attached, a 5-membered ring, is a residue of an amino acid, in particular a proteinogenic amino acid, ornithine, gamma–aminobutyric acid or beta alanine, or a 1-amino cycloalkyl carboxylic acid.

Edible salts include those typically employed in the food and beverage industry and include chlorides, sulphates, phosphates, gluconates, sodium, citrates, carbonates, acetates and lactates.

The proteinogenic amino acids are alanine (Ala), cysteine (Cys), aspartic acid (Asp), phenylalanine (Phe), glutamic acid (Glu), histidine (His), isoleucine (Ile), lysine (Lys), leucine (Leu), methionine (Met), asparagines (Asn), glutamine (Gln), arginine (Arg), serine (Ser), theronine (Thr), valine (Val), tryptophan (Trp), tyrosine(Tyr), proline (Pro) or glycine (Gly).

The three letter codes in parentheses are common abbreviations used in relation to the amino acids and they shall be used henceforth.

The carboxylic acids can likewise be represented by abbreviations. Henceforth, the carboxylic acid residues may be referred to by the abbreviation Cn, wherein "n" represents the number of carbon atoms in the residue. For example, the residue of an 18 carbon acid may be abbreviated as C18. Still further, if the 18 carbon acid is saturated, e.g. stearic acid. It may be abbreviated as C18:0 (because it contains zero double bonds), whereas an 18 carbon acid having one double bond– e.g. oleic acid – may be abbreviated as C18:1. Still further, if the C18 acid has a single double bond in the cis configuration, then it can be abbreviated as C18:1c. Similarly, if the double bond was in the trans configuration, then the abbreviation becomes C18:1t.

The compounds of formula (I) can also be represented in terms of these abbreviations. For example, the compound of formula (I) consisting of a residue of a C18 carboxylic acid and a residue of the amino acid Proline can be represented by the abbreviation C18-Pro. For simplicity the compounds of formula (I) henceforth may be represented in this abbreviated form.

As is evident from the above formula (I), an amino nitrogen atom on the amino acid residue is bound to a carbonyl carbon atom of the carboxylic acid residue to form an amide linkage. Some amino acids (ornithine and Lysine) have more than one amine groups, and the amide linkage can be formed at any of these amino groups.

In a particular embodiment of the present invention the carboxylic acid residue is a residue of a fatty acid.

The fatty acid residue may be the residue of a C8 to C22 fatty acid. The fatty acid may be mammalian or non-mammalian. A mammalian fatty acid is a natural or synthetic fatty acid that is identical in structure to one naturally produced in a mammal, including, but not limited to, myristic acid, palmitic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, eicosatrienoic acid, arachidonic acid, eicosapentenoic acid, and docosatetraenoic acid. A non-mammalian fatty acid is a natural or synthetic fatty acid not normally produced by a mammal, including, but not limited to, pentadecanoic acid; heptadecanoic acid; nonadecanoic acid; heneicosanoic acid; 9-trans-tetradecenoic acid,; 10-trans-pentadecenoic acid, ; 9-trans-hexadecenoic acid, ; 10-trans-heptadecenoic acid,; 10-trans-heptadecenoic acid, ; 7-trans-nonadecenoic acid, ; 10,13-nonadecadienoic acid, ; 11-trans-eicosenoic acid, ; and 12-transhenicosenoic acid, .

The fatty acid residues may be saturated or unsaturated. If they are unsaturated, it is preferred that they have 1, 2 or 3 double bonds, which may in cis- or trans- configuration. More particularly, the preferred fatty acid residues are C16 to C18, and may be saturated or unsaturated.

The skilled person will appreciate, however, that natural sources of these fatty acids, for example almond oil, avocado oil, castor oil, coconut oil, corn oil, cottonseed oil, olive oil, peanut oil, rice bran oil, safflower oil, sesame oil, soybean oil, sunflower oil, palm oil and canola oil, each consist of a complex mixture of fatty acids. For example, safflower oil is predominately a source of the C18:2 linoleic acid, nevertheless it may contain other fatty acids, such as linolenic acid (C18:3) and palmitic acid (C16:0), amongst others. Accordingly, reference herein to a compound containing a particular fatty acid residue, for example a residue of C18 fatty acid, may be a reference to a pure, or substantially pure C18 fatty acid residue, or it may relate to a mixture of fatty acid residues with the predominant residue being a C18 residue. Preferred fatty acid residues are C16 to C18.

Compounds of formula (I) may contain chiral atoms, and as such they may exist in racemic form, as a mixture of stereoisomers or as resolved as single isomers. The use of the term "a compound of formula (I)" may refer to both mixtures of isomers or resolved single isomers.

In particular, the compounds of formula (I) may contain the residue of D- or L-amino acids.

The compounds of formula (I) can be formed by known methods using commercially available starting materials, reagents and solvents, and a detailed discussion is not warranted here. In an embodiment of the present invention, the conjugates can be formed by the reaction of an amino acid with a carboxylic acid halide, e.g. a chloride under basic conditions in aqueous conditions such as a water/THF solvent system. Yield and reaction times may be improved by applying heat to the reaction mixture. In an alternative embodiment, a carboxylic acid can be reacted with an amino acid in dioxane in the presence of DCC (dicyclohexylcarbodiimide) and 1-hydroxypyrrolidine-2,5-dione.

In yet another embodiment, an amino acid alkyl ester may be reacted with a carboxylic acid chloride under basic conditions in an aqueous-based solvent, such as a water/THF solvent system. Thereafter, the ester can be hydrolysed carefully without affecting the amide bond in basic methanol water solution

In yet another embodiment, a carboxylic acid and an amino acid alkyl ester can be reacted in dioxane in the presence of DCC (dicyclohexylcarbodiimide) and 1-hydroxypyrrolidine-2,5-dione. The ester can be hydrolysed carefully without affecting the amide bond in dilute basic methanol water solution

In yet another embodiment, a (mixed) anhydride of a carboxylic acid is reacted with an amino acid in dioxane.

In yet another embodiment, a carboxylic acid alkyl ester can be reacted with an amino acid in dioxane

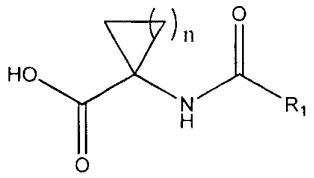
In still another embodiment, an amino acid alkyl ester is reacted with a triglyceride, optionally in the presence of a co-solvent. The amino acid ester thus formed is then hydrolysed according to a method described above.

In yet another embodiment, an amino acid is reacted with a triglyceride, optionally in the presence of a co-solvent.

In yet another embodiment, an amino acid is reacted with a triglyceride in the presence of a lipase , esterase, protease, peptidase, amidase or acylase, optionally in the presence of a cosolvent and/or water.

In yet another embodiment a carboxylic acid alkyl ester is reacted with an amino acid in the presence of a lipase , esterase, protease, peptidase, amidase or acylase, optionally in the presence of a co-solvent and/or water.

In an embodiment of the the present invention there is provided compounds of formula (I) represented by the formula



their edible salts, and their use in edible compositions

wherein

R_1, is hereinabove defined, and

n is 1, 2, 3 or 4.

The preferred compounds are those wherein "n" is 1.

The amino acid residue disclosed in the above formula may be abbreviated as "ACCA".

The compounds include C8-ACCA, C9-ACCA, C10-ACCA, C12-ACCA, C14-ACCA, C16-ACCA, C18-ACCA, C20-ACCA and C22-ACCA.

The compounds include C8-ACCA, C9-ACCA, C10-ACCA, C12-ACCA, C14-ACCA, C16-ACCA, C18-ACCA, C20-ACCA and C22-ACCA, wherein the carboxylic acid residue is saturated.

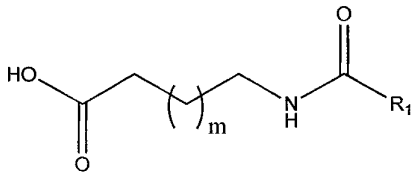
The compounds include C8-ACCA, C9-ACCA, C10-ACCA, C12-ACCA, C14-ACCA, C16-ACCA, C18-ACCA, C20-ACCA and C22-ACCA, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

The compounds include those specified above wherein the cycloalkane ring in the amino acid residue is cyclopropane (n=1).

Particularly preferred compounds are N-palmitoyl 1-amino-cyclopropyl carboxylic acid (C16:0-ACCA), N-stearoyl 1-amino-cyclopropyl carboxylic acid (C18:0-ACCA), N-linoleoyl 1-amino-cyclopropyl carboxylic acid (C18:2-ACCA), N-linolenoyl 1-amino-cyclopropyl carboxylic acid (C18:2-ACCA), N-oleoyl 1-amino-cyclopropyl carboxylic acid (C18:1-ACCA),

N-(9-palmitenoyl) 1-amino-cyclopropyl carboxylic acid (C16:1-ACCA), N-decanoyl 1-amino-cyclopropyl carboxylic acid (C10:0-ACCA) and N-geranoyl 1-amino-cyclopropyl carboxylic acid (C10:2-ACCA).

The present invention provides in another embodiment the compounds of formula (I) represented by the formula



and their edible salts, and their use in edible compositions
wherein

R_1, is hereinabove defined, and
m is 0 or 1.

It will be apparent to the person skilled in the art that when m is 1, the amino acid residue is a residue of gamma amino butyric acid (GABA), whereas when m is 0, the amino acid residue is a residue of beta-alanine (Beta Ala). Both the compounds of formula (I) wherein m is 1 and the amino acid residue is a residue of GABA, and the compounds of formula (I) wherein m is 0 and the amino acid residue is a residue of beta-alanine, their edible salts, as well as their use in edible compositions, are all embodiments of the present invention.

These compounds are particularly useful to incorporate into an edible product to impart a remarkable mouthfeel, body and enhanced fat perception; or an enhanced umami or salt taste; or a cooling and richness. They are particularly useful in applications low in fat, salt and umami. They are also useful in fat-free formualtions such as beverages and oral care applications. They also find use in dairy applications and in vanilla, cocoa and chocolate.

The compounds include C8-GABA, C9- GABA, C10- GABA, C12- GABA, C14- GABA, C16-GABA, C18- GABA, C20- GABA and C22- GABA.

The compounds include C8-GABA, C9- GABA, C10- GABA, C12- GABA, C14- GABA, C16-GABA, C18- GABA, C20- GABA and C22- GABA, wherein the carboxylic acid residue is saturated.

The compounds include C8-GABA, C9- GABA, C10- GABA, C12- GABA, C14- GABA, C16-GABA, C18- GABA, C20- GABA and C22- GABA, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds include C10-GABA, C12-GABA, more particularly C12:1-GABA, C14-GABA, C16-GABA, more particularly C16:1-GABA, C18-GABA, more particularly C18:1-GABA, still more particularly C18:1c-GABA and C18:1t-GABA. Most preferred is a compound C18:2-GABA.

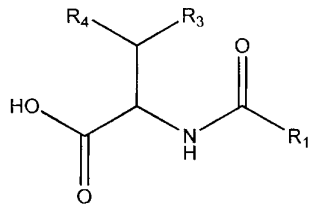
The compounds include C8-Beta Ala, C9- Beta Ala, C10- Beta Ala, C12- Beta Ala, C14- Beta Ala, C16- Beta Ala, C18- Beta Ala, C20- Beta Ala and C22- Beta Ala.

The compounds include C8-Beta Ala, C9- Beta Ala, C10- Beta Ala, C12- Beta Ala, C14- Beta Ala, C16- Beta Ala, C18- Beta Ala, C20- Beta Ala and C22- Beta Ala, wherein the carboxylic acid residue is saturated.

The compounds include C8-Beta Ala, C9- Beta Ala, C10- Beta Ala, C12- Beta Ala, C14- Beta Ala, C16- Beta Ala, C18- Beta Ala, C20- Beta Ala and C22- Beta Ala, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

A preferred compound is C18:2-Beta Ala.

The present invention provides in another embodiment the compounds of formula (I) represented by the formula



and their edible salts, and their use in edible compositions
wherein

R_1, is hereinabove defined,
R_3 is hydrogen or methyl, and
R_4 is methyl, ethyl or iso-propyl.

Particular compounds are those in which R_3 is hydrogen and R_4 is iso-propyl; R_3 is methyl and R_4 is methyl; and R_3 is methyl and R_4 is ethyl. The skilled person will appreciate that the amino acid residue in which R_3 is hydrogen and R_4 is iso-propyl is the residue of Leucine (Leu); whereas the amino acid residue in which R_3 is methyl and R_4 is methyl is the residue of Valine (Val); and the amino acid residue in which R_3 is methyl and R_4 is ethyl is the residue of iso-Leucine (Ile).

The compounds in which R_3 is hydrogen and R_4 is iso-propyl; R_3 is methyl and R_4 is methyl; and R_3 is methyl and R_4 is ethyl, as well as their use in edible compositions, are all embodiments of the present invention.

These compounds are particularly useful to enhance authentic fruit profiles, They may also find use in fruit flavoured milk, yoghurt and ice creams.

The compounds include C8-Leu, C9- Leu, C10- Leu, C12- Leu, C14- Leu, C16- Leu, C18- Leu, C20- Leu and C22- Leu.

The compounds include C8-Leu, C9- Leu, C10- Leu, C12- Leu, C14- Leu, C16- Leu, C18- Leu, C20- Leu and C22- Leu, wherein the carboxylic acid residue is saturated.

The compounds include C8-Leu, C9- Leu, C10- Leu, C12- Leu, C14- Leu, C16- Leu, C18- Leu, C20- Leu and C22- Leu, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particular compounds bearing the Leu residue include N-palmitenoyl-L-leucine, N-palmitoyl-L-leucine, N-linolenoyl-L-leucine, N-linoleoyl-L-leucine and N-oleoyl-L-leucine.

The compounds include C8-Ile, C9- Ile, C10- Ile, C12- Ile, C14- Ile, C16- Ile, C18- Ile, C20- Ile and C22- Ile.

The compounds include C8-Ile, C9- Ile, C10- Ile, C12- Ile, C14- Ile, C16- Ile, C18- Ile, C20- Ile and C22- Ile, wherein the carboxylic acid residue is saturated.

The compounds include C8-Ile, C9- Ile, C10- Ile, C12- Ile, C14- Ile, C16- Ile, C18- Ile, C20- Ile and C22- Ile, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

A particularly preferred compound bearing the Ile residue is N-oleoyl-Ile.

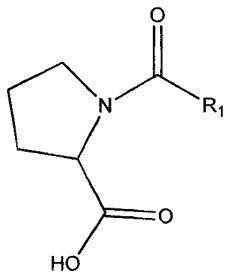
The compounds include C8-Val, C9- Val, C10- Val, C12- Val, C14- Val, C16- Val, C18- Val, C20- Val and C22- Val.

The compounds include C8-Val, C9- Val, C10- Val, C12- Val, C14- Val, C16- Val, C18- Val, C20- Val and C22- Val, wherein the carboxylic acid residue is saturated.

The compounds include C8-Val, C9- Val, C10- Val, C12- Val, C14- Val, C16- Val, C18- Val, C20- Val and C22- Val, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Val residue include N-palmitenoyl-L-valine, N-palmitoyl-L-valine, N-linolenoyl-L-valine, N-linoleoyl-L-valine and N-oleoyl-L-valine.

In another embodiment of the invention, there is provided compounds of formula (I) corresponding to the formula



their edible salts, and their use in edible compositions

wherein

R_1, is hereinabove defined.

The skilled person will appreciate that the amino acid residue in the compounds defined above is the proline residue (Pro).

These compounds are particularly effective to enhance juiciness and typical citrus authenticity. They find use particularly in powdered soft drinks and beverages, and also in dairy applications, such as fruit flavoured milk, yoghurt and ice creams.

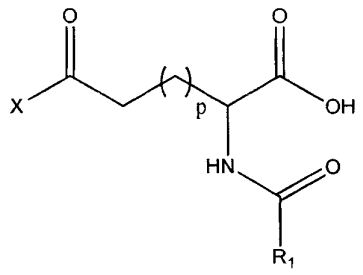
The compounds include C8-Pro, C9- Pro, C10- Pro, C12- Pro, C14- Pro, C16- Pro, C18- Pro, C20- Pro and C22- Pro.

The compounds include C8-Pro, C9- Pro, C10- Pro, C12- Pro, C14- Pro, C16- Pro, C18- Pro, C20- Pro and C22- Pro, wherein the carboxylic acid residue is saturated.

The compounds include C8-Pro, C9- Pro, C10- Pro, C12- Pro, C14- Pro, C16- Pro, C18- Pro, C20- Pro and C22- Pro, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Pro residue N-geranoyl-Pro, N-palmitoyl-Pro, N-palmiteneoyl-Pro, N-stearoyl-Pro, N-linoleoyl-Pro and N-linolenoyl-Pro.

In another embodiment of the invention, there is provided compounds of formula (I) corresponding to the formula



their edible salts, and their use in edible compositions

wherein

R_1, is hereinabove defined,

X is OH or NH_2 and

P is 0 or 1.

The skilled person will appreciate that when p is 0 and X is OH, the amino acid residue set forth in the above formula is a residue of aspartic acid, whereas when p is 1, and X is OH the residue is that of glutamic acid, whereas when p is 0 and X is NH_2, the residue is that of asparagine (Asn), and when p is 1 and X is NH_2, the residue is that of glutamine (Gln) .

The compounds bearing an aspartic acid residue, the compounds bearing a glutamic acid residue, the compounds bearing an asparagine residue, and the compounds bearing a glutamine residue, as well as their edible salts, and their use in edible compositions, each represent particular embodiments of the present invention.

These compounds are particularly useful to enhance savoury character, mouthfeel and overall flavour performance, juiciness and salivation. They may find use in low salt, low umami and low fat as well as fruit flavour drinks as well as dairy applications.

The compounds include C8-Glu, C9- Glu, C10- Glu, C12- Glu, C14- Glu, C16- Glu, C18- Glu, C20- Glu and C22- Glu.

The compounds include C8-Glu, C9- Glu, C10- Glu, C12- Glu, C14- Glu, C16- Glu, C18- Glu, C20- Glu and C22- Glu, wherein the carboxylic acid residue is saturated.

The compounds include C8-Glu, C9- Glu, C10- Glu, C12- Glu, C14- Glu, C16- Glu, C18- Glu, C20- Glu and C22- Glu, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Glu residue include N-geranoyl-Glu, N-palmitoyl-Glu, N-palmitenoyl-Glu, N-stearoyl-Glu,N- linoleoyl-Glu and N-linolenoyl-Glu.

The compounds include C8-Asp, C9- Asp, C10- Asp, C12- Asp, C14- Asp, C16- Asp, C18- Asp, C20- Asp and C22- Asp.

The compounds include C8-Asp, C9- Asp, C10- Asp, C12- Asp, C14- Asp, C16- Asp, C18- Asp, C20- Asp and C22- Asp, wherein the carboxylic acid residue is saturated.

The compounds include C8-Asp, C9- Asp, C10- Asp, C12- Asp, C14- Asp, C16- Asp, C18- Asp, C20- Asp and C22- Asp, wherein the carboxylic acid residue is unsaturated and contains 1, 2

or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Asp residue include N-geranoyl-Asp, N-palmitoyl-Asp, N-palmitenoyl-Asp, N-stearoyl-Asp, N-linoleoyl-Asp and N- linolenoyl-Asp.

The compounds include C8-Gln, C9- Gln, C10- Gln, C12- Gln, C14- Gln, C16- Gln, C18- Gln, C20- Gln and C22- Gln.

The compounds include C8-Gln, C9- Gln, C10- Gln, C12- Gln, C14- Gln, C16- Gln, C18- Gln, C20- Gln and C22- Gln, wherein the carboxylic acid residue is saturated.

The compounds include C8-Gln, C9- Gln, C10- Gln, C12- Gln, C14- Gln, C16- Gln, C18- Gln, C20- Gln and C22- Gln, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Gln residue include N-geranoyl-Gln, N-palmitoyl-Gln, N-palmitenoyl-Gln, N-stearoyl-Gln, N-linoleoyl-Gln and N- linolenoyl-Gln.

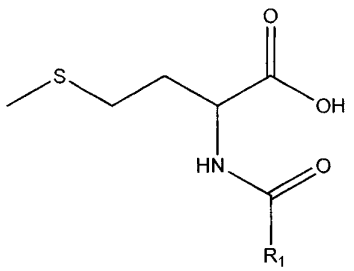
The compounds include C8-Asn, C9- Asn, C10- Asn, C12- Asn, C14- Asn, C16- Asn, C18- Asn, C20- Asn and C22- Asn.

The compounds include C8-Asn, C9- Asn, C10- Asn, C12- Asn, C14- Asn, C16- Asn, C18- Asn, C20- Asn and C22- Asn, wherein the carboxylic acid residue is saturated.

The compounds C8-Asn, C9- Asn, C10- Asn, C12- Asn, C14- Asn, C16- Asn, C18- Asn, C20-Asn and C22- Asn, wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Asn residue include N-geranoyl-Asn, N-palmitoyl-Asn, N-palmitenoyl-Asn, N-stearoyl-Asn, N-linoleoyl-Asn and N- linolenoyl-Asn.

In another embodiment of the invention, there is provided compounds of formula (I) corresponding to the formula



their edible salts, and their use in edible compositions

wherein

R_1, is hereinabove defined.

The skilled person will appreciate that in the above formula the amino acid residue is the residue of methionine (Met).

These compounds are particularly effective to enhance juiciness and salivation, as well as the authenticity of fruits. They also are useful in soft drinks applications for their masking properties.

The compounds include C8-Met, C9- Met, C10- Met, C12- Met, C14- Met, C16- Met, C18- Met, C20- Met and C22- Met.

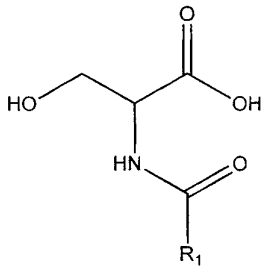
The compounds include C8-Met, C9- Met, C10- Met, C12- Met, C14- Met, C16- Met, C18- Met, C20- Met and C22- Met, wherein the carboxylic acid residue is saturated.

The compounds include C8-Met, C9- Met, C10- Met, C12- Met, C14- Met, C16- Met, C18- Met, C20- Met and C22- Met wherein the carboxylic acid residue is unsaturated and contains 1, 2

or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Met residue include N-geranoyl-Met, N-palmitoyl-Met, N-palmitenoyl-Met, N-stearoyl-Met, N-linoleoyl-Met and N-linolenoyl-Met.

In another embodiment of the invention, there is provided compounds of formula (I) corresponding to the formula



their edible salts, and their use in edible compositions
wherein
R_1, is hereinabove defined.

The skilled person will appreciate that in the above formula the amino acid residue is the residue of serine (Ser).

These compounds find particular use in low salt, umami and fat, fruit flavoured beverages and/or dairy applications.

The compounds include C8-Ser, C9- Ser, C10- Ser, C12- Ser, C14- Ser, C16- Ser, C18- Ser, C20- Ser and C22- Ser.

The compounds include C8-Ser, C9- Ser, C10- Ser, C12- Ser, C14- Ser, C16- Ser, C18- Ser, C20- Ser and C22- Ser, wherein the carboxylic acid residue is saturated.

The compounds include C8-Ser, C9- Ser, C10- Ser, C12- Ser, C14- Ser, C16- Ser, C18- Ser, C20- Ser and C22- Ser wherein the carboxylic acid residue is unsaturated and contains 1, 2 or 3 double bonds. The double bonds may be in cis-configuration, trans-configuration or a mixture of cis- and trans-configuration.

Particularly preferred compounds bearing the Ser residue include N-palmitoyl-Ser, N-palmitenoyl-Ser, N-stearoyl-Ser, N-linoleoyl-Ser and N-linolenoyl-Ser.

Other compounds useful in the present invention include:

N-octanoyl-L-phenylalanine, , N-eicosanoyl-L-phenylalanine, N-palmitoleoyl-L-phenylalanine, N-palmitoyl-L-phenylalanine , N-linolenoyl-L-phenylalanine , N-linoleoyl-L-phenylalanine, N-oleoyl-L-phenylalanine, N-SDA-L-phenylalanine, N-DPA-L-phenylalanine, and N-tetracosahexaenoyl-L-phenylalanine;

N-palmitoyl-L-alanine, N-linolenoyl-L-alanine, N-linoleoyl-L-alanine;

N-palmitoyl-L-tyrosine, N-linoleoyl-L-tyrosine, N-oleoyl-L-tyrosine, N-linolenoyl-L-tyrosine;

N-palmitoyl-L-tryptophan, N-linolenoyl-L-tryptophan, N-linoleoyl-L-tryptophan; and N-linoleoyl-glycine.

Preferably, compounds of formula (I) do not include the compounds C12:1-Ala; C12:1-Gly; C12:2-Ala; C18:3-Ala; and C16:1-Ala, particularly when a double bond is in the cis-configuration; C18:3-Ala; C20:5-Ala; C16:0-Ala; C22:0-Gly, in particular C22:6-Gly; C18:2-Leu; C23:1-Leu; C18:1-Ile; C8:0-Glu; C12:0-Asp; C18:1-Ser; and C20:4-Ser.

The compounds of formula (I) impart remarkable organoleptic properties to edible compositions to which they are added. In particular, they impart highly intense, authentic and harmonious flavour, and a roundness and fullness to edible compositions containing them.

This finding was all the more surprising considering that when applicant tasted the compounds in dilute aqueous solution, they exhibited a disappointing, faintly fatty taste profile. As such, they appeared to be quite unsuitable for use in flavour applications. Only their combination with flavour co-ingredients and the judicious selection of their usage levels was it possible to discover the remarkable organoleptic properties of these compounds. Their effect on edible compositions is quite unusual in that they actually complement, lift or accentuate the essential or authentic flavour and mouth feel characteristics of the foods or beverages in which they are incorporated. Accordingly, the compounds of the present invention find utility in a broad spectrum of applications in the food and beverage industry, as well as in health and wellness.

Accordingly, the invention provides in another of its aspects, a method of conferring flavour and/or mouthfeel to, or improving taste and/or mouthfeel of an edible composition, which method comprises adding to said composition a compound of formula (I) defined herein.

The remarkable organoleptic effects are observed when the compounds of formula (I) are incorporated into an edible composition containing one or more flavour co-ingredients.

The flavour co-ingredients may be sugars, fats, salt (e.g. sodium chloride), MSG, calcium ions, phosphate ions, organic acids, proteins, purines and mixtures thereof.

In a particular embodiment, sugars are present in amounts of 0.001 % to 90 %, more particularly 0.001 % to 50 %, still more particularly 0.001 % to 20 % based on the total weight of an edible composition.

In a particular embodiment, fats are present in amounts of 0.001 % to 100 %, more particularly 0.001 % to 80 %, more particularly 0.001 % to 30 %, still more particularly 0.001 % to 5 % based on the total weight of an edible composition.

In a particular embodiment, salt (e.g. sodium chloride) is present in amounts of 0.001 % to 20 %, more particularly 0.001 % to 5 % based on the total weight of an edible composition.

In a particular embodiment, MSG is present in amounts of 0.001 % to 2 % based on the total weight of an edible composition.

In a particular embodiment, calcium is present in amounts of 0.001% to 50% more particularly 0.001 % to 20 %, still more particularly 0.001 % to 1 % based on the total weight of an edible composition.

In a particular embodiment, organic acids are present in amounts of 0.001 % to 10 %, more particularly 0.001 % to 7 % based on the total weight of an edible composition.

Types of organic acids include citric, malic, tartaric, fumaric, lactic, acetic and succinic. Types of edible compositions containing organic acids include beverages, such as carbonated soft drink beverages, still beverages, Juices, powdered soft drinks, liquid concentrates, alcoholic beverages and functional beverages.

In a particular embodiment, phosphorus is present in an amount up to 0.5 % by weight of an edible composition. Typically phosphorus will be present as a phosphate or as phosphoric acid.

In a particular embodiment, purines are present in an amount up to 0.5 % by weight of an edible composition. The term "purines" include ribonucleotides such as IMP and GMP.

Despite their interesting organoleptic properties, nevertheless, applicant found that formulating the compounds of formula (I) was not a trivial matter. The discovered potency of the compounds suggested that they could be employed at very low levels in flavour applications, and so for ease of handling, mixing and processing with other ingredients, although it is possible to use the compounds in neat form, it is desirable to extend or add volume to the physical form of the compounds by incorporating them into a suitable vehicle, for example a diluent, such as a solvent. However, the compounds are solids or viscous oils at ambient temperatures, and have very limited solubility in water. Applicant

found that an at least about 0.01 % stock solution, more particularly about 0.01 – 1 % stock solution of a compound of formula (I) achieved a balance regarding acceptable solvent levels for ease of handling and mixing, and the desire to limit the amount of solvent that would have to be removed from the stock solution when further processing of the compounds in flavour compositions and edible products for reasons of palatability, efficiency, cost and the like. Applicant found that suitable solvents for the stock solution include ethanol, triacetine, glycerol and miglyol.

In order to aid in the process of solubilization and produce a stock solution and minimize the amount of solvent, it is preferred to use compounds of the formula (I) formed from a mixture of carboxylic acids, rather than a pure carboxylic acid.

Accordingly, the invention provides in another of its aspects an at least about 0.01 % stock solution, more particularly about 0.01 – 1 % stock solution of a compound of formula (I).

The stock solution may contain other materials such as carrier materials and/or adjuvants more fully described below. In a particular embodiment, the stock solution contains an anti-oxidant selected from the group consisting of vitamin C, vitamin E, rosemary extract, antrancine, butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT). Anti-oxidants are preferably employed to prevent, or significantly reduce, generation of volatile off notes as a result of degradation of the compounds of formula (I). Anti-oxidants are particularly preferred when the compounds of formula (I) bear a residue of an unsaturated fatty acid. Anti-oxidants are particularly preferred if the fatty acid residue contains more than 1 double bond. Determination of an effective amount of anti-oxidant is within the purview of the skilled person, however amounts in the range of about 10 ppm to 1000 ppm based on the weight of the stock solution may be present.

In preparing the flavour compositions of the present invention, the compounds of formula (I) may be employed in any physical form. They may be used in neat form, in the form of a stock solution described above; they may be used in the form of an emulsion; or they may be used in a powder form. If the compounds of formula (I) are presented in the form of a

powder, the powder form can be produced by a dispersive evaporation process, such as a spray drying process as is more fully described below. The powder form may be prepared by subjecting a liquid formulation containing a compound of formula (I) to a dispersive evaporation process. The liquid formulation may comprise a solution, suspension or emulsion comprising the compound of formula (I). In particular, the liquid formulation may take the form of the stock solution described hereinabove. The liquid formulation may contain other ingredients such as a carrier material and/or an adjuvant as described more fully below.

A powder comprising a compound of formula (I) forms another aspect of the present invention.

The compounds of formula (I) may be incorporated into an edible composition alone, or in the form of a flavour composition comprising one or more flavour co-ingredients.

A flavour composition comprising a compound according to the formula (I) forms another aspect of the present invention.

In an embodiment of the present invention, the flavour formulation comprises a compound of formula (I) and at least flavour co-ingredient.

In a particular embodiment of the present invention the flavour composition comprises:

i) a compound according to formula (I);
ii) at least one flavour co-ingredient;
iii) optionally a carrier material; and
iv) optionally at least one adjuvant.

By the term "flavour co-ingredient" is an ingredient that is able to contribute or impart or modify in a positive or pleasant way the taste of an edible composition.

All manner of flavour co-ingredients may be employed in a composition according to the present invention, including, but not limited to natural flavours, artificial flavours, spices, seasonings, and the like. Flavour co-ingredients include synthetic flavour oils and flavouring aromatics and/or oils, oleoresins, essences, distillates, and extracts derived from plants, leaves, flowers, fruits, and so forth, and combinations comprising at least one of the foregoing.

Flavour oils include spearmint oil, cinnamon oil, oil of wintergreen (methyl salicylate), peppermint oil, Japanese mint oil, clove oil, bay oil, anise oil, eucalyptus oil, thyme oil, cedar leaf oil, oil of nutmeg, allspice, oil of sage, mace, oil of bitter almonds, and cassia oil; useful flavouring agents include artificial, natural and synthetic fruit flavours such as vanilla, and citrus oils including lemon, orange, lime, grapefruit, yazu, sudachi, and fruit essences including apple, pear, peach, grape, blueberry, strawberry, raspberry, cherry, plum, prune, raisin, cola, guarana, neroli, pineapple, apricot, banana, melon, apricot, ume, cherry, raspberry, blackberry, tropical fruit, mango, mangosteen, pomegranate, papaya and the like.

Additional exemplary flavours imparted by a flavouring agent include a milk flavour, a butter flavour, a cheese flavour, a cream flavour, and a yogurt flavour; a vanilla flavour; tea or coffee flavours, such as a green tea flavour, an oolong tea flavour, a tea flavour, a cocoa flavour, a chocolate flavour, and a coffee flavour; mint flavours, such as a peppermint flavour, a spearmint flavour, and a Japanese mint flavour; spicy flavours, such as an asafetida flavour, an ajowan flavour, an anise flavour, an angelica flavour, a fennel flavour, an allspice flavour, a cinnamon flavour, a chamomile flavour, a mustard flavour, a cardamom flavour, a caraway flavour, a cumin flavour, a clove flavour, a pepper flavour, a coriander flavour, a sassafras flavour, a savoury flavour, a Zanthoxyli Fructus flavour, a perilla flavour, a juniper berry flavour, a ginger flavour, a star anise flavour, a horseradish flavour, a thyme flavour, a tarragon flavour, a dill flavour, a capsicum flavour, a nutmeg flavour, a basil flavour, a marjoram flavour, a rosemary flavour, a bayleaf flavour, and a wasabi (Japanese horseradish) flavour; a nut flavour such as an almond flavour, a hazelnut flavour, a macadamia nut flavour, a peanut flavour, a pecan flavour, a pistachio flavour, and a walnut flavour; alcoholic flavours, such as a wine flavour, a whisky flavour, a brandy

flavour, a rum flavour, a gin flavour, and a liqueur flavour; floral flavours; and vegetable flavours, such as an onion flavour, a garlic flavour, a cabbage flavour, a carrot flavour, a celery flavour, mushroom flavour, and a tomato flavour.

In some embodiments, said flavour co-ingredients include aldehydes and esters such as cinnamyl acetate, cinnamaldehyde, citral diethylacetal, dihydrocarvyl acetate, eugenyl 49 formate, p-methylamisol, and so forth can be used. Further examples of aldehyde flavourings include acetaldehyde (apple), benzaldehyde (cherry, almond), anisic aldehyde (licorice, anise), cinnamic aldehyde (cinnamon), citral, i.e., alpha-citral (lemon, lime), neral, i.e., beta-citral (lemon, lime), decanal (orange, lemon), ethyl vanillin (vanilla, cream), heliotrope, i.e., piperonal (vanilla, cream), vanillin (vanilla, cream), alpha-amyl cinnamaldehyde (spicy fruity flavours), butyraldehyde (butter, cheese), valeraldehyde (butter, cheese), citronellal (modifies, many types), decanal (citrus fruits), aldehyde C-8 (citrus fruits), aldehyde C-9 (citrus fruits), aldehyde C- 12 (citrus fruits), 2-ethyl butyraldehyde (berry fruits), hexenal, i.e., trans-2 (berry fruits), tolyl aldehyde (cherry, almond), veratraldehyde (vanilla), 2,6-dimethyl-5-heptenal, i.e., melonal (melon), 2,6-dimethyloctanal (green fruit), and 2-dodecenal (citrus, mandarin), and the like.

Further examples of other flavour co- ingredients can be found in "Chemicals Used in Food Processing", publication 1274, pages 63-258, by the National Academy of Sciences.

Flavour co-ingredients can also include salt tastants, umami tastants, and savoury flavour compounds. Non limiting examples include: NaCl, KCl, MSG, guanosine monophosphate (GMP), inosin monophospahte (IMP), ribonucleotides such as disodium inosinate, disodium guanylate, N-(2-hydroxyethyl)-lactamide, N-lactoyl -GMP, N-lactoyl tyramine, gamma amino butyric acid, allyl cysteine, 1-(2-hydroxy-4-methoxylphenyl)-3-(pyridine-2-yl)propan-1-one, arginine, potassium chloride, ammonium chloride, succinic acid, N-(2-methoxy-4-methyl benzyl)-N'-(2-(pyridin-2-yl)ethyl) oxalamide, N-(heptan-4-yl)benzo(D)(1,3)dioxole-5-carboxamide, N-(2,4-dimethoxybenzyl)-N'-(2-(pyridin-2-yl)ethyl) oxalamide, N-(2-methoxy-4-methyl benzyl)-N'-2(2-(5-methyl pyridin-2-yl)ethyl) oxalamide, cyclopropyl-E,Z-2,6-nonadienamide.

In particular embodiments of the present invention, the flavour co-ingredient is selected from the compounds and compositions disclosed in WO2005102701, WO2006009425, WO2005096843, WO2006046853 and WO2005096844, all of which references are herein incorporated by reference in their entirety.

Flavour co-ingredients may include known salt tastants, umami tastants, and savoury flavour compounds. Non limiting examples include: NaCl, KCl, MSG, guanosine monophosphate (GMP), inosin monophospahte (IMP), ribonucleotides such as disodium inosinate, disodium guanylate, N-(2-hydroxyethyl)-lactamide, N-lactoyl -GMP, N-lactoyl tyramine, gamma amino butyric acid, allyl cysteine, 1-(2-hydroxy-4-methoxylphenyl)-3-(pyridine-2-yl)propan-1-one, arginine, potassium chloride, ammonium chloride, succinic acid, N-(2-methoxy-4-methyl benzyl)-N'-(2-(pyridin-2-yl)ethyl) oxalamide, N-(heptan-4-yl)benzo(D)(1,3)dioxole-5-carboxamide, N-(2,4-dimethoxybenzyl)-N'-(2-(pyridin-2-yl)ethyl) oxalamide, N-(2-methoxy-4-methyl benzyl)-N'-2(2-(5-methyl pyridin-2-yl)ethyl) oxalamide, cyclopropyl-E,Z-2,6-nonadienamide.

The carrier material may be employed in compositions according to the invention to encapsulate or to entrap in a matrix the other components of the composition. The role of the carrier material may be merely that of a processing aid or a bulking agent, or it might be employed to shield or protect the other components from the effects of moisture or oxygen or any other aggressive media. The carrier material might also act as a means of controlling the release of flavour from edible compositions.

Carrier materials may include mono, di- or trisaccharides, natural or modified starches, hydrocolloids, cellulose derivatives, polyvinyl acetates, polyvinylalcohols, proteins or pectins. Example of particular carrier materials include sucrose, glucose, lactose, levulose, fructose, maltose, ribose, dextrose, isomalt, sorbitol, mannitol, xylitol, lactitol, maltitol, pentatol, arabinose, pentose, xylose, galactose, maltodextrin, dextrin, chemically modified starch, hydrogenated starch hydrolysate, succinylated or hydrolysed starch, agar, carrageenan, gum arabic, gum accacia, tragacanth, alginates, methyl cellulose,

carboxymethyl cellulose, hydroxyethyl cellulose, hydroxypropylmethyl cellulose, derivatives and mixtures thereof. Of course, the skilled addresse with appreciate that the cited materials are hereby given by way of example and are not to be interpreted as limiting the invention.

By "flavour adjuvant" is meant an ingredient capable of imparting additional added benefit to compositions of the present invention such as a colour, light resistance, chemical stability and the like. Suitable adjuvants include solvents (including water, alcohol, ethanol, triacetine, oils, fats, vegetable oil and miglyol), binders, diluents, disintegrating agents, lubricants, colouring agents, preservatives, antioxidants, emulsifiers, stabilisers, anti-caking agents, and the like. In a particular embodiment, the flavour composition comprises an anti-oxidant. Said anti-oxidants may include vitamin C, vitamin E, rosemary extract, antrancine, butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT).

Examples of such carriers or adjuvants for flavour 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 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 flavour compositions are described in standard texts, such as "Handbook of Industrial Chemical Additives", ed. M. and I. Ash, 2nd Ed., (Synapse 2000).

Flavour compositions according to the present invention may be provided in any suitable physical form. For example, they may be in the form of oils, emulsions or dispersions in a hydrous liquid or organic liquid suitable for use in edible compositions, or solid form, such as powders.

If the flavour compositions are to be provided in the form of a powdered composition, they may be prepared by dispersive evaporation techniques generally known in the art, such as spray drying.

Accordingly, in another aspect of the present invention there is provided a method of forming a powder composition, comprising the steps of providing a liquid composition comprising a compound of the formula (I) and one or more optional ingredients selected from at least one flavour co-ingredient, a carrier material and an adjuvant, and dispersively evaporating said liquid composition to form a powder composition.

In this manner, a compound of formula (I) or a flavour composition comprising said compound may be presented in a powder form.

The liquid composition used in the preparation of a powder may be in the form of a solution, emulsion, dispersion or slurry. The liquid may contain water, and/or an organic liquid, such as ethanol, glycerol, triacetine, miglyol (MCT) that is acceptable for use in edible compositions.

Powder compositions according to the present invention may be prepared according to methods and apparatus known in the art for producing powders on an industrial scale. A particularly suitable method is spray drying. Spray drying techniques and apparatus are well known in the art and need no detailed discussion herein. The spray drying techniques, apparatus and methods described in US2005/0031769 and US2013/0022728, as well as those techniques, apparatus and methods described in those documents are suitable for producing powder compositions of the present invention and are herein incorporated by reference in their entirety.

The manner in which the compounds of formula (I) are incorporated into powder flavour compositions of the invention is not critical. For example, the compounds may be added to the liquid composition described above and be subjected to a dispersive evaporation

process along with all the other components of the flavour composition. Alternatively, compounds may be added to the flavour composition after it has been formed as a powder.

Many of the flavour co-ingredients described herein above are volatile and/or may be sensitive to oxidative degradation, particularly when subjected to elevated temperature, and under humid conditions. Accordingly, particular problems can arise when subjecting flavour co-ingredients described above to dispersive evaporation processes such as spray drying. A non-exhaustive list of ingredients that can be particularly susceptible include, those ingredients containing artificial, natural or synthetic fruit flavours such as vanilla, chocolate, coffee, cocoa and citrus oil, including lemon, orange, grape, lime and grapefruit, and fruit essences including apple, pear, peach, strawberry, raspberry, cherry, plum, pineapple, apricot and the like. The volatile components of these flavour co-ingredients may include, but are not limited to, acetaldehyde, dimethyl sulfide, ethyl acetate, ethyl propionate, methyl butyrate, and ethyl butyrate. Flavour co-ingredients containing volatile aldehydes or esters include, e.g., cinnamyl acetate, cinnamaldehyde, citral, diethylacetal, dihydrocarvyl acetate, eugenyl formate, and p-methylanisole. Further examples of volatile compounds that may be present as co-ingredients include acetaldehyde (apple); benzaldehyde (cherry, almond); cinnamic aldehyde (cinnamon); citral, i.e., alpha citral (lemon, lime); neral, i.e., beta citral (lemon, lime); decanal (orange, lemon); ethyl vanillin (vanilla, cream); heliotropine, i.e., piperonal (vanilla, cream); vanillin (vanilla, cream); alpha-amyl cinnamaldehyde (spicy fruity flavors); butyraldehyde (butter, cheese); valeraldehyde (butter, cheese); citronellal (modifies, many types); decanal (citrus fruits); aldehyde C-8 (citrus fruits); aldehyde C-9 (citrus fruits); aldehyde C-12 (citrus fruits); 2-ethyl butyraldehyde (berry fruits); hexenal, i.e., trans-2 (berry fruits); tolyl aldehyde (cherry, almond); veratraldehyde (vanilla); 2,6-dimethyl-5-heptenal, i.e., melonal (melon); 2-6-dimethyloctanal (green fruit); and 2-dodecenal (citrus, mandarin); cherry; or grape and mixtures thereof.

Applicant surprisingly found that the inclusion of a compound of formula (I) in a powder flavour composition, it was possible to obtain flavour quality reminiscent of flavour oils.

Accordingly, the invention provides in another of its aspects a method of maintaining flavour quality of a powder flavour composition comprising the step of including in said powder flavour composition a compound of formula (I)

As stated hereinabove, compounds of formula (I) or flavour compositions containing such compounds can be incorporated into edible compostions, and an edible composition containing such a compound or flavour composition forms another aspect of the present invention.

The term "edible composition" refers to products for consumption by a subject, typically via the oral cavity (although consumption may occur via non-oral means such as inhalation), for at least one of the purposes of enjoyment, nourishment, or health and wellness benefits. Edible compositions may be present in any form including, but not limited to, liquids, solids, semi-solids, tablets, capsules, lozenges, strips, powders, gels, gums, pastes, slurries, syrups, aerosols and sprays. The term also refers to, for example, dietary and nutritional supplements. Edible compositions include compositions that are placed within the oral cavity for a period of time before being discarded but not swallowed. It may be placed in the mouth before being consumed, or it may be held in the mouth for a period of time before being discarded. An edible composition as herein above defined includes compositions whose taste is modified in the manner described herein by the addition of compounds of formula (I) or whose taste is so modified by processing such that it is enriched in a compound of formula (I).

Broadly, the edible composition includes, but is not limited to foodstuffs of all kinds, confectionery products, baked products, sweet products, savoury products, fermented products, dairy products, beverages and oral care products.

In a particular embodiment the term "edible compositions" refers to products for consumption by a subject, typically via the oral cavity (although consumption may occur via non-oral means such as inhalation), for one of the purposes of enjoyment or nourishment.

In a more particular embodiment the term "edible compositions" refers to products for consumption by a subject, typically via the oral cavity (although consumption may occur via non-oral means such as inhalation), for the purpose of enjoyment. Still more particularly, the term refers to foodstuffs and beverages.

In a particular embodiment, the term "edible composition" does not relate to pharmaceutical compositions.

In a particular embodiment, the term "edible composition" does not relate to nutritional supplements.

Exemplary foodstuffs include, but are not limited to, chilled snacks, sweet and savoury snacks, fruit snacks, chips/crisps, extruded snacks, tortilla/corn chips, popcorn, pretzels, nuts, other sweet and savoury snacks, snack bars, granola bars, breakfast bars, energy bars, fruit bars, other snack bars, meal replacement products, slimming products, convalescence drinks, ready meals, canned ready meals, frozen ready meals, dried ready meals, chilled ready meals, dinner mixes, frozen pizza, chilled pizza, soup, canned soup, dehydrated soup, instant soup, chilled soup, uht soup, frozen soup, pasta, canned pasta, dried pasta, chilled/fresh pasta, noodles, plain noodles, instant noodles, cups/bowl instant noodles, pouch instant noodles, chilled noodles, snack noodles, dried food, dessert mixes, sauces, dressings and condiments, herbs and spices, spreads, jams and preserves, honey, chocolate spreads, nut-based spreads, and yeast-based spreads.

Exemplary confectionery products include, but are not limited to, chewing gum (which includes sugarized gum, sugar-free gum, functional gum and bubble gum), centerfill confections, chocolate and other chocolate confectionery, medicated confectionery , lozenges, tablets, pastilles, mints, standard mints, power mints, chewy candies, hard candies, boiled candies, breath and other oral care films or strips, candy canes, lollipops, gummies, jellies, fudge, caramel, hard and soft panned goods, toffee, taffy, liquorice, gelatin candies, gum drops, jelly beans, nougats, fondants, combinations of one or more of the above, and edible flavour compositions incorporating one or more of the above.

Exemplary baked products include, but are not limited to, alfajores, bread, packaged/industrial bread, unpackaged/artisanal bread, pastries, cakes, packaged/industrial cakes, unpackaged/artisanal cakes, cookies, chocolate coated biscuits, sandwich biscuits, filled biscuits, savoury biscuits and crackers, bread substitutes,

Exemplary sweet products include, but are not limited to, breakfast cereals, ready-to-eat ("rte") cereals, family breakfast cereals, flakes, muesli, other ready to eat cereals, children's breakfast cereals, hot cereals,

Exemplary savoury products include, but are not limited to, salty snacks (potato chips, crisps, nuts, tortilla-tostada, pretzels, cheese snacks, corn snacks, potato-snacks, ready-to-eat popcorn, microwaveable popcorn, pork rinds, nuts, crackers, cracker snacks, breakfast cereals, meats, aspic, cured meats (ham, bacon), luncheon/breakfast meats (hotdogs, cold cuts, sausage), tomato products, margarine, peanut butter, soup (clear, canned, cream, instant, UHT),canned vegetables, pasta sauces.

Exemplary dairy products include, but are not limited to, cheese, cheese sauces, cheese-based products, ice cream, impulse ice cream, single portion dairy ice cream, single portion water ice cream, multi-pack dairy ice cream, multi-pack water ice cream, take-home ice cream, take-home dairy ice cream, ice cream desserts, bulk ice cream, take-home water ice cream, frozen yoghurt, artisanal ice cream, dairy products, milk, fresh/pasteurized milk, full fat fresh/pasteurized milk, semi skimmed fresh/pasteurized milk, long-life/uht milk, full fat long life/uht milk, semi skimmed long life/uht milk, fat-free long life/uht milk, goat milk, condensed/evaporated milk, plain condensed/evaporated milk, flavoured, functional and other condensed milk, flavoured milk drinks, dairy only flavoured milk drinks, flavoured milk drinks with fruit juice, soy milk, sour milk drinks, fermented dairy drinks, coffee whiteners, powder milk, flavoured powder milk drinks, cream, yoghurt, plain/natural yoghurt, flavoured yoghurt, fruited yoghurt, probiotic yoghurt, drinking yoghurt, regular drinking yoghurt, probiotic drinking yoghurt, chilled and shelf-stable desserts, dairy-based desserts, soy-based desserts.

Exemplary beverages include, but are not limited to, flavoured water, soft drinks, fruit drinks, coffee-based drinks, tea-based drinks, juice-based drinks (includes fruit and vegetable), milk-based drinks, gel drinks, carbonated or non-carbonated drinks, powdered drinks, alcoholic or non-alcoholic drinks.

Exemplary fermented foods include, but are not limited to, Cheese and cheese products, meat and meat products, soy and soy products, fish and fish products, grain and grain products, fruit and fruit products.

In a particular embodiment the consumable product is selected from the group consisting of soy sauce, cheese, soup, hot and cold sauces, fruits, vegetables, ketchups, tea, coffee, snacks such as potato chips or extruded snacks.

The compounds of formula (I), when added to a flavour composition and/or an edible composition act on a composition to complement its flavour and/or mouthfeel to render it more delicious and authentic. The effects may be temporal or related to intensity, for example the compounds may act by enhancing, strengthening, softening, sharpening a flavour, or making more salivating. The compounds of formula (I) may also affect the temporal profile of a flavour, that is, they may affect the initial impact of a flavour, the body of a flavour, or its lingering effect.

The compounds of formula (I) may modify any aspect of the temporal profile of taste or flavour of an edible composition. In particular, the compounds improve mouthfeel and impart more creamy and fatty sensations.

Compounds of formula (I) or flavour compositions containing same may be added to edible compositions in widely carrying amounts. The amount will depend on the nature of the edible composition to be flavoured, and on the desired effect, as well as on the nature of the ingredients present in said flavour composition. In order to obtain the remarkable beneficial effects attributed to the presence of the compounds of formula (I), the flavour

composition should be employed in amounts such that the compounds of formula (I) are present in amounts of 1 part per billion to 10 parts per million based on the total weight of the edible composition. Whereas amounts higher than this can be employed, the beneficial effects are considerably less apparent and undesirable off-notes can become increasingly apparent.

Interesting organoleptic effects, e.g. salt, alcohol or coolant boosting effects, in edible compositions containing salt or alcohol or coolant compounds can be achieved when compounds of the formula (I) are employed at levels of 1 to 100 ppb.

Interesting organoleptic effects, for example umami boosting effects, in edible compositions containing umami tastants can be achieved when compounds of the formula (I) are employed at levels of 100 to 250 ppb.

Interesting organoleptic effects, in particular mouthfeel boosting effects, in edible compositions can be achieved when compounds of the formula (I) are employed at levels of 250 to 500 ppb.

Interesting organoleptic effects, e.g. fat boosting effects, in edible compositions containing fats can be achieved when compounds of the formula (I) are employed at levels of 500 to 1000 ppb.

It is particularly advantageous to incorporate compounds of formula (I) into edible compositions that are formed under conditions of high temperature, such as baking, frying or which are processed by heat treatments such as pasteurization or under UHT conditions. Under high preparation or processing temperatures, volatile flavour ingredients may be lost or degraded with the result that flavour intensity can be reduced and the essential and authentic flavour characteristics can be diminished. Such edible products include dairy products, snack foods, baked products, powdered soft drinks and similar dry mixes, and the like, fats and condiments, mayonnaise, dressings, soups and bouillons, and beverages.

A particularly preferred class of edible composition according to the present invention are powdered soft drinks and similar dry mix applications. Dry mix applications are known in the art and included products in powder form that are intended to be reconstituted before consumption. They include powdered soups, powdered cake mixes, powdered chocolate drinks, instant coffees, seasonings and fonds, and the like.

Dry powders formed by dispersive evaporation processes, such as spray drying, represent a very convenient vehicle to deliver flavour oil quality flavours to edible compositions.

Unfortunately, flavour oils, and in particular citrus flavour oils can be particularly sensitive to dispersive evaporation processes, especially processes carried out at high temperature. Flavour oils tend to evaporate or degrade to form products having unfavourable off-notes. Powdered flavour compositions, particularly those containing citrus oils, can be of poor quality and exhibit relatively short self-life, as a result.

Surprisingly, the incorporation of compounds of formula (I) or flavour compositions containing same into powder compositions, results in powder compositions that exhibit the impact and authenticity of the flavour oils used in their preparation, essentially maintaining flavour oil quality in a powdered flavour formulations.

Accordingly, the invention provides in another aspect a powder flavour composition comprising a compound according to formula (I) and at least one additional flavour co-ingredient.

In another aspect of the invention there is provided a powder soft drink composition or other dry mix composition comprising a compound according to formula (I).

In yet another aspect of the present invention there is provided a powdered soft drink composition or other dry mix composition comprising a powder flavour composition comprising a compound of formula (I).

In yet another aspect of the present invention there is provided a method of forming a powder flavour composition comprising the step of incorporating into said composition a compound according to formula (I).

In a particular embodiment of the compound of formula (I) may be added to the formed powder flavour composition, or it may be added to flavour composition before forming the powder.

Another particularly preferred class of edible composition according to the present invention are snack foods. Snack foods are a category of product well known to the skilled person in the food industry. These products are described above and include, without limitation, pretzels, corn chips, potato chips, puffed products, extruded products, tortilla chips and the like. Still more particularly, the invention is concerned with low fat snack food compositions. Low fat snack food compositions contain less that 30 % by weight fat, more particularly between 5 to 25 % by weight of fat.

A problem with reducing fat in a snack food composition is the loss in taste and texture. Fats play an important role in the way that dough behaves during processing and greatly affect the quality, flavor and texture of ready-to-eat products. As the fat content in snack products is reduced or replaced with other ingredients (e.g., non-digestible fat, protein, fiber, gums), adverse organoleptic effects (e.g., mouth coating, drying, lack of crispness and lack of flavour) are increased. The adverse organoleptic effects result in products having reduced palatability.

Considerable efforts have been expended in devising flavour compositions to overcome the problems associated with low fat snack food products. Flavours may be applied to a snack food as topical coatings in the form of dry powders and/or as liquids (e.g., oil-based, water-based). Another approach has been to add flavour to the dough.

Despite these various approaches which have been taken to improve consumer appeal and palatability of snack foods, and particularly low fat snack foods, there is still a need for

improved low-fat snack foods having coatings applied thereto with the visual appeal, flavor, and texture of full-fat snack foods.

Compounds according to formula (I) or flavour compositions containing same can be incorporated into snack foods to impart an impactful flavour and a mouthfeel with a remarkable roundness and fullness. Furthermore, the taste and mouthfeel effects can be achieved even in low fat snack foods.

Accordingly, the invention provides in another of its aspects a snack food comprising a flavour composition as hereinabove described. In a particular embodiment of the invention the snack food has a fat content of about 40 % or less by weight based on the total weight of the snack food, more particularly about 30 % or less, still more particularly 25 % or less, more particularly still about 10 % or less, still more particularly about 5 % or less, still more particularly about 3 % or less.

Examples of snack foods are described above and include products processed by oven baking, extrusion or frying, and which are made from potato and/or corn and/or various grains such as rice or wheat.

Another particularly preferred class of edible composition according to the present invention is alcoholic beverages.

Applicant surprisingly found that compounds according to formula (I) incorporated into an alcoholic beverage had the effect of increasing the alcohol impact of the beverage.

Accordingly, the invention provides in another of its aspects an alcoholic beverage comprising a compound according to formula (I).

In yet another aspect of the invention there is provided a method of producing a heightened alcoholic impression in an alcoholic beverage by incorporating into said beverage a compound according to formula (I).

Compounds of formula (I) may be incorporated into said alcoholic beverage in amounts of 1 ppb to 1 ppm.

Another class of edible compositions are products taken orally in the form of tablets, capsules, powders, multiparticulates and the like. Such compounds may include pharmaceutical dosage forms or nutraceutical dosage forms.

Certain groups of people have problems swallowing tablets or capsules, powders, multi-particulates and the like. This problem can be particularly pronounced in certain consumer groups, such as children and the very old or infirm. Applicant surprisingly found that compounds according to the formula (I) when taken into the oral cavity produce a pronounced salivating effect. Incorporating the compounds into these forms, particularly as part of a coating around said dosage forms can ease the swallowing process for consumers, in particular children and the old or infirm.

Accordingly, the invention provides in another of its aspects an orally administrable dosage form, in particular in the form of tablets capsules, powders or multiparticulates comprising a compound according to the formula (I).

Another preferred class of edible composition is baked goods. Compounds of the formula (I) may be incorporated topically or in-dough. Incorporated at levels of 1 ppb to 1 ppm, the compounds of formula (I) render baked products less dry and more succulent.

Other preferred class of edible compositions are caloric or non-caloric beverages containing carbohydrate sweeteners, such as sucrose, high fructose corn syrup, fructose and glucose, or high intensity, non-nutritive sweeteners such as aspartame, acesulfame K, sucralose, cyclamate, sodium saccharin, neotame, rebaudioside A, and/or other stevia-based sweeteners; as well as other optional ingredients such as juices, organic acids such as citric acid, alcohol and functional ingredients.

Incorporated at levels of 1 ppb to 10 ppm, compounds of formula (I) impart to said beverages containing sweeteners at levels of less than 1 % and up to about 20 %, an upfront sweetness and mouthfeel that is reminiscent of sugar.

Other preferred edible compositions are savoury compositions, in particular those that are soy-based or fish-based.

Incorporated at levels of 1 ppb to 10 ppm, in a soy-based composition (such as soy sauce) or a fish-based composition (such as fish sauce) containing 5 to 40 % salt, the compositions are found to exhibit strong umami tastes that are long-lasting and rich.

Another preferred edible composition is a clouded beverage composition.

Certain beverages such as juices have relatively higher turbidity and thus have an opaque appearance. Often, it is desired that the beverage have a relatively high turbidity. This might be desirable to provide a more natural appearance to beverages with low juice content, or it might be for reasons related to masking sedimentation or "ringing" (where flavour or colour oils rise to the surface of a container during storage). Clouded beverages are usually formed by means of a clouding agent. Clouding agents are usually supplied in the form of emulsions, or the clouding agent may be part of a powdered beverage that upon reconstitution will formed an emulsion providing a permanent cloud to the beverage.

Compounds of the formula (I), in addition to their remarkable organoleptic properties, can lend stability to clouding agents and to beverage compositions containing same.

Accordingly, the invention provides in another of its aspects a composition comprising a beverage clouding composition and a compound of formula (I).

In a particular embodiment of the invention, a flavour composition as herein defined may be provided in the form of an emulsion. This emulsion composition may be particularly

useful in clouded beverage applications, in particular, in which it is intended to employ a clouding agent.

In yet another aspect of the invention there is provided a clouded beverage composition comprising a clouding agent and a compound of the formula (I).

Other preferred edible compositions are those compositions that are formed by a process of ripening.

In food processing, it frequently occurs that a food needs to remain for a prolonged period of time and under well-defined conditions to obtain the food with the requisite and recognised quality. A commonly used term for this process is ripening. Ripening is well known in the processing of certain types of cheese, meat, soy-sauce and wine, as well as beer sausage, sauerkraut, tempeh and tofu. There are also specific steps that are carried out for specific reasons (such as water-removal, or off-note removal) that have beneficial effects on the food products. Examples of this are the conching of chocolate and the drying of noodles, vegetables and fruits. The transformations that improve the quality of the food are induced by chemical conversions, enzymatically catalysed conversions or fermentative transformations. All of these conversions are slow and therefore expensive; they are also not fully predictable or controllable.

The compounds of formula (I), having regard to their remarkable property of adding to the authentic taste characteristics of the edible compositions in which they are incorporated, may be added to an edible product during its ripening process in order to reduce storage time without adversely influencing the taste quality of the ripened product.

Accordingly, in another aspect of the invention there is provided a method of ripening a product selected from the group consisting of cheese, meat, soy-sauce and wine, beer, sausage, sauerkraut, tempeh and tofu, comprising the step of ripening the product in the presence of a compound according to the formula (I).

In another aspect of the invention there is provided a method of conching chocolate, said method comprising the step of adding to the chocolate a compound according to the formula (I), or a flavour composition containing same.

There now follows a series of non-limiting examples that serve to illustrate the invention.

Synthesis Examples

1.1 Route A: (DCC method)

In a 250 mL round-bottomed flask was mixed fatty acid (3.93 mmol) with 1-hydroxypyrrolidine-2,5-dione (0.498 g, 4.32 mmol) in dioxane (50 ml) to give a colorless solution. The solution was cooled to 10°C and DCC (0.892 g, 4.32 mmol) was added while stirring. Stirring was continued for three hours at room temperature. The formed solids were filtered (dicyclohexylurea) and the filtrate was added to a solution of amino acid (6.48 mmol) in a 2% solution of sodiumbicarbonate (0.363 g, 4.32 mmol) in water. The reaction mixture was stirred for 4 hours at 50°C. Dioxane was evaporated and the aqueous residue was further diluted with water, acidified with a diluted hydrochloric acid solution and extracted with ethylacetate. Organic layers were combined, washed with brine, dried and evaporated to yield 1.3 g of a white solid. Product was purified by flash column chromatography, eluent DCM/methanol.

1 g of 85-90% pure product could be obtained.

1.2 Route B (DCC method with protection group)

Step 1:

To a solution of an O-methylated amino acid (16.51 mmol) in DCM (100 ml) was added triethylamine (1.519 g, 15.01 mmol) at minus 15°C.A fatty acid (.01 mmol) was added while stirring. A solution of DCC (15.01 mmol) in 10 mL of DCM was added dropwise at 0°C. The reaction mixture was stirred at 0°C for 1 hour and stirring was continued at room temperature for 3 hours. The dicyclohexylurea was removed by filtration from the reaction mixture. Filtrate was washed with a saturated sodiumbicarbonate solution, diluted hydrochloric acid solution and water. Organic layer was separated, dried and evaporated to

yield 3 g of an oil. This oil was purified by flash column chromatography, eluent DCM/methanol The intermediate ester compound could be isolated in a purity of 95%.

Step 2:

The O-methylated N-acyl-amino-acid (4.91 mmol) was dissolved in a mixture of Ethanol (8.00 ml) and water (8 ml). To this mixture was added a 32% solution of sodiumhydroxide (2.453 g, 19.63 mmol) and mixture was stirred at room temperature for three hours. Mixture stand over for 14 hours.

After 14 hours the mixture was acidified with a concentrated hydrochloric acid solution (1.612 ml, 19.63 mmol), diluted with water and extracted with mtbe. Organic layer was separated, dried and evaporated. 1.3 g of a half solid yellow residue was obtained.NMR confirmed the structure of the title compound, purity 95%

1.3 Route C (acid chloride)

An amino acid (20 mmol) was dissolved in a solution of sodiumhydroxide (54.5 mmol) in water (40 ml).

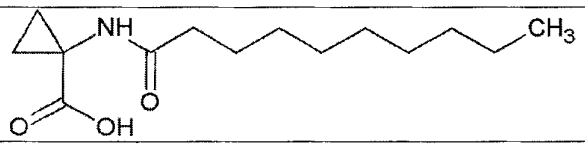
Tetrahydrofuran (60 ml) was added. Fatty acid chloride (18.18 mmol) was added dropwise at room temperature. Stirring was continued for 2 hours. Mixture was diluted with water, acidified with a 37% solution of hydrochloric acid (2.99 ml, 36.4 mmol) and extracted with ethylacetate.

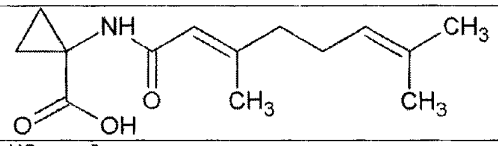
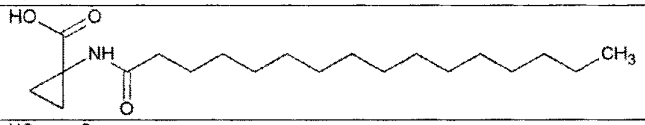
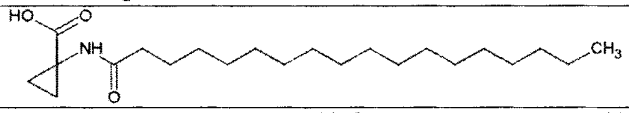
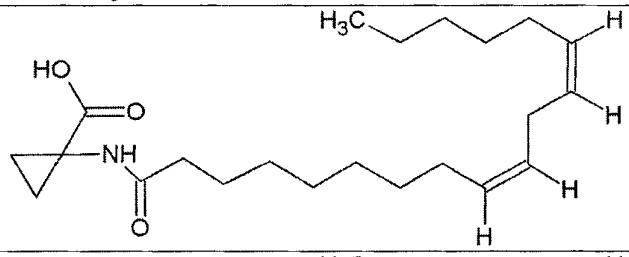
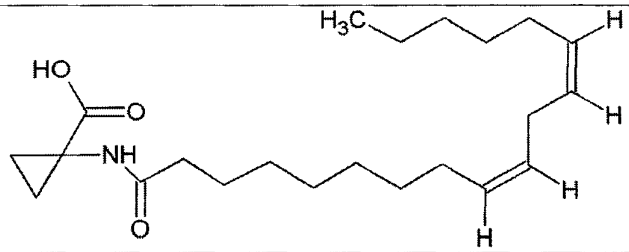
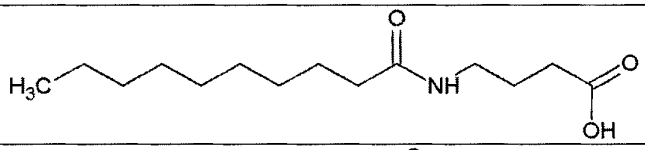
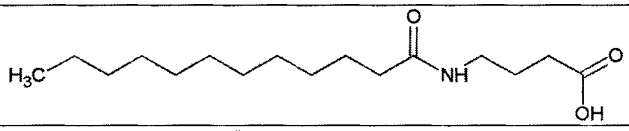
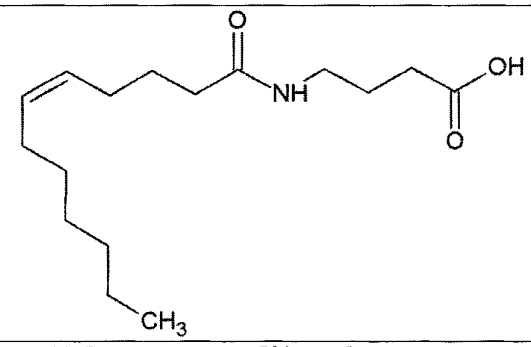
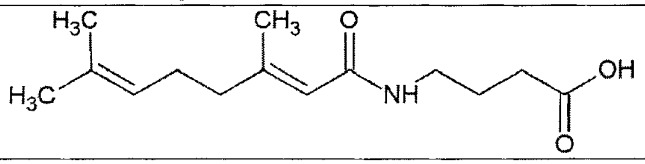
Organic layers were combined, dried and evaporated.

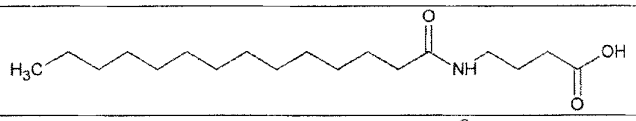
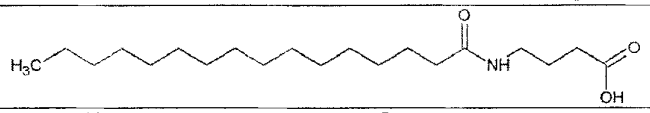
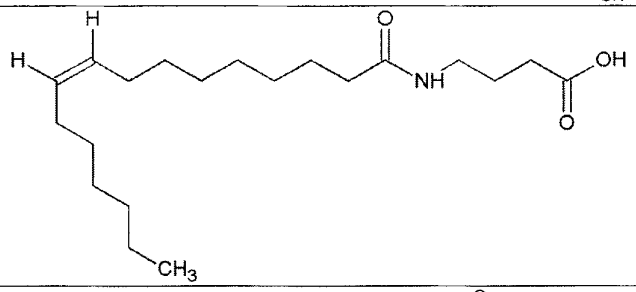
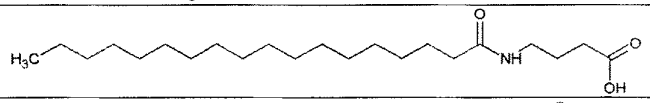
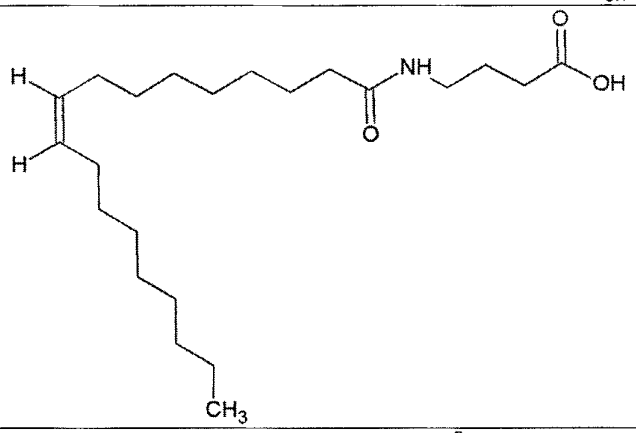
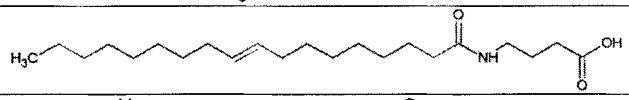
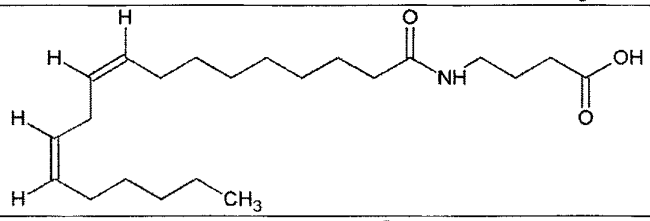
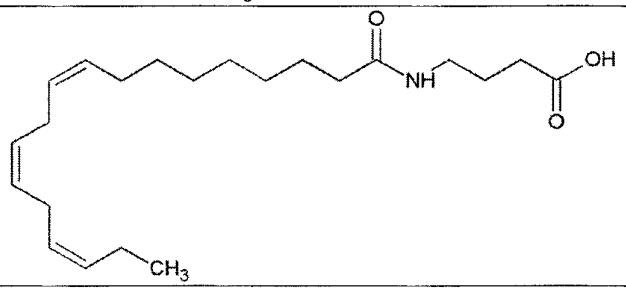
The residue contains about 20% free fatty acid according NMR. The solids were stirred with heptane for 30 minutes, filtered and dried. This resulted in 2.4 g of the title compound as a creamy colored solid. (purity 95%).

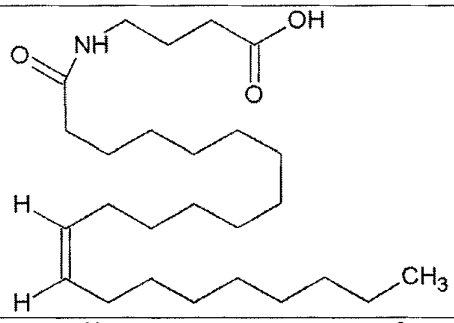
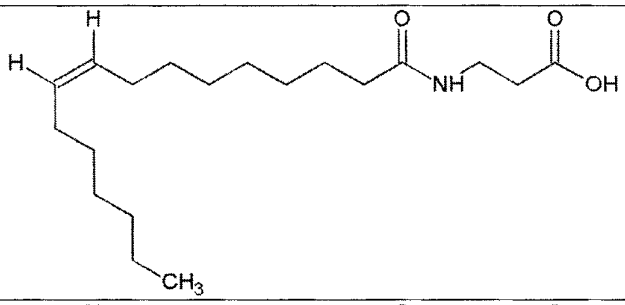
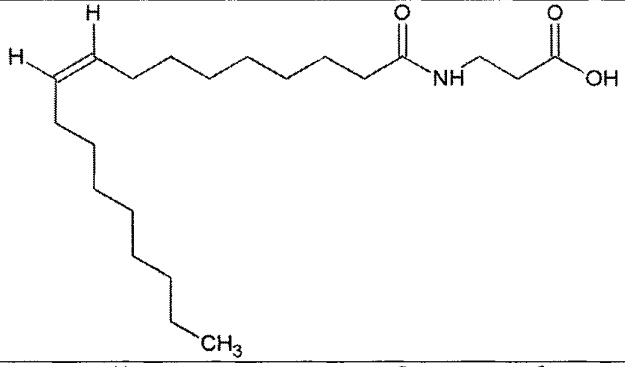
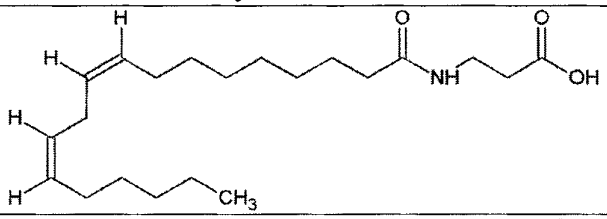
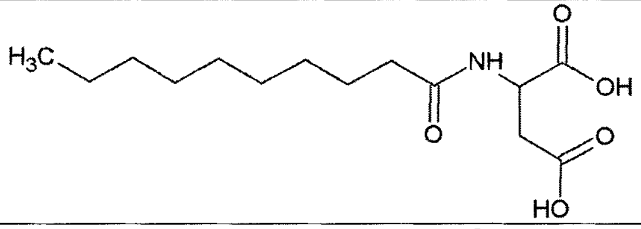
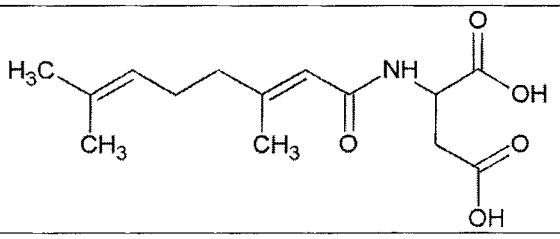
1.4 Table of synthesized compounds

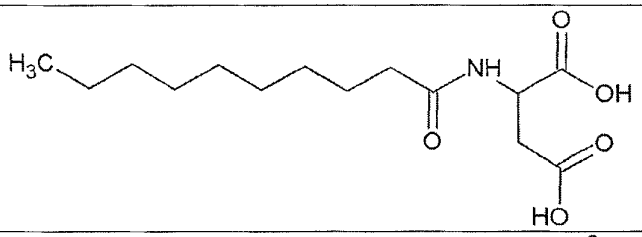
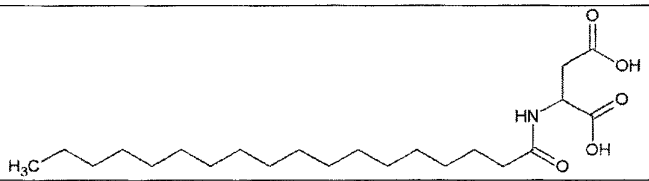
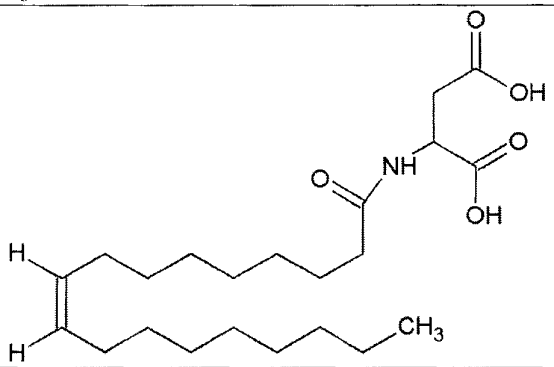
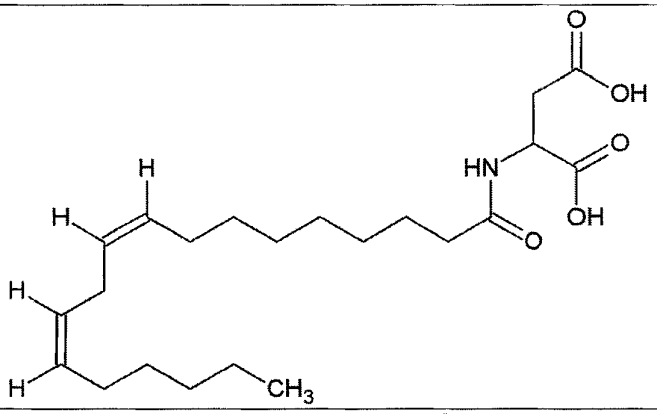
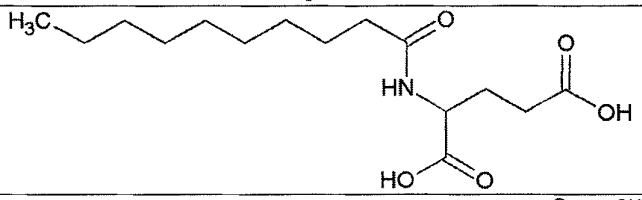
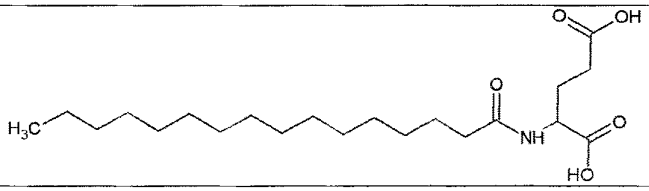
Table 1: List of synthesized compounds

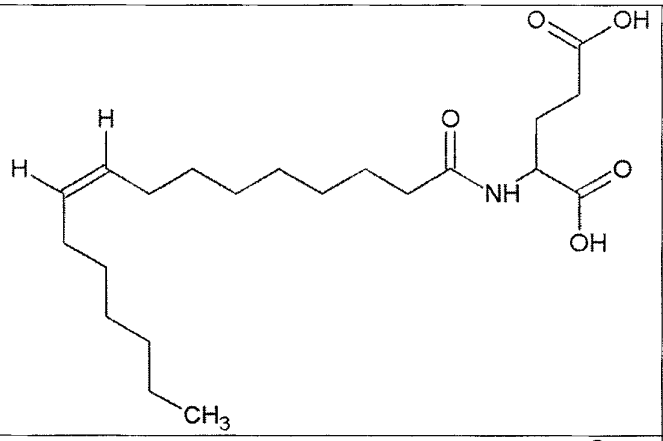
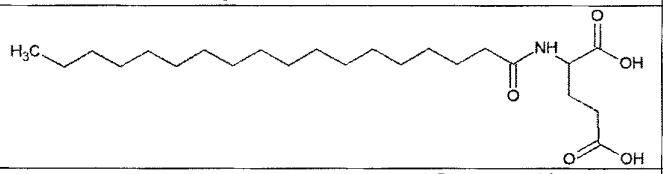
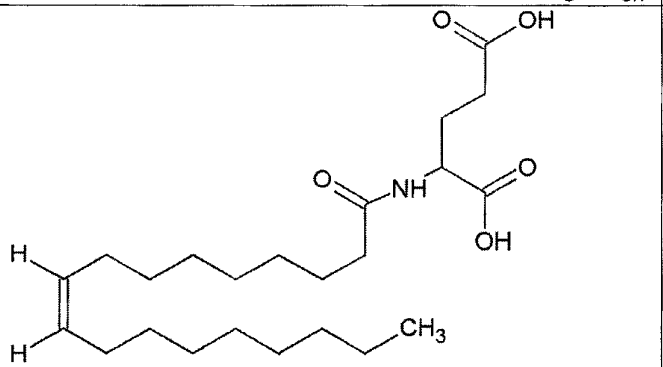
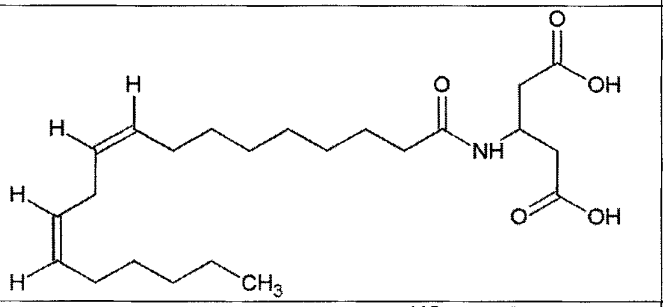
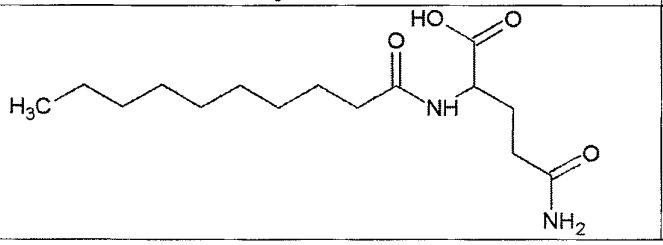
Structure	Amino acid	Carboxylic acid	Structure	Route
1	ACC	C10:0		C

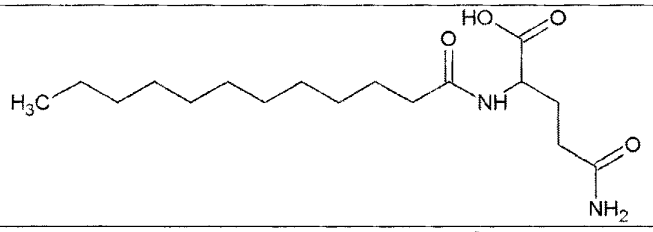
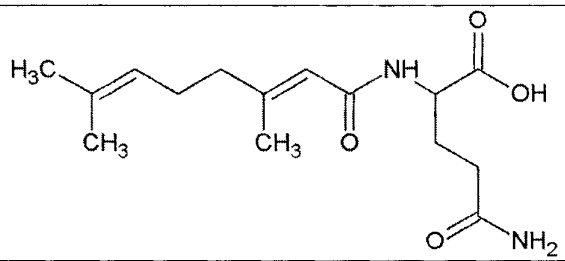
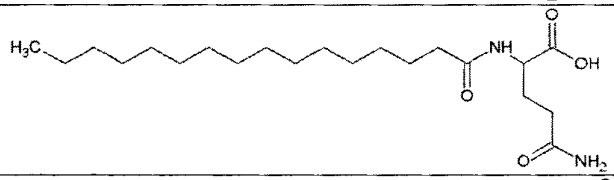
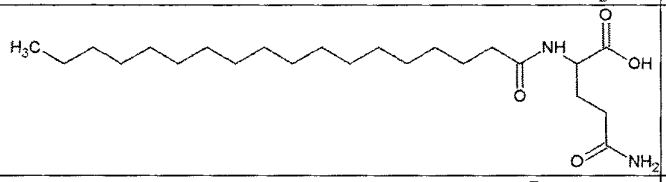
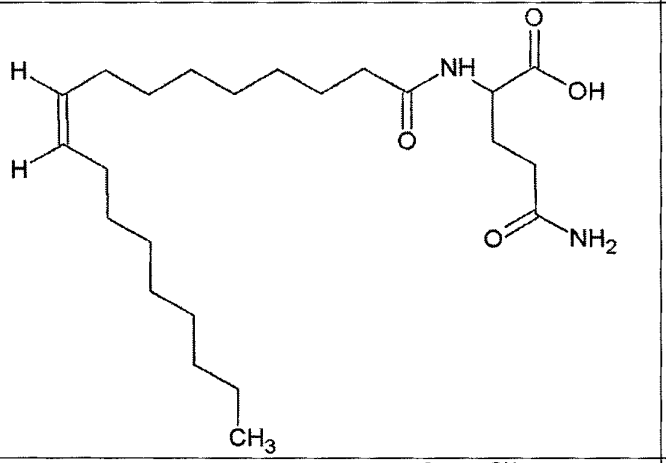
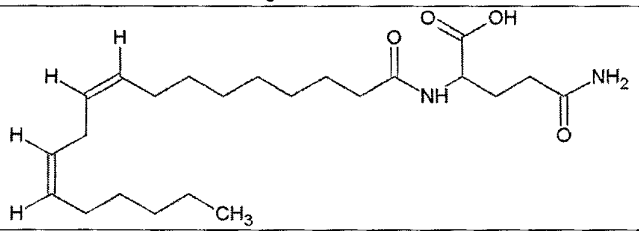
2	ACC	C10:2		A
3	ACC	C16:0		C
4	ACC	C18:0		C
5	ACC	C18:1		C
6	ACC	C18:2		A
7	GABA	C10:0		C
8	GABA	C12:0		C
9	GABA	C12:1		C
10	GABA	C10:2		C

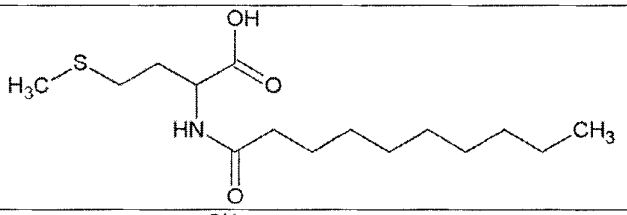
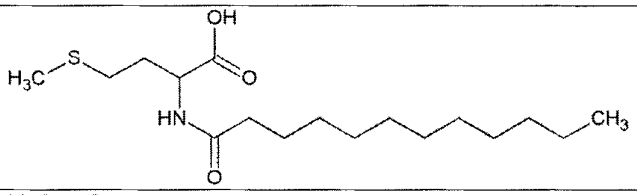
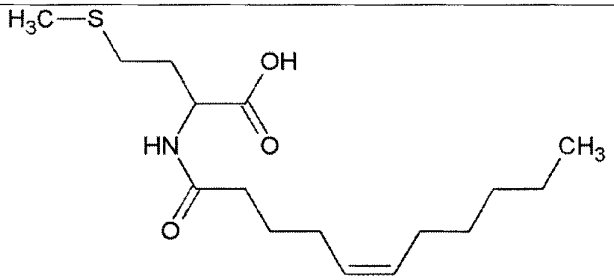
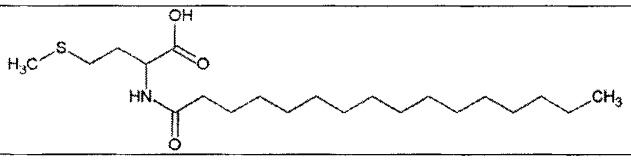
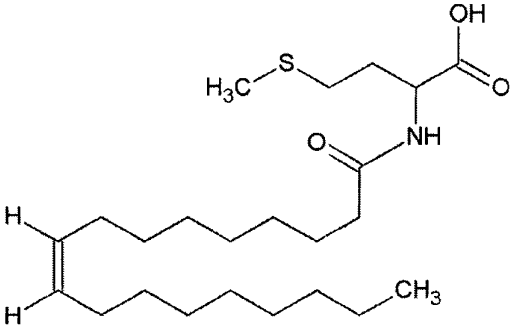
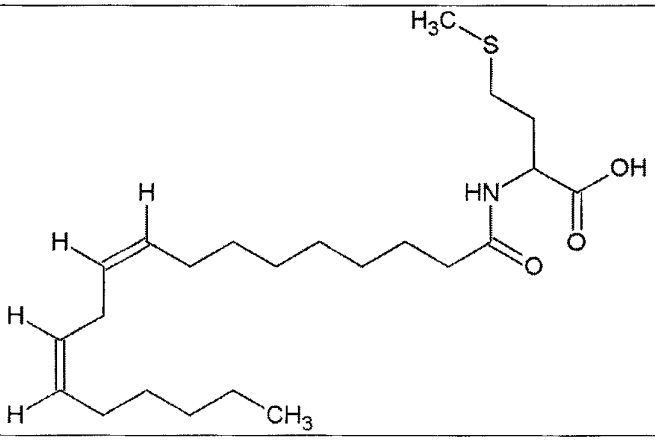
11	GABA	C14:0		C
12	GABA	C16:0		C
13	GABA	C16:1		A
14	GABA	C18:0		C
15	GABA	$C18:1_c$		C
16	GABA	$C18:1_t$		C
17	GABA	C18:2		A
18	GABA	C18:3		A

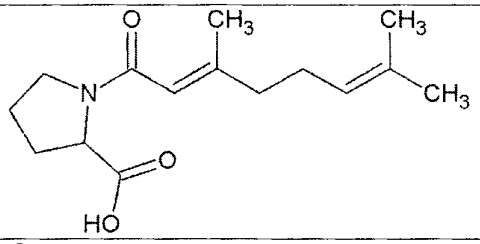
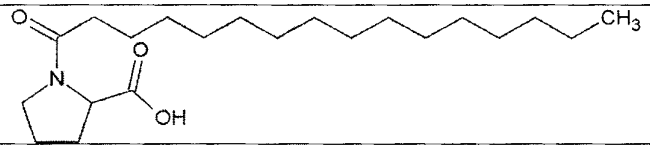
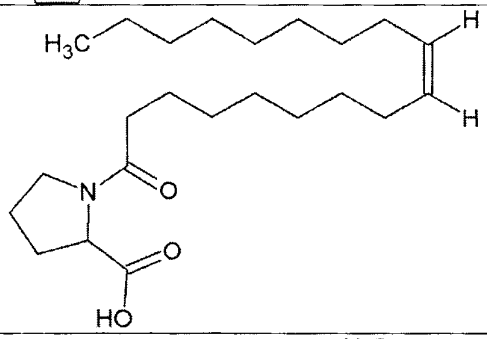
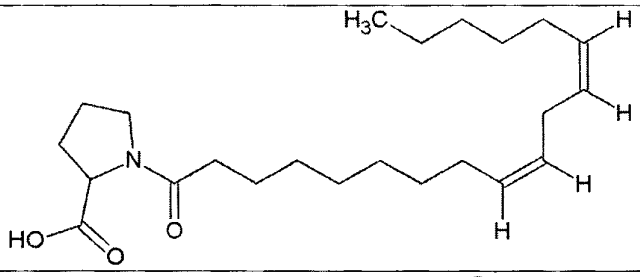
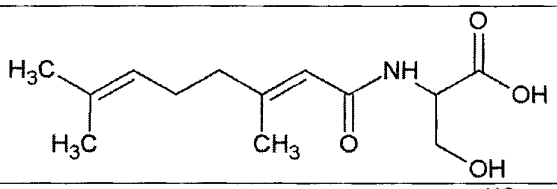
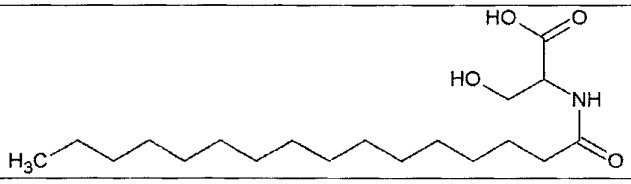
19	GABA	C22:1		C
20	Beta-alanine	C16:1		A
21	Beta-alanine	C18:1		C
22	Beta-alanine	C18:2		A
23	Aspartic acid	C10:0		C
24	Aspartic acid	C10:2		B

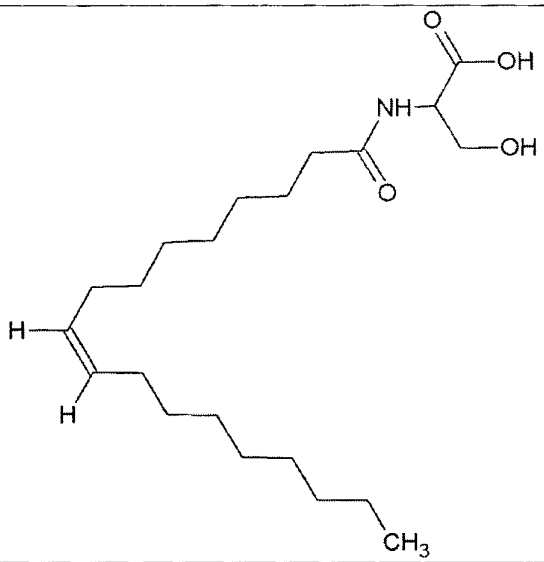
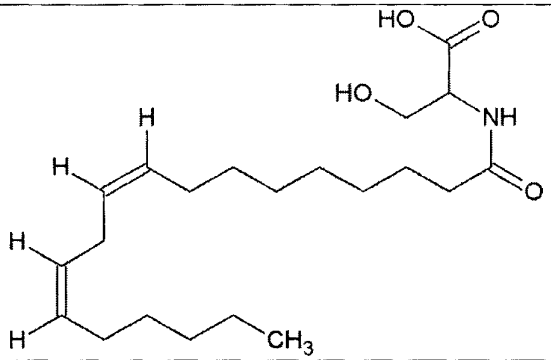
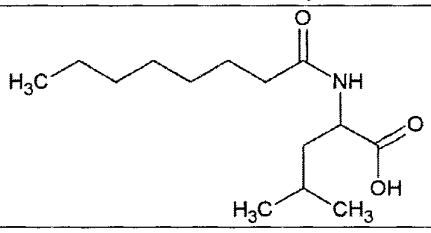
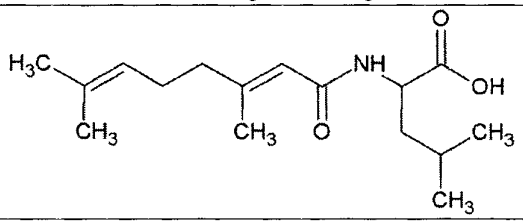
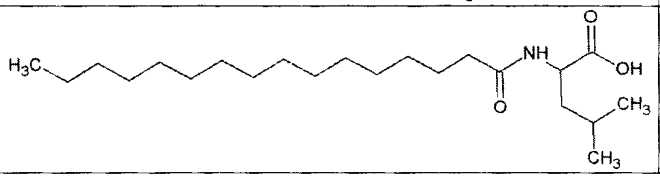
25	Aspartic acid	C16:0		C
26	Aspartic acid	C18:0		C
27	Aspartic acid	C18:1		C
28	Aspartic acid	C18:2		A
29	Glutamic acid	C10:0		C
830	Glutamic acid	C16:0		C

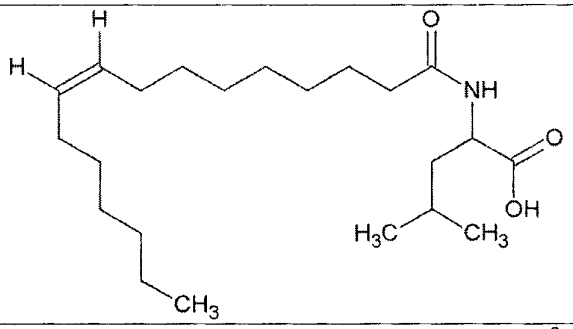
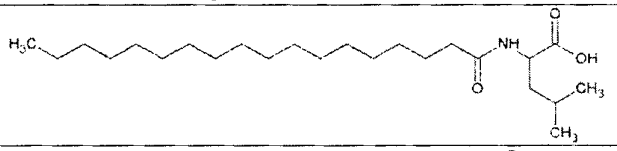
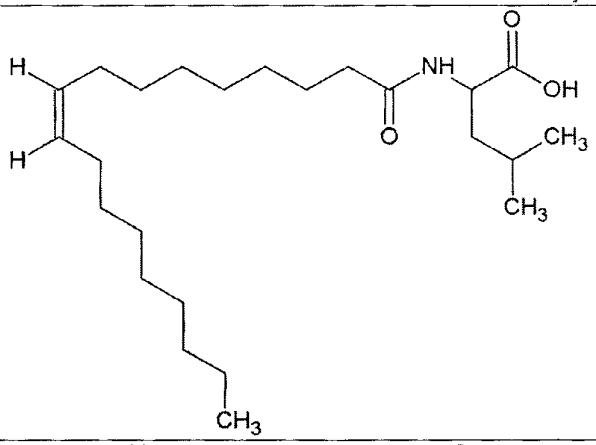
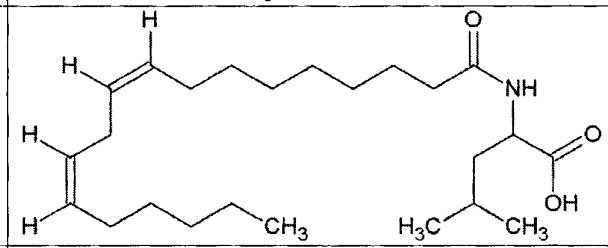
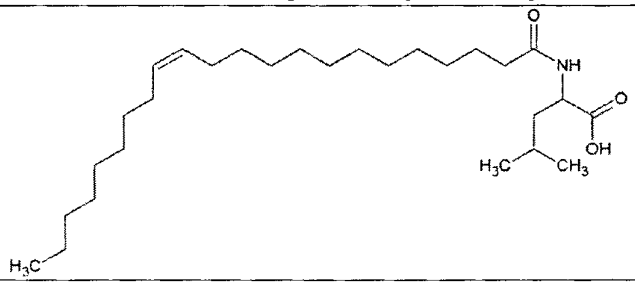
31	Glutamic acid	C16:1		A
32	Glutamic acid	C18:0		C
33	Glutamic acid	C18:1		C
34	Glutamic acid	C18:2		A
35	Glutamine	C10:0		C

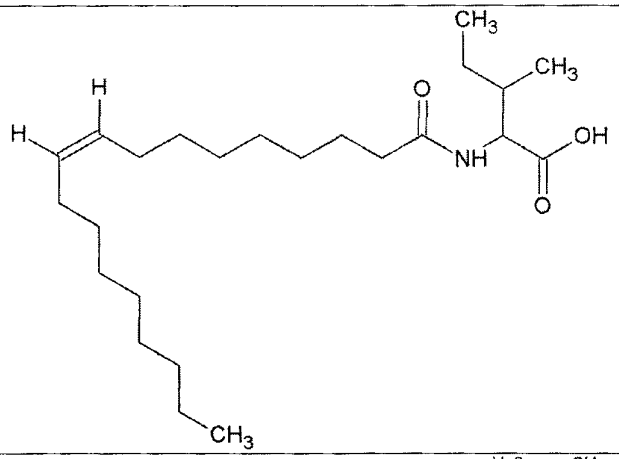
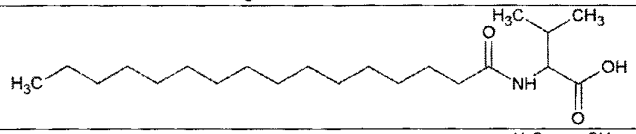
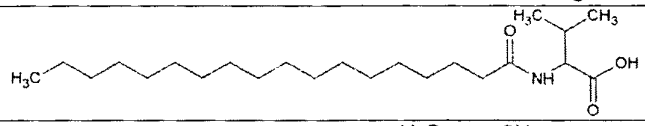
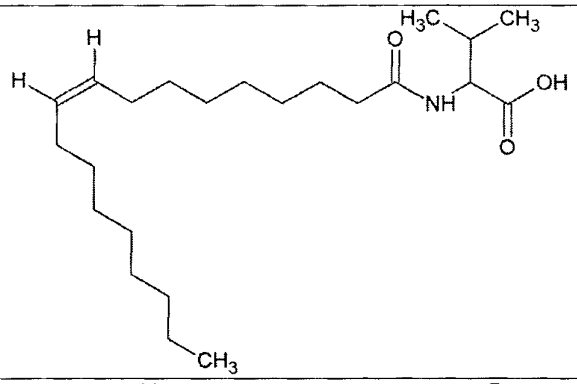
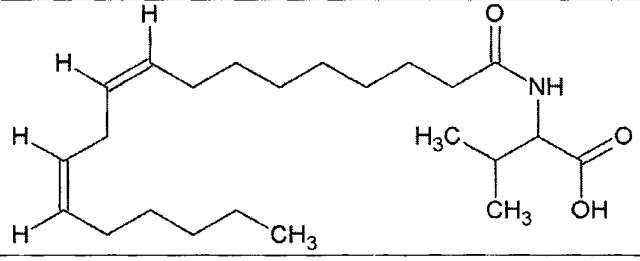
36	Glutamine	C12:0		C
37	Glutamine	C10:2		A
38	Glutamine	C16:0		C
39	Glutamine	C18:0		C
40	Glutamine	C18:1		C
41	Glutamine	C18:2		A

42	Methionine	C10:0		A
43	Methionine	C12:0		A
44	Methionine	C12:1		A
45	Methionine	C16:0		A
46	Methionine	C18:1		A
47	Methionine	C18:2		A

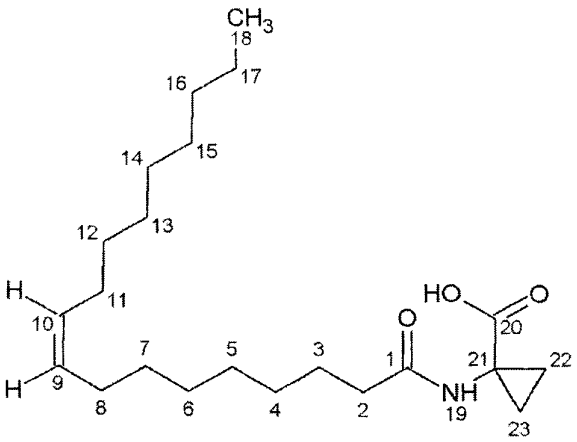
48	Proline	C10:2		A
49	Proline	C16:0		C
50	Proline	C16:0		C
51	Proline	C18:2		A
52	Serine	C10:2		B
53	Serine	C16:0		C

54	Serine	C18:1		C
55	Serine	C18:2		A
56	Leucine	C-8:0		C
57	Leucine	C10:2		B
58	Leucine	C16:0		C

59	Leucine	C16:1		A
60	Leucine	C18:0		C
61	Leucine	C18:1		C
62	Leucine	C18:2		B
63	Leucine	C22:1		A

64	Isoleucine	C18:1		C
65	Valine	C16:0		C
66	Valine	C18:0		C
67	Valine	C18:1		C
68	Valine	C18:2		A

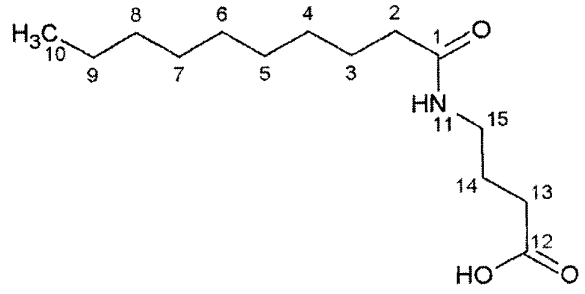
2 NMR data (examples)
2.1 Structure 5 ACC-C18:1



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 0.88 (t, *J*=7.05 Hz, 3 H, H-C(18)) 1.09 - 1.21 (m, 2 H H-C(22,23)) 1.21- 1.1.39 (m, 20 H, H-C(4, 5, 6, 7, 12, 13, 14, 15, 16, 17)) 1.54 - 1.68 (m, 4 H, H-C(3, 22, 23)) 1.91 - 2.07 (m, 4 H, H-C(8, 11)) 2.18 (t, *J*=7.73 Hz, 2 H, H-C(2)) 5.26 - 5.44 (m, 2 H, H-C(9, 10)) 6.28 (s, 1 H, H-N(19))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 14.13 (C(18) 18.01 (C(22, 23)) 22.69 (C(17)), 25.45 (C(3)), 27.19 (C(11) 27.23 (C11)) 29.16 (C4)) 29.18 (C6)) 29.26 (C(5)) 29.33 (C(13, 15)) 29.45 (C(14)) 29.72 (C(7)) 29.78 (C(12)) 31.91 (C(16, 21)) 33.47 (C(2)) 129.76 (C(10)) 129.99 (C(9)) 175.15 (C(1)) 177.39 (C(20))

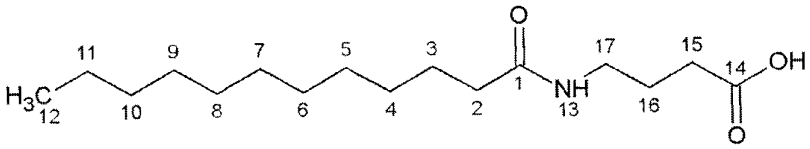
2.2 Structure 7 GABA-C10:0



^{1}H NMR (600 MHz, DMSO-d_6) δ ppm 0.83 - 0.87 (m, 3 H, H-C(10)) 1.18 - 1.29 (m, 12 H, H-C(4, 5, 6, 7, 8, 9) 1.46 (quin, *J*=7.22 Hz, 2 H, H-C(14)) 1.59 (quin, *J*=7.22 Hz, 2 H, H-C(3)) 2.02 (t, *J*=7.39 Hz, 2 H, H-C(2)) 2.19 (t, *J*=7.39 Hz, 2 H, H-C(13)) 3.00 - 3.05 (m, 2 H, H-C(15)) 7.77 (t, *J*=5.50 Hz, 1 H, H-N(15)

^{13}C NMR (150 MHz, DMSO-d_6) δ ppm 13.95 (C(10)) 22.09 (C(9)) 24.64 (C(14)) 25.29 (C(3)) 28.64 (C(5)) 28.66 (C(7)) 28.78 (C(6)) 28.90 (C(4)) 31.07 (C(13)) 31.27 (C(8)) 35.38 (C(2)) 35.77 (C(15)) 172.03 (C(1)) 174.21 (C(12))

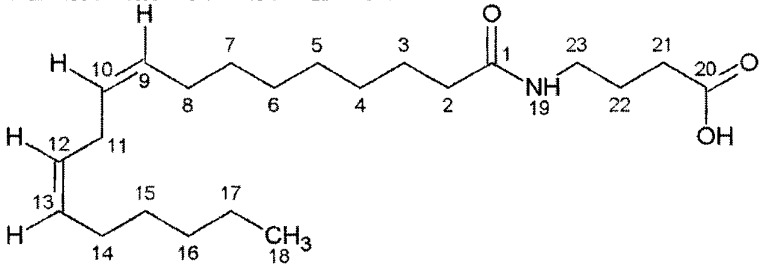
2.3 Structure 8 GABA-C12:0



^{1}H NMR (600 MHz, DMSO-d_6) δ ppm 0.85 (t, J=6.87 Hz, 3 H, H-C(12)) 1.15 - 1.33 (m, 16 H, H-C(4, 5, 6, 7, 8, 9, 10, 11) 1.41 - 1.51 (m, 2 H, H-C(3)) 1.59 (quin, J=7.22 Hz, 2 H, H-C(16)) 2.02 (t, J=7.56 Hz, 2 H, H-C(2)) 2.19 (t, J=7.56 Hz, 2 H, H-C(15)) 3.02 (q, J=6.53 Hz, 2 H, (H-C(17)) 7.77 (t, J=5.33 Hz, 1 H, H-N(13))

^{13}C NMR (150 MHz, DMSO-d_6) δ ppm 13.95 (C(12)) 22.09 (C(11)) 24.64 (C(16((25.29 (C(3)) 28.64 (C(9)) 28.71 (C(15)) 28.77 (C(6)) 28.95 (C(8)) 29.00 (C(5)) 29.02 (C(4)) 31.06 (C(7)) 31.29 (C(10)) 35.77 (C(17)) 172.02 (C(1)) 174.20 (C14))

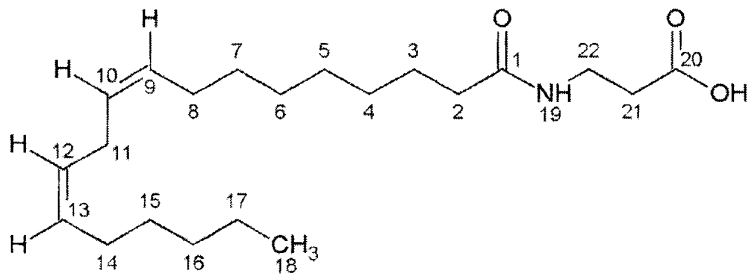
2.4 Structure 17 GABA-C18:2



^{1}H NMR (600 MHz, CHLOROFORM-d) δ ppm 0.89 (t, J=6.87 Hz, 3 H, H-C(18)) 1.26 - 1.39 (m, 14 H, H-C(4, 5, 6, 7, 15, 16, 17) 1.57 - 1.65 (m, 2 H, H-C(3)) 1.84 (quin, J=6.96 Hz, 2 H, H-C(22)) 2.05 (q, J=7.22 Hz, 4 H, H-C(8), H-C(14)) 2.19 (t, J=7.73 Hz, 2 H, H-C(2)) 2.40 (t, J=7.05 Hz, 2 H, H-C(21)) 2.77 (t, J=6.87 Hz, 2 H, H-C(11)) 3.33 (q, J=6.53 Hz, 2 H, H-C(23)) 5.30 - 5.41 (m, 4 H, H-C(9, 10, 12,13) 5.96 (br. s., 1 H, H-N(19))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 14.08 (C(18) 22.58 C(17)) 24.74 (C3)) 25.63 (C(22)) 25.75 (C(11)) 27.20 (C 8, 14)) 29.15 (C(6)) 29.26 (C(5, 21)) 29.35 (C(15)) 29.62 (C(4)) 31.49 C(7)) 31.52 C(16)) 36.73 C(2)) 38.84 (C23)) 127.90 (C12)) 128.06 (C(10)) 130.03 (C(9) 130.25 (C(13)), 174.17 (C(1) 177.43 (C(20))

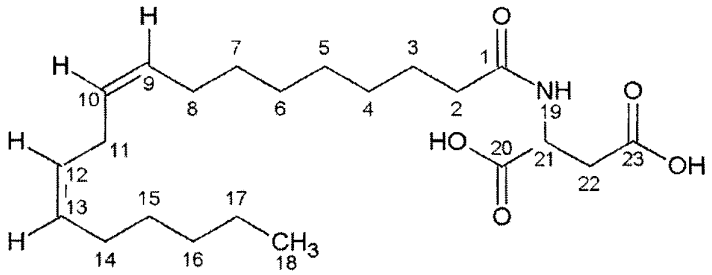
2.5 Structure 22 beta-Alanine-C18:2



^{1}H NMR (600 MHz, DMSO-d_6) δ ppm 0.85 (t, J=7.05 Hz, 3 H, H-C(18)) 1.11 - 1.37 (m, 14 H, H-C(4, 5, 6, 7, 15. 16, 17) 1.37 - 1.53 (m, 2 H, H-C(3)) 1.94 - 2.08 (m, 6 H, H-C(2, 8, 14) 2.34 (t, J=6.87 Hz. 2 H. H-C(21)) 2.73 (t, J=6.70 Hz, 2 H, H-C(11)) 3.13 - 3.27 (m, 2 H, H-C(22)) 5.24 - 5.40 (m, 4 H, H-C(12, 13)) 7.84 (t, J=5.67 Hz, 1 H, H-N(19))

^{13}C NMR (150 MHz, DMSO-d_6) δ ppm 13.91 (C(18)) 21.97 (C(17)) 25.21 (C(3)) 25.24 (C(11)) 26.60 (C(8)) 26.63 (C(14)) 28.58 (C(6)) 28.63 (C(5)) 28.68 (C(15)) 28.73 (C(4)) 29.04 (C(7)) 30.89 (C(16)) 33.98 (C(21)) 34.70 (C(22)) 35.27 (C(2)) 127.73 (C(10, 12)) 129.71 (C(9, 13)) (C(1)) 172.91 (C(20))

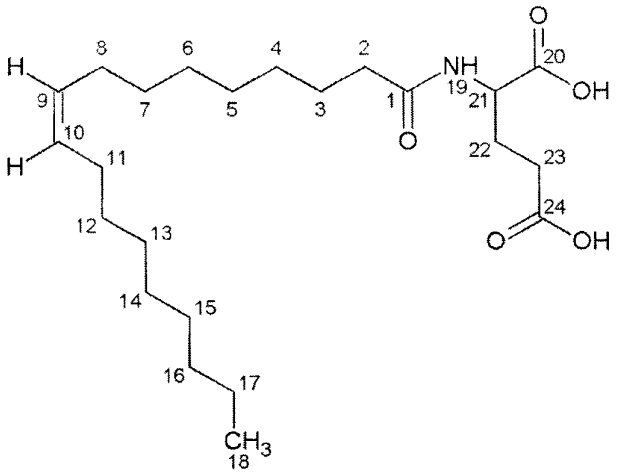
2.6 Structure 28 Asp-C18:2



^{1}H NMR (600 MHz, DMSO-d_6) δ ppm 0.86 (t, J=6.87 Hz, 3 H, H-C(18)) 1.17 - 1.38 (m, 14 H, H-C(4, 5, 6, 7, 15, 16, 17) 1.42 - 1.50 (m, 2 H, H-C(3) 2.01 (q, J=7.10 Hz, 4 H, H-C(8, 14) 2.06 - 2.10 (m, 2 H, H-C(2)) 2.48 - 2.55 (m, 1 H, H-C(22)) 2.62 - 2.68 (m, 1 H, H-C(22)) 2.73 (t, J=6.87 Hz, 2 H, H-C(11)) 4.49 (d, J=6.53 Hz, 1 H, H-C(21)) 5.18 - 5.42 (m, 4 H, H-C(9, 10, 12, 13) 8.09 (d, J=7.90 Hz, 1 H, H-N(19))

^{13}C NMR (150 MHz, DMSO-d_6) δ ppm 13.93 (C(18) 21.97 (C(17)) 25.21 (C(3), 26.60 (C(11)) 26.65 (C(8)) 28.55 (C(14)) 28.59 (C(6)) 28.70 (C(4)) 28.73 (C(5)) 29.05 (C(15)) 30.69 (C(7)) 30.89 (C(16)) 35.06 (C(2)) 36.25 (C(22) 48.49 (C(21)) 127.75 (C(10, 12)) 129.74 (C(9, 13) 171.73 (C(20)) 172.02 (C(1)) 172.61 (C23))

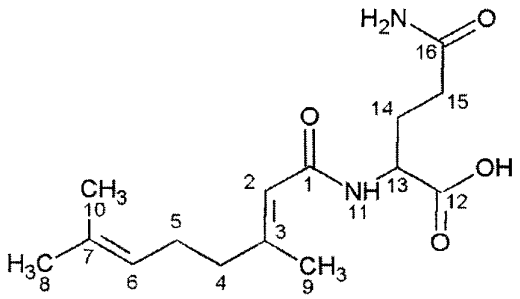
2.7 Structure 33 Glu-C18:1



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 0.88 (t, *J*=7.05 Hz, 3 H, H-C(18) 1.19 - 1.39 (m, 20 H, H-C(4, 5, 6, 7, 12, 13, 14, 15, 16, 17) 1.56 - 1.68 (m, 2 H, H-C(3)) 1.94 - 2.04 (m, 4 H-C(8, 12)) 2.08 (dt, *J*=13.83, 6.66 Hz, 1 H, H-C(22)) 2.20 - 2.25 (m, 3 H, H-C(22)) 2.43 - 2.55 (m, 2 H, H-C(23)) 4.64 (q, *J*=6.87 Hz, 1 H, H-C(21)) 5.30 - 5.38 (m, 2 H, H-C(9,10)) 6.70 (d, *J*=7.22 Hz, 1 H, H-N(19))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 14.13 (C(18) 22.69 (C(17)) 25.57 (C(3) 26.81 (C(22) 27.20 (C(11) 27.24 (C(8) 29.18 (C(6)) 29.22 (C(4)) 29.26 (C(5) 29.33 (C(13, 15) 29.55 (C(14)) 29.75 (C(7)) 29.78 (C(12)) 29.88 (C(23) 31.91 (C(16)) 36.36 (C(2)) 51.60 (C(21)) 129.71 (C(10)) 130.02 (C(9)) 174.62 (C(1)) 175.66 (C(20) 177.95 (C(24))

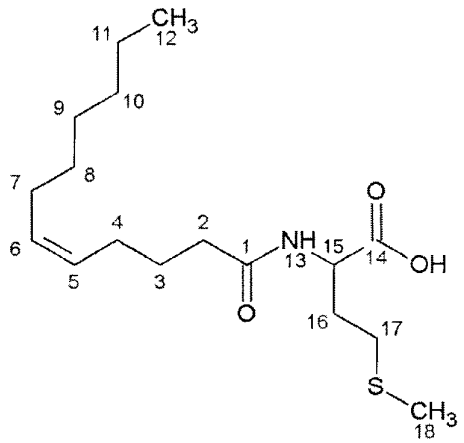
2.8 Structure 37 Gln-C10:2



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 1.56 - 1.61 (s, 3 H, H-C(10) 1.67 (s, 3 H, H-C(8)) 2.05 - 2.14 (m, 6 H, H-C(4, 14, 15) 2.15 - 2.20 (m, 3 H, H-C(9)) 2.39 (dd, *J*=15.46, 7.22 Hz, 2 H, H-C(5)) 4.51 (d, *J*=6.19 Hz, 1 H, H-C(13)) 5.01 - 5.13 (m, 1 H, H-C(6) 5.60 - 5.72 (s, 1 H, H-C(2)) 6.63 (br. s., 1 H, H-N(11)) 7.14 (br. s., 2 H, H_2-N))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 17.69 (C(10) 18.52 (C(9) 25.67 (C(8)) 26.17 (C(5)) 30.95 (C(14)) 31.68 (C(15) 40.97 (C(4)) 51.92 (C(13)) 117.22 (C(2)) 123.14 (C(6)) 132.39 (C(7)) 156.33 (C(3)) 167.95 (C(1) 174.69 (C(16)) 177.12 (C(12))

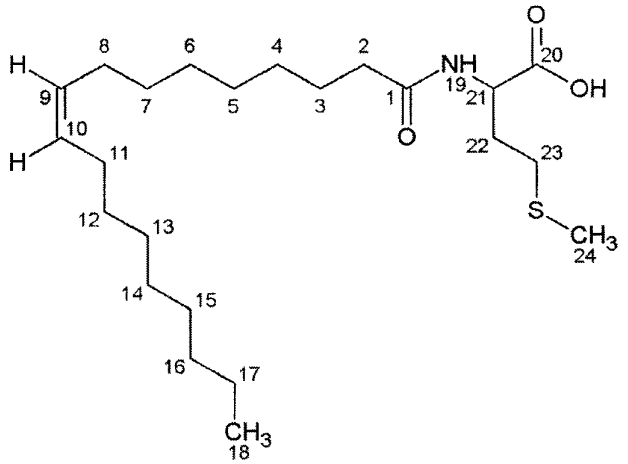
2.9 Structure 44 Met-C12:1



^{1}H NMR (300 MHz, CD_3OD) δ ppm 0.92 (t, *J*=6.9 Hz, 3H, H-C(12)), 1.32-1.38 (m, 8H, H-C(8, 9, 10, 11), 1.63-1.73 (q, *J*=7.5 Hz, 2H, H-C(3)), 1.98-2.16 (m, 9H, H-C(4, 7, 16, 18), 2.28 (t, *J*=7.2Hz, 2H, H-C(2)), 2.48-2.65 (m, 2H, H-C(17)), 4.56 (d, d, *J*=5.1, 9.9 Hz, 1H, H-C(15)), 5.33-5.46 (m, 2H, H-C(5, 6)).

^{13}C NMR (300 MHz, CD_3OD) δ ppm 14.43 (C(12) 15.21 (C(18)) 23.71 (C(11)) 27.01 (C(4)) 27.70 (C(3)) 28.22 (C(7)) 30.08 (C(9)) 30.83 (C(17)) 31.31 (C(8)) 32.19 (C(16)) 32.95 (C(10)) 36.37 (C(2)) 52.59 (C(15)) 129.81 (C(5)) 131.80 (C(6)) 175.17 (C(14)) 176.28 (C(1))

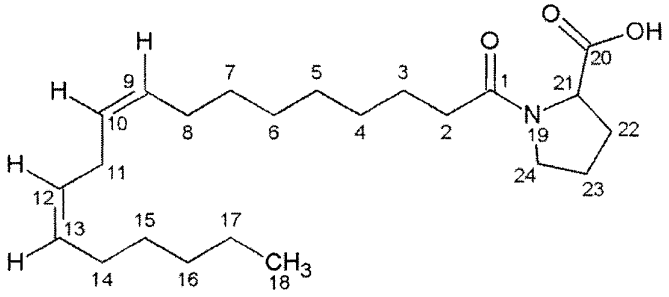
2.10 Structure 46 Met-C18:1



^{1}H NMR (300 MHz, CD_3OD) δ ppm 0.90 (t, *J*=6.6 Hz, 3H, H-C(18)), 1.27-1.34 (m, 20H, H-C(4 ,5, 6, 7, 12, 13, 14, 15, 16, 17), 1.60-1.65 (m, 2H, H-C(3)), 1.90-2.19 (m, 9H, H-C(8, 11, 22, 24), 2.25 (t, *J*=6.3 Hz, 2H, H-C(C-H(2)), 2.49-2.62 (m, 2H, H-C(23)), 4.55 (d, d, *J*=4.8, 9.9 Hz, 1H, H-C(21)), 5.30-5.40 (m, 2H, H-C(9, 10).

^{13}C NMR (300 MHz, CD_3OD) δ ppm 14.44 (C(18)), 15.24 (C(24)), 23.76, (C(17)) 26.96 (C(3)), 28.16 (C(11)), 30.26 (C(8)), 30.28(C(6)), 30.37 (C(4)), 30.47 (C(5)), 30.62 (C(15), 30.85 ((C13, 14)), 30.87 (C(23)), 31.33 (C(7,12)), 32.18 (C(22)), 33.12 (C(16)), 36.84 (C(2)), 52.60 (C(21)), 131.22 (C(9, 10)), 175.20 (C(1)), 176.61 (C(20)).

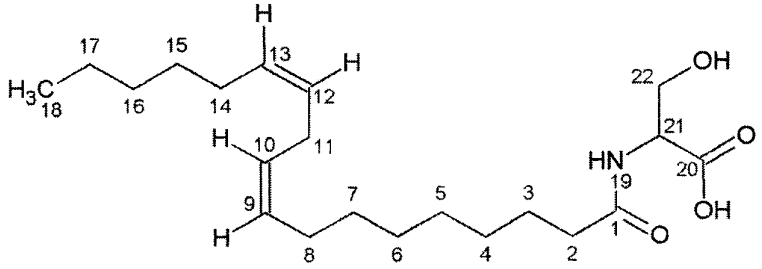
2.11 Structure 51 Proline-C18:2



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 0.78 - 0.85 (m, 3 H, H-C(18)) 1.18 - 1.33 (m, 14 H, H-C(4, 5, 6, 7, 15, 16, 17) 1.54 - 1.65 (m, 2 H, H-C(3)) 1.84 - 1.92 (m, 1 H, H_C(22)) 1.92 - 2.03 (m, 6 H, H_C(8, 14, 23)) 2.26 - 2.32 (m, 2 H, H-C(2)) 2.44 (ddd, *J*=12.29, 6.10, 2.92 Hz, 1 H, H-C(22)) 2.70 (t, *J*=6.70 Hz, 2 H, H-C(11)) 3.39 (td, *J*=9.62, 6.87 Hz, 1 H, H-C(24)) 3.47 - 3.53 (m, 1 H, H-C(24)) 4.53 (dd, *J*=8.08, 1.89 Hz, 1 H, H-C(21)) 5.16 - 5.36 (m, 4 H, H-C(9, 10, 12, 13)

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 14.07 (C(18)) 22.57 (C(17)) 24.48 (C(3)) 24.79 C(23)) 25.62 (C11)) 27.05 (C(22)) 27.17 (C(8)) 27.19 (C(14)) 29.10 C(6)) 29.27 (C(4, 15)) 29.34 (C(5)) 29.60 C(7)) 31.51 C((16)) 34.45 C(2)) 47.98 C(24)) 60.25 (C(21)) 128.07 (C(12)) 128.07 (C(10)) 130.00 (C(9)) 130.24 C(13)) 171.87 (C(1)) 175.87 (C20))

2.12 Structure 55 Serine- 18:2

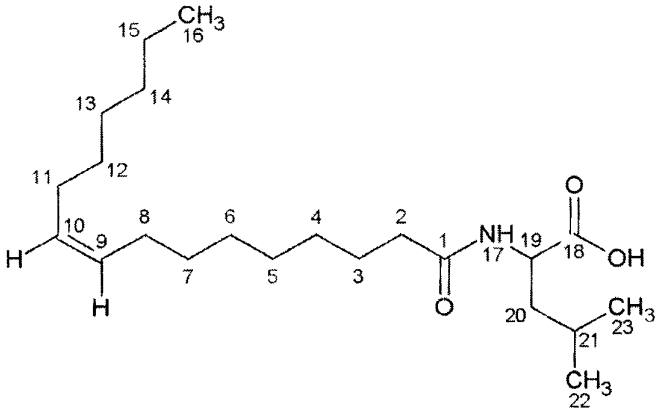


^{1}H NMR (600 MHz, DMSO-d_6) δ ppm 0.85 (t, *J*=6.87 Hz, 3 H, H-C(18) 1.18 - 1.35 (m, 16 H, H-C(3, 4, 5, 6, 7, 15, 16, 17) 1.43 - 1.51 (m, 2 H, H-C(2)) 2.01 (q, *J*=6.87 Hz, 4 H, H-C(8, 14)) 2.12 (t, *J*=7.39 Hz, 2 H, H-C(2) 2.73 (t, *J*=6.70 Hz, 2 H, H-C(11)) 3.58 (dd, *J*=10.83, 4.30 Hz, 1 H, H-C(22)) 3.65 (dd, *J*=10.83, 4.30 Hz, 1 H, H-C(22) 4.21 - 4.27 (m, 1 H, H-C(21)) 5.26 - 5.38 (m, 4 H, H-C(9, 10, 12, 13)) 7.90 (d, *J*=7.90 Hz, 1 H, H-N(19)_

^{13}C NMR (150 MHz, DMSO-d_6) δ ppm 13.91 (C(18)) 22.01 (C(17)) 25.22 (C(3)) 25.24 (C(11)) 26.63 (C(8)) 26.68 (C(14)) 28.65 (C(6)) 28.69 (C(4)) 28.77 (C(5. 15)) 20.09 (C(7)) 30.93 (C16))

35.07 (C(2)) 54.55 (C(21)) 61.49 (C(22)) 127.74 (C(10, 12)) 129.72 (C(9, 13)) 172.19 (C(1)) 172.27 (C(20))

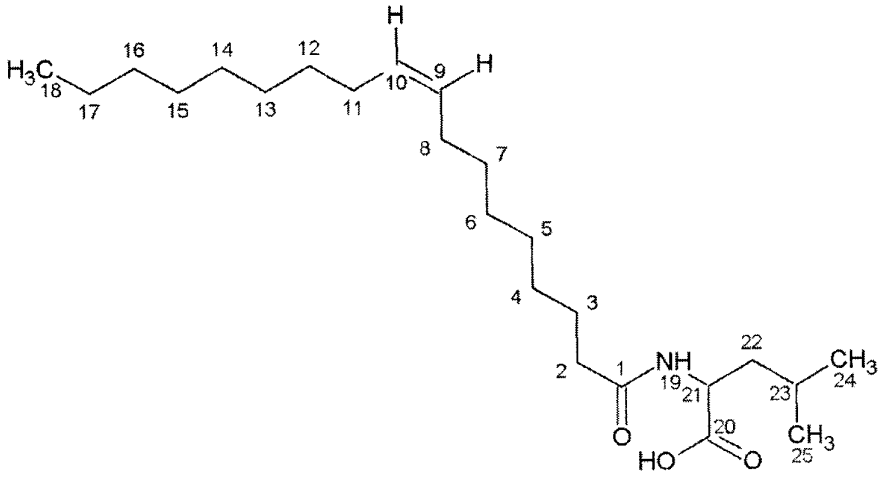
2.12 Structure 59 Leucine16:1



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 0.85 - 0.90 (m, 3 H, H-C(16)) 0.91 - 0.98 (m, 6 H, H-C(22, 23)) 1.19 - 1.40 (m, 14 H, H-C(4, 5, 6, 7, 12, 13, 14)) 1.49 - 1.75 (m, 7 H, H-C(3, 15, 20, 21)) 2.01 (q, *J*=6.07 Hz, 4 H, H-C(8, 11)) 2.24 (t, *J*=7.73 Hz, 2 H, H-C(2)) 4.54 - 4.59 (m, 1 H,H-C(19)) 5.24 - 5.43 (m, 2 H, H-C(9, 10)) 6.14 (d, *J*=8.25 Hz, 1 H, H-N(19))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 14.11 (C16)) 21.9 (C(15) 22.66 (C(22) 22.86 (C(23) 24.91 (C21)) 25.63 (C(3)) 27.18 (C(11)) 27.23 (C(8)) 28.99 (C(6)) 29.16 (C(4)) 29.20 (C(5)) 29.25 (C(13)) 29.71 (C(7)) 29.73 (C(12)) 31.79 (C(14)) 36.51 (C(2)) 41.32 (C(20)) 50.87 (C(19)) 129.73 (C(9)) 130.00 (C(10)) 173.95 (C(1)) 176.38 (C(18))

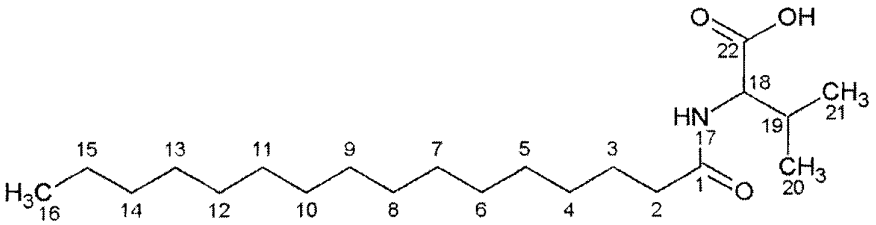
2.13 Structure 61 Leu-C18:1



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 0.77 - 0.84 (m, 3 H, H-C(18)) 0.85 - 0.93 (m, 6 H, H-C(24, 25)) 1.14 - 1.29 (m, 20 H, H-C(4, 5, 6, 7, 12, 13, 14, 15, 16, 17) 1.48 - 1.59 (m, 3 H, H-C(3, 22) 1.60 - 1.69 (m, 2 H, C-H(22, 23) 1.90 - 1.99 (m, 4 H, H-C(8, 11)) 2.17 (t, *J*=7.39 Hz, 2 H, H-C(2)) 4.55 (td, *J*=8.51, 4.64 Hz, 1 H, H-C(21)) 5.15 - 5.35 (m, 2 H, H-C(9,10) 5.95 (d, *J*=7.56 Hz, 1 H, H-N(19))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 13.68 (C(18)) 21.43 (C(17)) 22.24 (C(25) 22.40 (C(24) 24.45 (C(23)) 25.14 (C(3)) 26.74 (C(11) 26.78 (C(8)) 28.71 (C(6)) 28.73 (C(4)) 28.78 (C(5)) 28.88 (C(13, 15)) 29.09 (C(14)) 29.26 (C(7)) 31.46 (C16)) 36.04 (C(2)) 40.70 (C(22)) 50.41 (C(21)) 129.28 (C(9, 10) 173.64 (C(1) 176.11 (C(20))

Structure 65 Val-C16:0



^{1}H NMR (600 MHz, CHLOROFORM-*d*) δ ppm 0.88 (t, *J*=7.05 Hz, 3 H, H-C(16)) 0.95 (d, *J*=6.87 Hz, 3 H, H-C(21)) 0.98 (d, *J*=6.87 Hz, 3 H, H-C(20)) 1.19 - 1.37 (m, 24 H, H-C(3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14) 1.59 - 1.71 (m, 2 H, H-C(3)) 2.20 - 2.32 (m, 3 H, H-C(3)) 4.59 (dd, *J*=8.59, 4.81 Hz, 1 H, H-C(18)) 6.19 (d, *J*=8.59 Hz, 1 H, H-N(17))

^{13}C NMR (150 MHz, CHLOROFORM-d) δ ppm 14.13 C(16)) 17.70 C(20)) 19.02 C(21)) 22.71 C(15)) 25.78 C(3)) 29.25 C(6)) 29.35 C(9)) 29.38 (C(13) 29.52 C(5)) 29.64 C(4)) 29.68 (C(7, 10)) 29.72 C(8, 11, 12)) 31.00 (C(19)) 31.94 (C(14)) 36.69 (C(2)) 57.08 C(18)) 174.23 (C(1)) 175.49 C(22)

Application Examples

Condiments and fats

The following formulations were prepared and tasted by trained panelists.

1.Soy based Product

Salt level pure product between 5-40%

Salt level in application 0.3-1.0%

C18:2 gaba - (0,5ppm) was added to a 1% diluted salt reduced kikoman soy sauce (9% salt). The resultant composition was considered to be stronger, more umami, long lasting, richer

C18:2 gaba -(0,5 ppm) was added to pure salt reduced kikoman soy sauce (9% salt). The resultant composition was considered to be strong in body and mouthfeel,and more salty.

C18:1-ACCA -(0,5ppm) was added to pure salt reduced kikoman soy sauce (9% salt). The resultant composition was considered to have strong upfront saltiness lingering, very strong saltiness.

2.Fish based

Salt level pure product between 5-40%
Salt level in application 0.3-1.0%

C18:2 gaba - (0,5ppm) was added to a 1% diluted fish sauce sauce (0,27% salt). The resultant composition was deemed to be stronger in umami, longer lasting and richer.

C18:2 gaba -(0,5 ppm) was added to pure fish sauce (27% salt). The resultant composition was considered to be strong in body and mouthfeel, more salty, richer with more rounded fish notes.

C18:1-ACCA -(0,5ppm) was added to pure fish sauce. The composition was considered to exhibit strong saltiness lingering and with a strong body and mouthfeel.

3. Emulsions-Colloids

3.1-Water in oil

Butter

Fat levels 20-90%

Salt levels 0,1-1.7%

Blueband 82% fat 1.5% salt

C18:2 gaba added at 1 ppm. The composition was considered to exhibit a more authentic butter taste, with more mouthfeel

Pilaf

Standard cooked rice with 10% of the above mentioned 18:2 gaba flavoured butter was deemed to have more mouthfeel, with a lingering creamy authentic butter taste.

3.2-Oil in water

Mayonnaise

Fat levels between 10-80%

Low fat Mayonnaise (27% Fat, 9% carbohydrates (of which 5% sugar), 1.4% salt)

C18:1-ACCA (0,5 ppm) added to the mayonnaise was deemed to produce a nicely balanced compositions with a full mouthfeel and a more eggy taste.

C18:2 gaba (0,5 ppm) added to the mayonnaise was deemed to produce a creamy, thick mouthfeel with a full fat impression.

3.3-Dressings

Oil levels 0,5-50%

Acidity PH 3-6

low fat salad dressing (13,6% Fat, 8%, carbohydrates (of which 5.3% sugar))

C18:1-ACCA (0,5 PPM) was added to the dressing and produced a composition with more mouthfeel with body and less acidic.

C18:2 gaba (0,5PPM) was added to the dressing and produced a better mouthfeel that was impressively creamy.

4-Soups and Bouillons

Fat levels 0.1-10%

Salt levels 0,3-1,4%

Standard Chicken bouillon base, 0,7% salt, 0,5% fat

C10:0 ACCA @ 0,5PPM – Nice strong salty, Umami lingering body, better chicken profile

C10:0 ACCA @ 0,2PPM – More umami lingering body

C18:1-ACCA @ 0,5PPM – More body and fatty notes, Salivating and good aftertaste

C18:1-ACCA @ 0,2PPM – Saltier, Stronger and more umami

C18:2 ACCA @ 0,2PPM – Creamy, full body, more fatty chicken

Geranoyl ACCA @ 0,2PPM – Saltier Umami lingering Mouthfeel

Beef Bouillon base 1,0% salt , 0,5% fat

C18:1 met @ 1,0PPM – Full bodied, long lasting, more mouthfeel

C18:1 met @ 0,5PPM – Very salty and rich

C18:2 gaba @ 0,5PPM – Strong , Salty, Umami, mouthfeel

C16:1 leu @ 0,5PPM – Strong salty and rich

C18:2 val @ 0,5PPM – more body and mouthfeel, more umami

5-Jus and Fonds

Beef jus

C18:1-ACCA @ 40PPB – more salty, fatty, total profile is enhanced

6-Cheese

Fat level 1-40%
Salt 0,3-2%

Spreadable cheese ERU
C18:2 gaba @ 0,5PPM -- Full, Salty, cheese bite, more mature
C18:1-ACCA @ 0,5PPM -- Strong umami, lingering cheese bite

Cheese sauce: 5% fat 1,6% salt

C18:2 gaba @ 0,5PPM -- Full, Salty, cheese bite expanding
C18:1-ACCA @ 0,5PPM -- Strong umami, cheese bite, expanding

7-Beef and Poultry

Differentiator high temperature 100-250 degrees Celcius in a frying in oil process

C18:2 gaba @ 2,0 PPM in 135 gram frying oil (blue band 82% Fat) 450 gram chicken filet 2 minutes high fire and 5 minutes medium fire.

Taste of the chicken is more juicy, succulent, lingering more white meat
Also the oil has more savoury golden brown notes.

8-Baked goods and Pizza

Differentiator high temperature 100-250 degrees Celcius in hot air baking process

C18:2 gaba @ 0,5PPM in the crust and @ 0,5 PPM in the tomato sauce

The pizza was topped off with cheese and baked in a hot air oven @ 200 degrees Celcius

The crust was less dry, more succulent and the tomato was richer, sweeter and the total lingering aftertaste was very rich and pleasant

9-Snack product

A snack product consisting of a fried potato base, containing 35% fat and flavored with cheese seasoning containing salt, MSG, dairy, organic acids, sugars, and a flavour formulation. The following compounds were added to the snack product at the indicated levels and the tasting results are reported:

C18:2 gaba 1ppm: Fatty full, cheesy, cheese crust, long lasting,
C18:2 gaba 0.5ppm: increased dairy, cheesy.
C18:1-ACCA 1ppm: Increased Umami, salty.
C18:1-ACCA 0.5ppm: Increased salty
C18:1 met 0.5ppm: Increased cheese, creamy, salty and succulent
C18:1 met 0.25ppm: Salty, aged cheese, succulent

10-Air expanded base

An air expanded base (Rice, wheat, Tapioca, potato, salt, sugar, modified starch), containing 3% fat and flavored with cheese seasoning containing salt, MSG, dairy, organic acids, sugars and flavor. The following compounds were added to the base at the indicated levels and the tasting results are reported:

C18:2 gaba 1ppm: Fatty full, cheesy, cheese crust, long lasting, cover base
C18:2 gaba 0.5ppm: Increased dairy, cheese.
C18:1-ACCA 1ppm: Increased Umami, salty.
C18:1-ACCA 0.5ppm: Increased salty

11-Testing in Dairy Products

The following tests were carried out on dairy products processed by fermentation, pasteurization or UHT. The products contain fat, protein and calcium.

UHT milk cream flavoured ,non sweetened and different fat levels

In a UHT milk containing 0% , 1.5% and 3% fat, flavoured with a proprietary cream flavour dosed at 0.03% C18:2 gaba was added at 2 ppm.

Samples were evaluated by expert tasters.

Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness. The results are presented below:-

UHT milk 0% fat, Cream flavour (0.03%) : Milky, watery, card board aftertaste

UHT milk 0% fat, Cream flavour (0.03%) but with C18:2 gaba added at 2 ppm: Very creamy, milky, long lasting.

UHT milk 1.5% fat, Cream flavour (0.03%) : Milky , slightly creamy

UHT milk 1.5% fat, Cream flavour (0.03%) with added C18:2 gaba at 2 ppm: very creamy, milky, long lasting, salivating.

UHT milk 3.0% fat, Cream flavour (0.03%): Milky, slightly creamy

UHT milk 3.0% fat, Cream flavour (0.03%) with added C18:2 gaba at 2 ppm: very creamy, milky, long lasting, taste like whipped cream.

UHT sweetened banana flavoured milk, with different fat levels

In a UHT milk with 0% and 3% fat sweetened with 4% sucrose by weight, flavoured with proprietary banana flavour dosed at 0.04%. C18:2 gaba was added at 0.25 ppm, 0.5 ppm and 1 ppm.

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness.

UHT milk 0 % fat, Banana flavour (0.04%): Strong banana, estery, eugenol-like, unbalanced.
UHT milk 0% fat, Banana flavour (0.04%) C18:2 - gaba (0.25 ppm): fuller banana, more authentic, more sweet.
UHT milk 0% fat, Banana flavour (0.04%) ,C18:2- gaba (0.5 ppm): fuller banana, authentic, creamy and sweet, more mouthfeel
UHT milk 0% fat, Banana flavour (0.04%), C18:2 -gaba (1 ppm): creamy, creamy banana, sweet aftertaste, more mouthfeel and very longlasting
UHT milk 3 % fat, Banana flavour (0.04%): strong estery banana, eugenol like, spicy
UHT milk 3% fat, Banana flavour (0.04%),C18:2 -gaba (0.25 ppm): more authentic, less estery and more round
UHT milk 3% fat, Banana flavour (0.04%),C18:2- gaba (0.5 ppm): creamy banana
UHT milk 3% fat, Banana flavour (0.04%),C18:2- gaba (1 ppm): creamy long lasting and more authentic and more impact.

<u>Yoghurt cream flavoured, non-sweetened and different fat levels</u>

In a Yoghurt containing 0% 1.5% and 3% fat, flavoured with proprietary cream flavour dosed at 0.03%, C18:2-gaba was added at 2 ppm. Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, acidity, mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness.

Yoghurt 0% fat, Cream flavour (0.03%): very acidic, metallic
Yoghurt 0% fat, Cream flavour (0.03%),C18:2-gaba 2 ppm: less acidic, slight creamy aftertaste

Yoghurt 1.5% fat, Cream flavour (0.03%): mild creamy yoghurt

Yoghurt 1.5% fat, Cream flavour (0.03%),C18:2-gaba 2 ppm: very creamy, thick, nice long lasting, whipped cream note.

Yoghurt 3% fat, Cream flavour (0.03%): acidic, creamy aftertaste

Yoghurt 3% fat, Cream flavour (0.03%), C18:2-gaba 2 ppm: less acidic , much more creamy, very long lasting creamy aftertaste.

Strawberry flavoured sugar sweetened yoghurt

In a 1.5% fat yoghurt base, sweetened with 8% sucrose by weight, flavoured with a proprietary strawberry flavour @ 0,015% several different N-acyl aminoacids were added.

Base: fruity , strawberry

Base plus C18:2-gaba at 2ppm: very creamy and fresh strawberry

Base plus C18:0-leu at 5ppm: Very juicy full, 3D , stronger nicer strawberry, salivating long lasting.

Base plus C18:0 leu at 2ppm: Very juicy full, 3D , stronger nicer strawberry, long lasting nice creamy aftertaste.

Base plus C18:0-gaba at 2ppm: juicy full, jammy

Base plus C18:0-gln at 2 ppm: Sweet full juicy, nice, slight enhanced sulphury

Base plus C18:1-gln at 2ppm: Juicy, nice, fatty aftertaste.

Base plus C18:2-asn at 2ppm: green fresh, nice, fatty nice fuller

Activa strawberry yoghurt

In a Full fat,Activa strawberry flavoured yoghurt containing 13,5% sugar, 3.2% fat C18:2-gaba and C18:0-leu at 2 ppm

Activa : jammy strawberry, green and creamy

Activia plus C18:2-gaba at 2 ppm: very creamy, full and fresh strawberry

Activa plus C18:0-leu at 2 ppm: very juicy strawberry full, 3D, stronger strawberry, long lasting and creamy.

Vanilla flavoured milk 3.0% fat

In a 3 % fat milk drink, sweetened with 4% sucrose by weight, flavoured with Vaniline @ 10 ppm and a Vanilla extract @ 0.03% C18:2-gaba, C18:1-ACCA and C18:1-glu were added at 0.5 or 2 ppm.

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness.

Base: Milk 3% fat, 4% sugar, vanillin 10 ppm , vanilla extract 0.03%

Base: sweet vanillic, very slightly beany

Base: C18:2-gaba 2 ppm: beany, fatty, authentic, sweet

Base: C18-ACCA (cylco propyl) 0.5ppm: sweet,sugar-like, vanillic

Base: C18:1-glu 2ppm: full, fatty, vanilla bean enhanced,whipped cream like

Chocolate milk with different fat content

In a chocolate milk 1.8% and 2.7% fat C18:2-gaba was added at 0.5 and 1 ppm.

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness.

Chocolate milk 1.8% fat: cocoa powder taste, sweet, slightly creamy

Chocolate milk 1.8% fat C18:2-gaba at 0.5 ppm: stronger cocoa note, more chocolate vs cocoa

Chocolate milk 1.8% fat C18:2-gaba at 1 ppm: very creamy, chocolate, long-lasting creamy and chocolate taste.

Chocolate milk 3% fat: cocoa powder taste, sweet, creamy

Chocolate milk 3% fat C18:2-gaba at 0.5 ppm: very creamy, enhanced cocoa note.

Chocolate milk 3% fat C18:2-gaba at 1 ppm: very creamy, lasting, sweet, almost taste like chocolate ice cream.

Soy milk

In a soy milk (1.8% fat) sweetened with 5% sucrose by weight, flavoured with a proprietary milk flavour at a dosage of 0.1%, C18:2-gaba was added at 2 ppm

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness.

Soy milk, 5% sucrose, milk flavor @ 0.1 %: sweet, dry, green, soy bean taste

Soy milk, 5% sucrose, milk flavor @ 0.1%, C18:2-gaba at 2 ppm: clean, creamy, good masking of the soy bean taste, creamy and milky.

12- Caloric & non caloric beverages

Testing in beverage products containing carbohydrate sweeteners such as Sucrose, High Fructose Corn Syrup, Fructose and Glucose; or high intensity, non-nutritive sweeteners such as Aspartame Acesulfame K, Sucralose, Cyclamate, Na+ Saccharin, Neotame, Rebaudioside A and/or other stevia based sweeteners.

Sweetener in beverage applications ranges from 0-20 %.

Examples:

Carbonated Soft drink : <1% to 15% sweetener

Still beverages (non-alcoholic): <1% to 15% sweetener

Juice beverages; <1% to 15% sweetener

Powdered Soft drinks: <1% to 20% sweetener

Liquid concentrates: <1% to 20% sweetener

Alcoholic beverages: <1% to 40% sweetener

Functional beverages: <1% to 20% sweetener

Coffee based beverages: <1% to 15% sweetener

Tea based beverages: <1% to 15% sweetener

Test in 3 in 1 coffee

In a 3 in 1 Coffee beverage from Nestle (market product) sweetened with sucrose 13.2% and containing creamer (2.1% fat) C18:2-gaba was added.

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness.

Base is 3-in-1 Coffee beverage (market product) sweetened with sucrose and containing creamer with fat
Base: coffee, sweet, mild dairy
Base plus C18:2-gaba at 1 ppm: very nice mouthfeel effect, creamy as if coffee creamer is added, more sweet.

Test on Tang

In an orange flavoured Tang powdered soft drink (market product) sweetened with sucrose plus high intensity sweetener and containing citric acid, C18:2-gaba and C18:2-pro were tested.

All samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel & body, enhancement, richness, juiciness, long lastingness, salivation, sweetness, masking off notes of high intensity sweetener

Base is Orange flavoured Tang
Base: sweet, orange, licorice, and lingering high intensity sweetener offnotes, bitter, thin
Base plus C18:2-gaba at 0.5 ppm: enhances sweet juicy orange notes, enhanced mouthfeel. Additionally, the off-notes of the high intensity sweetener were suppressed.
Base plus C18:2-Pro at 1 ppm: very fresh, enhances sweet juicy orange notes, characteristic of authentic fresh orange fruit. Additionally, the off-notes of the high intensity sweetener were suppressed.

Mango flavoured still beverage containing different levels of juice.

In a Mango flavoured still beverage, sweetened with 8% sucrose and containing 0.1% citric acid and 1%, 4% and 6% clear mango juice flavoured with a proprietary Mango flavour @ 0.05% , C18:2-gaba and C18:2-Pro were added, as such (separate) and in combination.

All samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, juicy mouthfeel, enhancement, richness, juiciness, long lastingness, salivation, sweetness.

In a Mango flavoured still beverage, sweetened with 8% sucrose & containing 0.1% citric acid and 1% clear mango juice flavoured with proprietary Mango flavour @ 0.05%, C18:2-gaba and C18:2-Pro were added, as such (separate) and in combination.

Base is water, 8% sucrose, 0.1% citric acid, 1% clear mango juice (very low juice %) , flavoured with Mango flavor, dosed at 0.05%

Base: sweet, fruity, mango, thin
Base plus C18:2-Pro at 0.5 ppm: more sweet, sugar-like, very juicy and long lasting sweet, salivating
Base plus C18:2-gaba at 1 ppm: fatty skin-like, very juicy, authentic mango, much more mouthfeel, long lasting mango taste, mouthfeel is close to the full juice product
Base plus C18:2-Pro at 0.5 ppm and C18:2-gaba at 1 ppm: very juicy and sweet, authentic mango, long lasting sweet and long lasting mango taste, very close in mouthfeel to a full juice product

In a Mango flavoured still beverage, sweetened with 8% sucrose & containing 0.1% citric acid and 4% clear mango juice flavoured with Mango flavour @ 0.05% , C18:2-gaba and C18:2-Pro were added, as such (separate) and in combination.

Base is water, 8% sucrose, 0.1% citric acid, 4% clear mango juice (30% reduced juice), flavoured with Mango flavor, dosed at 0.05%

Base: sweet, fruity, mango, some low mouthfeel
Base plus C18:2-Pro at a range 0.5 ppm: more sweet, sugar-like, very juicy and long lasting sweet, salivating
Base plus C18:2-gaba at 1 ppm: fatty skin-like, very juicy, authentic mango, long lasting mango taste, more mouthfeel than the full juice product
Base plus C18:2-Pro at 0.5 ppm and C18:2-gaba at 1 ppm: very juicy and sweet, thick authentic mango, long lasting sweet and long lasting mango taste, more mouthfeel than a full juice product

In a Mango-flavoured still beverage, sweetened with 8% sucrose & containing 0.1% citric acid and 6% clear mango juice flavoured with Mango flavour @ 0.05%, C18:2-gaba and C18:2-Pro were added, as such (separate) and in combination.

Base is water, 8% sucrose, 0.1% citric acid, 6% clear mango juice (full juice), flavoured with Mango flavor, dosed at 0.05%.

Base: Sweet, fruity mango, full mouthfeel
Base plus C18:2-Pro at 0.5 ppm more sweet, sugar-like, very juicy and long lasting sweet, salivating, syrupy.
Base plus C18:2-gaba at 1ppm: fatty skin-like, very thick juicy, authentic mango, long lasting mango taste, rich.
Base plus C18:2-Pro at 0.5 ppm and C18:2-gaba at 1 ppm: juicy and sweet, thick authentic mango, long lasting sweet and long lasting mango taste, very rich.

13-Testing in alcoholic beverage products

Test on Baileys cream liqueur:

In Baileys cream liqueur(Market Product) containing 17% alcohol , carbohydrates 25% and 13% fat C18:2-gaba was added at 1 ppm.

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , alcohol impact, mouthfeel, fullness, salivation, sweetness, bitterness, richness, long lastingness and fattiness.

Base is Baileys cream liqueur

Base: alcoholic, cream, cocoa
Base plus C18:2-gaba at 1 ppm: strongly enhanced alcohol effect, more cocoa , very creamy and long lasting aftertaste.

Test on Heineken beer:
In Heineken beer (Market Product) containing 4% alcohol C18:2-gaba was added at 0.5 ppm.
Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , alcohol impact, malt taste , hop taste, mouthfeel, fullness, salivation, sweetness, bitterness, richness, long lastingness and fattiness.

Base is Heineken beer
Base: Bitter, hop like, fruity, malty, alcoholic
Base plus C18:2-gaba at 0.5 ppm: more hoppy, more bitter, more malt and stronger alcohol impact.

Test on Breezer Orange:
In Breezer Orange (Market Product) containing 4% alcohol C18:2-gaba was added at 1 ppm.

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, alcohol impact, juiciness, mouthfeel, fullness, salivation, sweetness, bitterness, richness, long lastingness and fattiness.

Base is Breezer Orange

Base: Bitter, orange, soapy, burning, alcoholic

Base plus C18:2-gaba at 0.5 ppm: more alcoholic, sweeter, more juicy orange, less soapy

14- Testing with beverages containing organic acids from 0.01% to 7%

Test 18:2 gaba on organic acids in a beverage.

In a solution containing water, 7% sucrose by weight, and different organic acids, 18:2 gaba was added at 1ppm. We observed taste effects on the acid perception upon addition of 18:2 gaba .

7% Sucrose plus Tartaric acid at 0.121% by weight

Base is water, 7% Sucrose by weight, Tartaric acid at 0.121% by weight

Base: sharp acidic, astringent aftertaste

Base plus C18:2-gaba at 1 ppm decreased sharp acidic perception, full body mouthfeel, higher mouthwatering, more immediate (upfront hit), and an impression of the flesh of fruit (grape, apple, banana, pear-like)

7% Sucrose plus Malic acid at 0.1081% by weight

Base is water, 7% Sucrose by weight, Malic acid at 0.1081% by weight

Base: acidic, green, slightly astringent

Base plus C18:2-gaba at 1 ppm decreased sharp acidic perception, give fuller body, mouthfeel, higher mouthwatering, and an impression of the flesh and skin notes of fruit (apple)

7% Sucrose plus Citric acid at 0.1% by weight

Base is water, 7% Sucrose by weight, Citric acid at 0.1% by weight

Base: fresh sharp, acidic

Base plus C18:2-gaba at 1 ppm decreased sharp acidic perception, full body mouthfeel, higher higher mouthwatering, and an impression of the juicy notes of citrus fruit (orange, lemon)

7% Sucrose plus Fumaric acid at 0.0936% by weight

Base is water, 7% Sucrose by weight, Fumaric acid at 0.0936% by weight

Base: musty, acidic, astringent

Base plus C18:2-gaba at 1 ppm: decreased sharp acidic perception, full body mouthfeel effects, higher sweet effects, and an impression of the full notes characteristic of sweet red & vanillic flavor types (vanilla, chocolate, raspberry, cherry, especially benzaldhyde)

15-Testing of Gaba and beta Ala derivatives

Samples were prepared and evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salty-ness, salivation, umami, sweetness, juiciness, richness, long lastingness and fattiness.

Test on Kikkoman soy sauce low salt

Base is Kikkoman soy sauce

Base: salty, dark roast taste, umami

Base plus C18:2-gaba at 0.5 ppm: much more salty, sweet and long lasting.

Test on "Eru prestige" spreadable cheese

Base is Eru prestige (market product)

Base: Yeasty, cheese bite, slightly bitter

Base plus C18:2-gaba at 0.5 ppm full salty, much more cheese bite, umami, lingering, long lasting.

Test on menthol fondant (1%)

Base is Fondant 65%, sugar syrup 34% and a proprietary menthol flavour at 1%

Base: Cooling, menthol, sweet

Base plus C18:2-gaba at 2 ppm: increased menthol impact, stronger cooling more sweet, long lasting, fresh.

Calve Salad dressing low fat (13.6% fat):

Base is Calve salad dressing (market product)

Base: acidic, rancid, watery

Base plus C18:2-gaba at 0.5 ppm much fuller , creamy, rich, less acidic.

Calve 60% reduced fat mayonnaise

Base is Calve Mayonnaise 60% reduced fat (market Product)

Base: rancid,acidic, empty

Base plus C18:2-gaba at 0.5 ppm full, rich , creamy, more egg yolk taste.

Comparison in a mango juice drink

Base is 8% sucrose, 0.1% citric acid, 1% clear mango juice, and a proprietary mango flavour at 0.05%.

Base: fruity mango

Base plus C16:1 gaba at 2 ppm: juicy, rich, full authentic

Base plus C18:1 gaba at 2 ppm: juicy, long lasting, rich

Base plus C18:2 gaba at 2 ppm: fatty skin like, juicy, authentic

Base: fruity mango

Base plus C16:0-beta ala at 2 ppm more juicy

Base plus C18:1-beta ala at 2 ppm more juicy, longlasting

Base plus C18:2-beta ala at 2 ppm full long lasting nice juicy, almost a bit salty

Comparison in beef bouillon

Base is Maggi beef bouillon 1 tablet in 500 ml of hot water

Base: salty, umami, powdery

Base plus C16:0-beta ala at 2 ppm more salty salivating umami

Base plus C18:1-beta ala at 2 ppm more salty salivating umami

Base plus C18:2-beta ala at 2 ppm salty, savoury, full

Comparison in a strawberry drink

Base is 7% sucrose, 0.1% citric acid, and a proprietary strawberry flavour @ 0.015%

Base: sweet, fruity, estery strawberry

Base plus C16:1-gaba at 2 ppm juicy, fruity, fatty, long lasting, good mouthfeel

Base plus C18:1-gaba at 2 ppm fatty and long lasting strawberry

Base plus C18:2-gaba at 2 ppm fatty mouthfeel, creamy strawberry, fruity and juicy

Base plus C18:0-gaba at 0.5 ppm mild creamy, fruity, juicy and long lasting

Test in a strawberry yoghurt

Base: Yoghurt 1.5% fat yoghurt, 8% sucrose, proprietary strawberry flavour @ 0,015%

Base: fruity, strawberry

Base plus C18:2-gaba at 2ppm, creamy, fruity authentic strawberry , stronger strawberry, ripe, long lasting, juicy

Test in vanilla milk:

Base: Milk 0.15% fat, sweetened with 4% sucrose by weight, flavoured with proprietary Vaniline flavour @ 10 ppm + Vanilla ext. @ 0.03%

Base: sweet vanillic, slightly beany taste

Base plus C18:2-gaba at 2 ppm: fatty, long lasting authentic vanilla, vanilla bean taste is enhanced

Test in chocolate flavoured drink:

Base: Water, 4% sucrose , proprietary chocolate flavor at 0.03%

Base: sweet vanillic, cocoa

Base plus C18:2-gaba at 2 ppm: full, sweeter, more vanillic, milk chocolate is enhanced, very long lasting

Test in pear flavoured drink:

Base: water,7% sugar,0.1% citric acid, proprietary pear flavour at 0.025%

Base: nice pear, fruity estery, green

Base plus C18:2-gaba at 1 ppm: long lasting, juicy and fatty skin like very authentic, like eating the fruit instead of drinking a drink

Test in peach flavoured drink:

Base is water, 8% sugar, 0.1% citric acid, and proprietary peach flavour at 0.05%

Base: fruity peach

Base plus C18:2-gaba at 1 ppm fruity peach, long lasting, juicy and fatty skin like very authentic

Test in Pineapple flavoured drink:

Base is water, 8% sugar, 0.1% citric acid and proprietary pineapple flavour at 0.03%

Base: candy pineapple, jammy

Base plus C18:2-gaba at 1 ppm very ripe, jammy, long lasting and sweet

16-Testing of C18 amino cyclopropanic acid (ACCA) derivative

Samples were prepared and evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salivation, salty-ness, umami, sweetness, juiciness, richness, long lastingness and fattiness.

Test on Kikkoman soy sauce low salt

Salt level pure product between 5-40%

Salt level in application 0.3-1.0%

C18:1-ACCA: 0.5 ppm Strong upfront saltiness lingering, very strong saltiness

Test in fish sauce

Salt level pure product between 5-40%
Salt level in application 0.3-1.0%

C18:1-ACCA 0.5ppm , -Strong saltiness lingering, strong body mouthfeel

Test in Mayonnaise

Fat levels between 10-80%
Low fat Mayonnaise (27% Fat)

C18:1-ACCA 0.5ppm– Nice balanced, full mouthfeel, increased eggyness

Test in Dressings

Oil levels 0.5 - 50%
Acidity PH 3-6
Low fat salad dressing (13,6% Fat)

C18:1-ACCA 0.5ppm – Increased mouthfeel body less acidic

Test in Soups and Bouillons

Fat levels 0.1 - 10%
Salt levels 0.3 - 1.4%

Standard Chicken bouillon base

0.7% salt, 0.5% fat

C18:1-ACCA 0.5ppm – More body and fatty notes, salivating and good aftertaste

C18:1-ACCA 0.2ppm – Saltier, Stronger and more umami

Test in Jus and Fonds

Beef jus

C18:1-ACCA 40ppb – more salty, fatty, total profile is enhanced

Test in Cheese

Fat level: 1 - 40%

Salt: 0.3 - 2%

Spreadable cheese ERU

C18:1-ACCA 0.5ppm -- Strong umami, lingering cheese bite

Cheese sauce: 5% fat 1.6% salt

C18:1-ACCA 0.5ppm -- Strong umami, cheese bite, expanding

17- Testing Glutamic acid and Aspartic acid derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salty-ness, salivation , umami, sweetness, juiciness, richness, long lastingness and fattiness.

Comparison in a mango juice drink

Base is water, 8% sucrose, 0.1% citric acid, 1% clear mango juice, proprietary mango flavour @ 0.05%

Base: fruity mango

Base plus C18:1-glu at 1 ppm heavy, jammy, enhanced mango, more sulfury, sl umami

Base plus C16:1-glu at 1 ppm full ,heavy, jammy, long lasting

Base plus C18:0-glu at 1 ppm fatty, full, sweet juicy

Base plus C16:0-glu at 1 ppm slightly more juicy impact

Comparison in a mango juice drink

Base is water, 8% sucrose, 0.1% citric acid, 1% clear mango juice, proprietary mango flavour @ 0.05%

Base: fruity mango

Base plus C16:0-asp at 1 ppm fatty, soft, apple skin

Base plus C18:1-asp at 1 ppm juicy fruit like

Base plus C18:0-asp at 1 ppm fatty, fruity, long lasting

Base plus C18:2-asp at 1 ppm fatty, authentic fruit like, slight raspberry and pear note

Comparison in a strawberry drink

Base is water, 7% sucrose, 0.1% citric acid, proprietary strawberry flavour @ 0.015%

Base: sweet, fruity, estery strawberry

Base plus C18:1-glu at 0.5 ppm: nice mouthfeel, more natural strawberry, full juicy

Base plus C16:1-glu at 0.5 ppm: full, fatty , creamy

Base plus C18:0-glu at 0.5 ppm: fruity, juicy, long lasting

Comparison in a vanilla milk drink

Base: Milk 0.15% fat, sweetened with 4% sucrose by weight, flavoured with proprietary Vaniline @ 10 ppm + Vanilla extract @ 0.03%

Base: sweet vanillic, slightly beany taste

Base plus C18:0-glu at 1 ppm full,fatty, whipped cream like

Base plus C16:1-glu at 1 ppm full, fatty, creamy, sweet vanilla

Base plus C16:0-glu at 1 ppm ice cream like, sweet, very full

Base plus C18:1-glu at 1 ppm full, beany, more sweet

Base: sweet vanillic, slightly beany taste

Base plus C18:2-asp at 2 ppm: sweet full very natural vanilla

Test in Chocolate flavoured drink flavoured

Base: Water, 4% sucrose, proprietary chocolate flavour @ 0.03%

Base: sweet vanillic, cocoa

Base plus C18:2-asp at 2 ppm: cardboard, sweet dry

Base: sweet vanillic, cocoa

Base plus C18:1-glu at 0.5 ppm full cocoa, nice sweet

Base plus C16:0-glu at 0.5 ppm sweet, fatty cocoa, sulphur is enhanced, enhanced nib note

Comparison in a bouilion

Base is Maggi beef bouillon 1 tablet in 500 ml of hot water

Base: salty, umami, powdery

Base plus C16:0-asp at 1 ppm salty, peppery

Base plus C18:1-asp at 1 ppm not special

Base plus C18:0-asp at 1 ppm lot off fullness and body, less salty

Comparison in a pear drink

Base: water, 7% sugar,0.1% citric acid, proprietary pear flavour at 0.025%

Base: nice pear, fruity estery, green

Base plus C18:1-glu at 0.5 ppm nice fatty, juicy, long lasting

Base plus C16:0-glu at 0.5 ppm fatty long lasting

Base: nice pear, fruity estery, green

Base plus C18:2-asp at 1 ppm very juicy, authentic , texture like pear 3D

Comparison in a peach drink

Base is water, 8% sugar, 0.1% citric acid, proprietary peach flavour at 0.05%

Base: fruity peach

Base plus C18:1-glu at 1 ppm ripe, much more juicy, long lasting, more fatty and sweet

Base plus C16:0-glu at 1 ppm fruity, nice juicy, sweet, soft peach skin

Base: fruity peach

Base plus C18:2-asp at 1 ppm fatty skin like , slight apple note

Test on Baileys cream liqueur:

Base: Baileys cream liqueur (containing 17% alcohol , carbohydrates 25% and 13% fat)

Base: alcoholic, cream, cocoa

Base plus C18:2 gaba 1 ppm: strongly enhanced alcohol effect, more cocoa , very creamy and long lasting aftertaste.

Test on Heineken beer:

Base: Heineken beer (containing 4% alcohol)

Base: Bitter, hop like, fruity, malty, alcoholic

Base plus C18:2 gaba 0.5 ppm : more hoppy, more bitter , more malt and stronger alcohol impact.

Test on Mouthwash:

Base: Paradontax alcohol free mouthwash.

Base: spicy, eugenol, minty, cooling, burning, bitter

Base plus C18:2 gaba 1 ppm: much less bitter, very sweet, smooth, less burning, round spicy, more minty and more cooling.

18-Testing Leucine, IsoLeucine and Valine derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salivation, salty-ness, umami, sweetness, juiciness, richness, long lastingness and fattiness.

Comparison in a mango juice drink

Base is water, 8% sucrose, 0.1% citric acid, 1% clear mango juice, proprietary mango flavour @0.05%

Base: fruity mango

Base plus C16:0-leu at 2 ppm very fruity, ripe mango taste, strawberry note

Base plus C18:1-leu at 2 ppm very long lasting, ripe , fruity , juicy

Base plus C18:0-leu at 2 ppm fruity strawberry like, ripe, long lasting

Base: fruity mango

Base plus C18:2-val at 1 ppm ripe,very juicy nice, full body, long lasting

Test in a strawberry drink

Base is 7% sucrose, 0.1% citric acid, proprietary strawberry flavour @ 0.015%

Base: sweet, fruity, estery strawberry

Base plus C18:0-leu at 0.5 ppm fruity authentic strawberry, stronger strawberry, ripe, long lasting, juicy

Test in a strawberry yoghurt

Base: Yoghurt 1.5% fat yoghurt, 8% sucrose, proprietary strawberry flavour @ 0,015%

Base: fruity, strawberry

Base plus C18:0-leu at 2 ppm fruity authentic strawberry , stronger strawberry, ripe, long lasting, juicy, creamy yoghurt.

Test in peach flavoured drink:

Base is water, 8% sugar, 0.1% citric acid, proprietary peach flavour at 0.05%

Base: fruity peach

Base plus C18:1-val at 1 ppm tropical, fatty, skin, juicy

Base plus C16:0-val at 1ppm very juicy

Test in beef bouillon:

Base is Maggi beef bouillon 1 tablet in 500 ml of hot water

Base: salty, umami, powdery

Base plus C18:2- val at 1 ppm more umami, salivating, salty

19-Testing Proline derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salty-ness, salivation, umami, sweetness, juiciness, richness, long lastingness and fattiness.

Comparison in a mango juice drink

Base is water, 8% sucrose, 0.1% citric acid, 1% clear mango juice, proprietary mango flavour @ 0.05%

Base: Fruity mango

Base plus C16:0-pro at 1 ppm overripe, orange like, long lasting after taste

Base plus C18:1-pro at 1 ppm sweet, orange albedo

Test in Orange beverage

Base is water,7% sugar, 0.1% citric acid, proprietary orange flavour @ 0.06%.

Base: orange, fruity, slightly candy

Base plus C18:2-pro at 1 ppm: very juicy , authentic orange

Test in Lemon beverage

Basis water, 7% sucrose, 0.15% citric acid, proprietary lemon flavor

Base: floral, citral, lemon

Base plus C18:2-pro at 1 ppm: very juicy, more citral like, very authentic.

Test in bouillion

Base is Maggi beef bouillon 1 tablet in 500 ml of hot water

Base: salty, umami, powdery

Base plus C16:0-pro at 1 ppm: more salty, full, darker, more meat-like

Base plus C18:1-pro at 1 ppm: full, more umami, long lasting

20-Testing with methionine derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salty-ness, salivation, umami, sweetness, juiciness, richness, long lastingness and fattiness

Comparison in a mango juice drink

Base is 8% sucrose, 0.1% citric acid, 1% clear mango juice, proprietary mango flavour @ 0.05%

Base: fruity mango

Base plus C18:2-met at 1 ppm: fresh nice juicy

Base plus C18:1-met at 1 ppm: sweeter, juicy, salivating.

Base plus C16:0-met at 1 ppm: fatty, full body, juicy, metallic

Base plus C12:1-met at 1 ppm: ripe full, more juicy, slightly metallic

Base plus 8:0-met at 1 ppm: green fresh, no additional body

Comparison in beef bouillon

Base is Maggi beef bouillon 1 tablet in 500 ml of hot water

Base: salty, umami, powdery

Base plus C18:2-met at 1 ppm: salivating salty, umami

Base plus C18:1-met at 1 ppm: very strong salty impact and aftertaste

Base plus C16:0-met at 1 ppm: salty, full, nice salivating, lingering

Base plus C12:1-met at 1 ppm: more salty

Base plus C8:0-met at 1 ppm: more salty, no additional fullness

Base: salty, umami, powdery

Base plus C18:1-met at 1 ppm: very strong salty impact and aftertaste, more fatty , mouthfeel, lingering full bodied

Base plus C18:1-met at 50 ppb: more salty, more bouillon taste

Base plus C18:1-met at 25 ppb: more peppery, more salty

Test in Orange beverage

Base is water,7% sugar, 0.1% citric acid , proprietary orange flavour @ 0.06%

Base: orange, fruity, slightly candy

Base plus C16:0-met at 1 ppm: slightly metallic, fresh

Base plus C18:1-met at 1 ppm: very juicy fresh, authentic, juicy

Base plus C12:1-met at 1 ppm: nice orange, fresh

Test in Lemon beverage

Basis water, 7% sucrose, 0.15% citric acid, proprietary lemon flavor

Base: floral, citral, lemon

Base plus C18:1-met at 1 ppm: fresh, less floral, very juicy, very authentic

Base plus C12:1-met at 1 ppm: fresh, slightly more citral

21-Testing Serine Derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salivation, salty-ness, umami, sweetness, juiciness, richness, long lastingness and fattiness

Comparison in a mango juice drink

Base is water, 8% sucrose, 0.1% citric acid, 1% *clear mango* juice, proprietary mango flavour @ 0.05%.

Base: fruity mango

Base plus C18:0-ser at 1 ppm: nice sweet, pineapple, long lasting

Base plus C18:2-ser at 1 ppm: apple note, less acidic, juicy

Comparison in beef bouilion

Base is Maggi beef bouillon 1 tablet in 500 ml of hot water

Base: salty, umami, powdery

Base plus C18:0-ser at 1 ppm: more salty, richer, more umami

Base plus C18:2-ser at 1 ppm: more umami, slightly more salty, sweet

Test in Orange beverage

Base is water,7% sugar, 0.1% citric acid, proprietary orange flavour @ 0.06%.

Base: orange, fruity, slightly candy

Base plus C18:2-ser at 1 ppm: very fresh , authentic, slightly less sweet, more juicy

22-Testing Glycine Derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salivation, sweetness, juiciness, richness, long lastingness and fattiness

Comparison in an orange drink

Base : water, 8% sucrose, 0.1% citric acid, proprietary orange flavour @ 0.06%.

Base: orange, fruity, slightly candy

Base plus C16:0-gly at 1 ppm sweet after taste juicy

Base plus C18:3-gly at 1 ppm sweet upfront, juicy, authentic, long lasting and sweet aftertaste

Base plus C18:2-gly at 1 ppm very juicy, salivating , authentic, long lasting and sweet aftertaste.

23-Testing Asparagine and Glutamate Derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste, mouthfeel, fullness, salty-ness, salivation , umami, sweetness, juiciness, richness, long lastingness and fattiness.

Test in Pineapple flavoured drink:

Base is water, 8% sugar, 0.1% citric acid and proprietary pineapple flavour at 0.03%

Base: candy pineapple, jammy

Base plus C18:2-asn at 1 ppm very ripe, jammy, long lasting , authentic

Test in pear flavoured drink:

Base is water, 8% sugar, 0.1% citric acid, proprietary pear flavour at 0.025%

Base: nice pear, fruity estery, green

Base plus C18:2-asn at 1 ppm very ripe, authentic pear, very juicy, long lasting

Base plus C18:1-glu at 1 ppm ripe, authentic pear, juicy, fatty skin like

Test in a strawberry drink

Base is 7% sucrose, 0.1% citric acid, proprietary strawberry flavour @ 0.015%

Base: sweet, fruity, estery strawberry

Base plus C18:2-asn at 0.5 ppm fuller, sweeter, jammy aftertaste, long lasting

Base plus C18:1-gln at 0.5 ppm more juicy, creamy, fruity long lasting

Comparison in a vanilla milk drink

Base: Milk 0.15% fat, sweetened with 4% sucrose by weight, flavoured with proprietary Vaniline @ 10 ppm + Vanilla extract @ 0.03%

Base: sweet vanillic, slightly beany taste

Base plus C18:2-asn at 1 ppm sweeter more fatty round

Base plus C18:1-glu at 1 ppm sweet vanillic

Base plus C18:2-glu at 1 ppm sweet vanillic, creamy, beaby

24-Testing Alanine Derivatives

Samples were evaluated by expert tasters. Tasters were asked to describe the samples focusing on authentic taste , mouthfeel, fullness, salty-ness, salivation , umami, sweetness, juiciness, richness, long lastingness and fattiness.

Test in a mango juice drink

Base is 8% sucrose, 0.1% citric acid, 1% clear mango juice, proprietary mango flavour @ 0.05%

Base: fruity mango

Base plus C18:2-ala at 1 ppm: fatty, juicy, apple skin taste

Test in a strawberry drink

Base is 7% sucrose, 0.1% citric acid, proprietary strawberry flavour @ 0.015%

Base: sweet, fruity, estery strawberry

Base plus C18:2-ala at 0.5 ppm creamy, fruity, juicy, green, long lasting, strawberry

Test in peach flavoured drink:

Base is water, 8% sugar, 0.1% citric acid, proprietary peach flavour at 0.05%

Base: fruity peach

Base plus C18:2-ala at 1 enhanced sulfur note, powdery, soft peach skin like, authentic peach, slight raspberry note

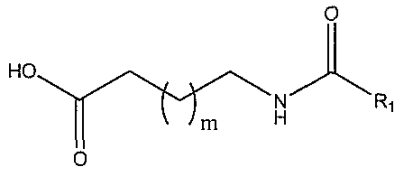
Claims:

1. A flavor composition according to a formula,

selected from the group consisting of:

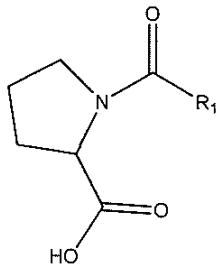
a) N-palmitoyl 1-amino-cyclopropyl carboxylic acid (C16:0-ACCA), N-stearoyl 1-amino-cyclopropyl carboxylic acid (C18:0-ACCA), N-linoleoyl 1-amino-cyclopropyl carboxylic acid (C18:2-ACCA), N-linolenoyl 1-amino-cyclopropyl carboxylic acid (C18:2-ACCA), N-oleoyl 1-amino-cyclopropyl carboxylic acid (C18:1-ACCA), N-(9-palmitenoyl) 1-amino-cyclopropyl carboxylic acid (C16:1-ACCA), N-decanoyl 1-amino-cyclopropyl carboxylic acid (C10:0-ACCA) and N-geranoyl 1-amino-cyclopropyl carboxylic acid (C10:2-ACCA);

b)



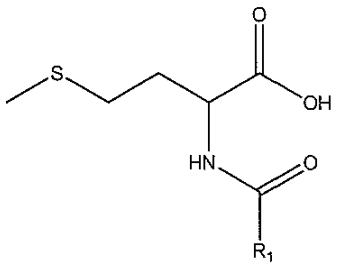
and edible salts thereof, wherein m is 0 or 1; R_1 is an alkyl residue containing 6 to 20 carbon atoms, or an alkene residue containing from 9 to 25 carbon atoms with 1 to 6 double bonds, wherein R_1 together with the carbonyl group to which it is attached is a residue of a carboxylic acid selected from gamma amino butyric acid (GABA) and beta alanine;

c)



and edible salts thereof; selected from N-geranoyl-Pro, N-palmiteneoyl-Pro, N-stearoyl-Pro, N-linoleoyl-Pro and N-linolenoyl-Pro;

d)



and edible salts thereof; selected from N-geranoyl-Met, N-palmitoyl-Met, N-palmitenoyl-Met, N-stearoyl-Met, N-linoleoyl-Met and N-linolenoyl-Met.

2. A stock solution comprising 0.01 to 1% by weight of the flavor composition according to any of the preceding claims in a solvent selected from ethanol, triacetine, glycerol and miglyol.

3. The use of the flavor composition according to any of the preceding claims as a food flavour ingredient in an edible composition.

4. The flavour composition according to claim 1 comprising at least one flavour co-ingredient selected from the group consisting of sugars, fats, salt, MSG, calcium ions, phosphate ions, organic acids, proteins, purines and mixtures thereof, optionally a carrier material and optionally an adjuvant.

5. The flavour composition according to claim 4 wherein the adjuvant is an anti-oxidant.

6. The flavour composition according to claim 1 in the form of an emulsion.

7. The flavour composition according to claim 1 in the form of a powder.

8. The flavour composition according to claim 1 in the form of a spray dried powder.

9. An edible composition comprising the flavour composition according to claim 1.

10. A caloric or non-caloric beverage according to claim 9 containing carbohydrate sweeteners, selected from sucrose, high fructose corn syrup, fructose and glucose, or high intensity, non-nutritive sweeteners selected from aspartame, acesulfame K, sucralose, cyclamate, sodium saccharin, neotame, rebaudioside A, and/or other stevia-based sweeteners, comprising a flavour composition according claim 1.

11. A soy-based edible composition according to claim 9 comprising a flavour composition according to claim 1.