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(54) **MACAÚBA OIL FOR THE PRODUCTION OF OLEOCHEMICALS**

(57) The present invention relates to a process of manufacturing a fatty acid-based surfactants comprising the step of converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into a fatty acid composition. Further, the present inven-

tion relates to fatty acid-based surfactants obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr and the use thereof in suitable applications.

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Description

[0001] The present invention relates to a process of manufacturing a fatty acid-based surfactants comprising the step of converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into a fatty acid composition. Further, the present invention relates to fatty acid-based surfactants obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr and the use thereof in suitable applications.

[0002] Numerous oil-based products are derived from renewable materials such as oil palm (principal source of palm oil). While such an approach is advantage since it safes the petroleum deposit it also provides several downsides. One issue is the deforestation in order to plant e.g. oil palm plantations, which aggravates the current climate change. Deforestation further leads to undesired loss of biodiversity and the loss of habitats for local tribes. In addition, particularly oil palms need tropical conditions and preferred temperatures between about 24 to 28 °C, monthly rainfalls of at least 100 mm/m², and a humidity between about 50 to 70%. These factors limit the possibility of a profitable cultivation.

[0003] At the same time the demand for renewable oil increases every year since the worldwide consume is increasing. Products derived from renewable oil can be found in every important industrial section, e.g. food products, pharmaceuticals, consumer goods, or energy (biodiesel).

[0004] Against this background, there is an ongoing need for a more environmental friendly alternative to known products derived from renewable oil such as palm oil. In particular, it was an object of the present invention to provide a fatty acid-based surfactant having an improved sustainability profile, as well as a process of manufacturing thereof. Further, it was an object of the present invention to provide a fatty acid-based surfactant, wherein the starting material is derived from plants that are less vulnerable against temperature fluctuation, as well as a process of manufacturing thereof. Finally, it was an objection to provide a personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crop formulation having an improved sustainability profile, as well as a process of manufacturing thereof. In this connection, a more environmental friendly alternative preferably provides at least one, more preferably at least two, still more preferably at least three, and in particular at least four, of the following impacts: reduced water demand, reduction of the loss of biodiversity, reduction of loss of habitats for local tribes, reduction of deforestation, improved recovery of degraded areas and springs and watersheds, improved retention of moisture in the soil.

[0005] It has surprisingly been found that at least one of these objects can be achieved by applying an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr.

[0006] Thus, according to one aspect, the present invention relates to a process of manufacturing a fatty acid-based surfactant, the process comprising the steps of

a) converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into a fatty acid composition,

b) separating fatty acids selected from the group consisting of a C4 fatty acid, a C6 fatty acid, a C8 fatty acid, a C10 fatty acid, a C12 fatty acid, a C14 fatty acid, a C16 fatty acid, a C18 fatty acid, a C20 fatty acid, and a C22 fatty acid, from the fatty acid composition obtained in step a),

c) optionally blending at least two of the separated fatty acids,

d) subsequently converting at least one of the separated fatty acids selected from the group consisting of C4 fatty acid, C6 fatty acid, C8 fatty acid, C10 fatty acid, C12 fatty acid, C14 fatty acid, C16 fatty acid, C18 fatty acid, C20 fatty acid, and C22 fatty acid, into the respective fatty acid-based surfactant.

[0007] In the following, preferred embodiments of the above process are described in further detail. It is to be understood that each preferred embodiment is relevant on its own as well as in combination with other preferred embodiments.

[0008] In a preferred embodiment A1 of the first aspect, the plant is a palm, preferably a palm of the genus *Acrocomia*, more preferably a Macaúba palm, and in particular *Acrocomia aculeata* and/or

the plant is a palm and the oil is extracted from the palm pulp and/or the palm kernel, preferably wherein the plant is Macaúba palm and the oil is extracted from the Macaúba kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

[0009] In a preferred embodiment A2 of the first aspect, in step a) the conversion is conducted under chemical or enzymatic conditions, preferably under chemical conditions and/or step a) involves a hydrolysis.

[0010] In a preferred embodiment A3 of the first aspect, the fatty acid composition in step a) comprises at least 45 wt.-%, based on the total weight of the fatty acid composition, of C4-C22 fatty acids, preferably C6-C20 fatty acids, more preferably C8-C18 fatty acids, even more preferably C8-C16 fatty acids or C16-C18 fatty acids, and in particular C10-C16 fatty acids and/or

1 to 20 of wt.-% of a C8 fatty acid,

1 to 8 of wt.-% of a C10 fatty acid,

30 to 48 wt.-% of a C12 fatty acid,
 5 to 15 wt.-% of a C14 fatty acid,
 4 to 13 wt.-% of a C16 fatty acid,
 15 to 42 wt.-% of a C18 fatty acid, and
 0 to 5 wt.-% of a C20 fatty acid,
 each based on the total weight of the fatty acid composition.

[0011] In a preferred embodiment A4 of the first aspect, the plant has an oil yield in tons per hectare per year in the range of 6 to 30 t/ha/yr, preferably 7 to 20 t/ha/yr, more preferably of 8 to 15 t/ha/yr.

[0012] In a preferred embodiment A5 of the first aspect, the fatty acid-based surfactant provided in step d) is selected from the group consisting of sulfonates, amides, isethionates, taurates, glycolipids, amino acids, esterquats, sophorolipids, rhamnolipids, and amphoacetates.

[0013] In a preferred embodiment A6 of the first aspect, the fatty acid-based surfactant provided in step d) is

an alpha-sulfo fatty acid disalts (A) of the general formula (I),



in which the radical R1 is a linear or branched alkyl or alkenyl radical with 6 to 16 carbon atoms and the radicals M1 and M2 - independently of one another - are selected from the group H, Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamine, preferably triethanolammonium, or an ester sulfonates (B) of the general formula (II),



in which the radical R2 is a linear or branched alkyl or alkenyl radical with 6 to 18 carbon atoms and the radical R3 is a linear or branched alkyl or alkenyl radical with 1 to 20 carbon atoms, where the radical R3 can be an alkenyl radical or be branched only above 3 carbon atoms, and the radical M7 is selected from the group Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamines, preferably triethanolammonium.

[0014] In a preferred embodiment A7 of the first aspect, step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from the plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr with a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably wherein the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO) and/or

the fatty acid-based surfactant obtained in step d) is blended with fatty acid-based surfactants obtained from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr and a subsequent conversion into the respective fatty acid-based surfactant, preferably wherein the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO).

[0015] In a preferred embodiment A8 of the first aspect, the process further comprises the steps

e) isolating a fatty acid-based surfactant selected from the group consisting of a C6 fatty acid-based surfactant, a C8 fatty acid-based surfactant, a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, a C16 fatty acid-based surfactant, a C18 fatty acid-based surfactant, and a C20 fatty acid-based surfactant, preferably a fatty acid-based surfactant selected from the group consisting of a C8 fatty acid-based surfactant, a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, a C16 fatty acid-based surfactant, and a C18 fatty acid-based surfactant, and in particular a fatty acid-based surfactant selected from the group consisting of a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, and a C16 fatty acid-based surfactant, and

f) optionally blending at least two of the isolated fatty acid-based surfactants, preferably blending at least two fatty acid-based surfactants selected from the group consisting of C10 fatty acid-based surfactant, C12 fatty acid-based surfactant, C14 fatty acid-based surfactant, and C16 fatty acid-based surfactant.

[0016] In a second aspect, the present invention relates to a fatty acid-based surfactant and blends thereof obtained

by a process according to the first aspect.

[0017] In a third aspect, the present invention relates fatty acid-based surfactant obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, wherein the oil obtained from the plant is converted into a fatty acid composition, which is then converted into the fatty acid-based surfactant.

[0018] In a preferred embodiment C1 of the third aspect, the plant is a palm, preferably a palm of the genus *Acrocomia*, more preferably a Macaúba palm, and in particular *Acrocomia aculeata* and/or wherein the oil is obtained by extraction of the fruits, preferably wherein the plant is a palm and the oil is extracted from the palm pulp and/or the palm kernel, more preferably wherein the plant is Macaúba palm and the oil is extracted from the Macaúba kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

[0019] In a fourth aspect, the present invention relates to the use of a fatty acid composition obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr for manufacturing a fatty acid-based surfactant.

[0020] In a fifth aspect, the present invention relates to the use of the fatty acid-based surfactant according to the second or the third aspect in a personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crops formulation.

[0021] In a sixth aspect, the present invention relates to a personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crop formulation comprising a surfactant according to the second or the third aspect.

[0022] In a seventh aspect, the present invention relates to process of manufacturing glycerol, the process comprising the step

a) converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into glycerol.

Detailed Description

[0023] Before describing in detail exemplary embodiments of the present invention, definitions which are important for understanding the present invention are given.

[0024] As used in this specification and in the appended claims, the singular forms of "a" and "an" also include the respective plurals unless the context clearly dictates otherwise. In the context of the present invention, the terms "about" and "approximately" denote an interval of accuracy that a person skilled in the art will understand to still ensure the technical effect of the feature in question. The term typically indicates a deviation from the indicated numerical value of $\pm 10\%$, preferably $\pm 8\%$, more preferably $\pm 5\%$, even more preferably $\pm 2\%$. It is to be understood that the term "comprising" and "encompassing" is not limiting. For the purposes of the present invention the term "consisting of" is considered to be a preferred embodiment of the term "comprising of". If hereinafter a group is defined to comprise at least a certain number of embodiments, this is meant to also encompass a group which preferably consists of these embodiments only. Furthermore, the terms "first", "second", "third" or "(a)", "(b)", "(c)", "(d)" etc. and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein. In case the terms "first", "second", "third" or "(a)", "(b)", "(c)", "(d)", "i", "ii" etc. relate to steps of a method or use or assay there is no time or time interval coherence between the steps, i.e. the steps may be carried out simultaneously or there may be time intervals of seconds, minutes, hours, days, weeks, months or even years between such steps, unless otherwise indicated in the application as set forth herein above or below. It is to be understood that this invention is not limited to the particular methodology, protocols, reagents etc. described herein as these may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to limit the scope of the present invention that will be limited only by the appended claims. Unless defined otherwise, all technical and scientific terms used herein have the same meanings as commonly understood by one of ordinary skill in the art.

[0025] As used herein the term "does not comprise", "does not contain", or "free of" means in the context that the composition of the present invention is free of a specific compound or group of compounds, which may be combined under a collective term, that the composition does not comprise said compound or group of compounds in an amount of more than 0.8 % by weight, based on the total weight of the composition. Furthermore, it is preferred that the composition according to the present invention does not comprise said compounds or group of compounds in an amount of more than 0.5 % by weight, preferably the composition does not comprise said compounds or group of compounds at all.

[0026] When referring to compositions and the weight percent of the therein comprised ingredients it is to be understood that according to the present invention the overall amount of ingredients does not exceed 100% ($\pm 1\%$ due to rounding).

[0027] The term "personal care composition" refers to any topical and oral product that can be used at least once daily by the costumer as an everyday care product for the human body, e.g. for face, hair, body, or oral care. The personal care composition may comprise one or more active agents, e.g., organic and/or inorganic UV filters, as well as other

ingredients or additives, e.g., emulsifiers, emollients, viscosity regulators, stabilizers, preservatives, or fragrances. Suitable daily care composition are according to the present invention, e.g. leave-on face and body care products and rinse-off face and body care products.

[0028] Suitable leave-on face and body care products are, e.g. sunscreen compositions, decorative preparations, and skin care preparations.

[0029] The term "sunscreen composition" or "sunscreen" refers to any topical product, which absorbs and which may further reflect and scatter certain parts of UV radiation. Thus, the term "sunscreen composition" is to be understood as not only including sunscreen compositions, but also any cosmetic compositions that provide UV protection. The term "topical product" refers to a product that is applied to the skin and can refer, e.g., to sprays, lotions, creams, oils, foams, powders, or gels. According to the present invention the sunscreen composition may comprise one or more active agents, e.g., organic and inorganic UV filters, as well as other ingredients or additives, e.g., emulsifiers, emollients, viscosity regulators, stabilizers, preservatives, or fragrances.

[0030] Suitable decorative preparations are, e.g., lipsticks, nail varnishes, eye shadows, mascaras, dry and moist make-up, rouge, powders, depilatory agents and suntan lotions.

[0031] Suitable skin care preparations are e.g., moisturizing, refining, and lifting preparations. The cited daily care compositions can be in the form of creams, ointments, pastes, foams, gels, lotions, powders, make-ups, sprays, sticks or aerosols.

[0032] The term "UV filter" or "ultraviolet filter" as used herein refers to organic or inorganic compounds, which can absorb and may further reflect and scatter UV radiation caused by sunlight. UV-filter can be classified based on their UV protection curve as UV-A, UV-B, or broadband filters.

[0033] In general, UV light can be divided into UV-A radiation (320 - 400 nm) and UV-B radiation (290 - 320 nm). The definition of "broadband" protection (also referred to as broad-spectrum or broad protection) is based on the "critical wavelength". For broadband coverage, UV-B and UV-A protection must be provided. According to the US requirements, a critical wavelength of at least 370 nm is required for achieving broad spectrum protection. The term "critical wavelength" is defined as the wavelength at which the area under the UV protection curve (% protection versus wavelength) represents 90 % of the total area under the curve in the UV region (290-400 nm). For example, a critical wavelength of 370 nm indicates that the protection of the sunscreen composition is not limited to the wavelengths of UV-B, i.e. wavelengths from 290-320 nm, but extends to 370 nm in such a way that 90 % of the total area under the protective curve in the UV region are reached at 370 nm.

[0034] Suitable rinse-off face and body care products are, e.g. shampoo, conditioner, shower gel, body scrub, face scrub, and hand soap.

[0035] The term "emollient" relates to cosmetic specific oils used for protecting, moisturizing and lubricating the skin. The word emollient is derived from the Latin word *mollire*, to soften. In general, emollients prevent evaporation of water from the skin by forming an occlusive coating. They can be divided into different groups depending on their polarity index.

[0036] The term "polarity index" refers to non-polar or polar oils. Non-polar oils are mainly based on hydrocarbons and lack an electronegative element, such as oxygen. In contrast, polar oils contain heteroatoms that differ in electronegativity, which results in a dipole moment. However, such oils are still insoluble in water, i.e. hydrophobic. The polarity index can be determined by measuring the interfacial tension between the respective oil and water.

[0037] The term "administration" refers to the application of a sunscreen or daily care composition to the skin of a person.

[0038] The prefix C_n-C_m indicates in each case the possible number of carbon atoms in the group. The term "alkyl" as used herein denotes in each case a linear or branched alkyl group having usually from 1 to 30 carbon atoms, preferably 4 to 26 or of 1 to 6 or of 1 to 3 carbon atoms. Examples of an alkyl group are methyl, ethyl, n-propyl, iso-propyl, n-butyl, 2-butyl, iso-butyl, tert-butyl, n-pentyl, 1-methylbutyl, 2-methylbutyl, 3-methylbutyl, 2,2-dimethylpropyl, 1-ethylpropyl, n-hexyl, 1,1-dimethylpropyl, 1,2-dimethylpropyl, 1-methylpentyl, 2-methylpentyl, 3-methylpentyl, 4-methylpentyl, 1,1-dimethylbutyl, 1,2-dimethylbutyl, 1,3-dimethylbutyl, 2,2-dimethylbutyl, 2,3-dimethylbutyl, 3,3-dimethylbutyl, 1-ethylbutyl, 2-ethylbutyl, 1,1,2-trimethylpropyl, 1,2,2-trimethylpropyl, 1-ethyl-1-methylpropyl, and 1-ethyl-2-methylpropyl.

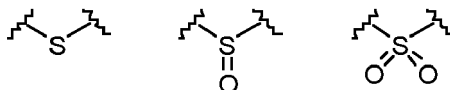
[0039] The term "alkoxy" as used herein denotes in each case a linear or branched alkyl group which is bonded via an oxygen atom and has usually from 1 to 6 carbon atoms, preferably 1 to 2 carbon atoms, more preferably 1 carbon atom. Examples of an alkoxy group are methoxy, ethoxy, n-propoxy, iso-propoxy, n-butyloxy, 2-butyloxy, iso-butyloxy, tert.-butyloxy, and the like.

[0040] The term "hydroxyalkyl" as used herein denotes in each case a linear or branched alkyl group having usually from 1 to 8 carbon atoms, preferably from 1 to 6 carbon atoms and being further substituted with 1 to 5, preferably with 1 to 2 hydroxy groups, in particular with 1 hydroxy group. Preferably, the one hydroxy group is terminating the linear or branched alkyl group so that the hydroxy group is bonded to an alkyl bridge, which is bonded to the remainder of the molecule. Examples of an hydroxyalkyl group are hydroxymethyl, hydroxyethyl, n-hydroxypropyl, 2-hydroxypropyl, n-hydroxybutyl, 2-hydroxybutyl, 2-hydroxy-2-methylpropyl, n-hydroxypentyl, and n-hydroxyhexyl.

[0041] As used herein, the term "alkylene" refers to a linking linear or branched alkylene group having usually from 1 to 4 carbon atoms, e.g. 1, 2, 3, or 4 carbon atoms. The alkylene group bridges a certain group to the remainder of the

molecule. Preferred alkylene groups include methylene (CH_2), ethylene (CH_2CH_2), propylene ($\text{CH}_2\text{CH}_2\text{CH}_2$) and the like. A skilled person understands that, if it is referred, e.g., to CH_2 that the carbon atom being tetravalent has two valences left for forming a bridge ($-\text{CH}_2-$). Similarly, when it is referred, e.g., to CH_2CH_2 , each carbon atom has one valence left for forming a bridge ($-\text{CH}_2\text{CH}_2-$). Furthermore, when it is referred, e.g., to $\text{CH}_2\text{CH}_2\text{CH}_2$, each terminal carbon atom has one valence left for forming a bridge ($-\text{CH}_2\text{CH}_2\text{CH}_2-$).

[0042] The term "heterocyclic" or "heterocyclyl" includes, unless otherwise indicated, in general a 3- to 9-membered, preferably a 4- to 8-membered or 5- to 7-membered, more preferably 5- or 6-membered, in particular 6-membered monocyclic ring. The heterocycle may be saturated, partially or fully unsaturated, or aromatic, wherein saturated means that only single bonds are present, and partially or fully unsaturated means that one or more double bonds may be present in suitable positions, while the Hückel rule for aromaticity is not fulfilled, whereas aromatic means that the Hückel ($4n + 2$) rule is fulfilled. The heterocycle typically comprises one or more, e.g. 1, 2, 3, or 4, preferably 1, 2, or 3 heteroatoms selected from N, O and S as ring members, where S-atoms as ring members may be present as S, SO or SO_2 . The remaining ring members are carbon atoms. In a preferred embodiment, the heterocycle is an aromatic heterocycle, preferably a 5- or 6-membered aromatic heterocycle comprising one or more, e.g. 1, 2, 3, or 4, preferably 1, 2, or 3 heteroatoms selected from N, O and S as ring members, where S-atoms as ring members may be present as S, SO or SO_2 . Examples of aromatic heterocycles are provided below in connection with the definition of "hetaryl". "Hetaryls" or "heteroaryls" are covered by the term "heterocycles". The saturated or partially or fully unsaturated heterocycles usually comprise 1, 2, 3, 4 or 5, preferably 1, 2 or 3 heteroatoms selected from N, O and S as ring members, where S-atoms as ring members may be present as S, SO or SO_2 . The skilled person is aware that S, SO or SO_2 is to be understood as follows:



[0043] Further, a skilled person is aware that resonance structures of the oxidized forms may be possible. Saturated heterocycles include, unless otherwise indicated, in general 3- to 9-membered, preferably 4- to 8-membered or 5- to 7-membered, more preferably 5- or 6-membered monocyclic rings comprising 3 to 9, preferably 4 to 8 or 5 to 7, more preferably 5 or 6 atoms comprising at least one heteroatom, such as pyrrolidine, tetrahydrothiophene, tetrahydrofuran, piperidine, tetrahydropyran, dioxane, morpholine or piperazine.

[0044] The term "aryl" or "aromatic carbocycle" preferably includes 6-membered aromatic carbocyclic rings based on carbon atoms as ring members. A preferred example is phenyl.

[0045] The term "fatty alcohol" as used herein is directed to linear or branched, preferably linear, primary alcohols. Fatty alcohols may comprise from 4 to 26 carbon atoms. According to the present invention, the term fatty alcohol encompasses saturated and unsaturated alcohol. The double bond of an unsaturated fatty alcohol can give either cis or trans isomers. According to the present invention, the term fatty alcohol encompasses saturated and unsaturated alcohols. 1-Butanol, 1-hexanol, 1-octanol, 1-decanol, lauryl alcohol, myristyl alcohol, cetyl alcohol, palmitoyl alcohol, stearyl alcohol, oleyl alcohol, arachidyl alcohol, behenyl alcohol, erucyl alcohol, lignoceryl alcohol, and ceryl alcohol should be named in this connection.

[0046] The term "fatty alcohol-based surfactant" as used herein denotes a surfactant that originates from a reaction of the primary alcohol group of a fatty alcohol.

[0047] The term "fatty acid" as used herein is directed to linear or branched, preferably linear, primary carboxylic acids. Fatty acids may comprise from 4 to 26 carbon atoms. According to the present invention, the term fatty acid encompasses saturated and unsaturated acids. The double bond of an unsaturated fatty acid can give either cis or trans isomers. Caprylic acid, capric acid, lauric acid, myristic acid, myristoleic acid, palmitic acid, palmitoleic acid, sapienic acid, stearic acid, oleic acid, elaidic acid, vaccenic acid, linoleic acid, linoelaidic acid, α -Linolenic acid, arachidic acid, arachidonic acid, eicosapentaenoic acid, erucic acid, behenic acid, docosahexaenoic acid, lignoceric acid, and cerotic acid should be named in this connection.

[0048] The term "fatty acid-based surfactant" as used herein denotes a surfactant that originates from a reaction of the primary carboxylic group of a fatty acid.

[0049] The term "oil palm" as used herein denotes a species of palm, which is also known as "*Elaeis guineensis*". It is the principal source of "palm oil".

[0050] The term "coconut tree" as used herein denotes a member of the palm tree family (*Arecaceae*) and is also referred to as *Cocos nucifera*. It is the principal source for "coconut oil".

[0051] The term "Macaúba palm" as used herein denotes a species of palm. Exemplarily species are known as "*Acrocomia aculeata*" (also known as "macaíba", "boicaiuva", "macaúva", "coco-de-catarro", "coco-baboso", and "coco-de-espinho"), "*Acrocomia hassleri*", and "*Acrocomia totei*". Macaúba palms can grow high, e.g. up to about 15 m. The

Macaúba fruit comprises pulp and kernel.

[0052] The term "pulp" as used herein refers to inner flesh of a fruit.

[0053] The term "kernel" as used herein is interchangeable with "seed" or "almond".

[0054] The term "cleaning composition" as used herein encompasses home care formulation, industrial care formulation, and institutional care formulation. Home care formulations are typically used by private costumers, whereas industrial care formulations are typically used by the industry, and institutional care formulations are typically used in e.g. clinics and nursing homes. It is however also possible that the respective formulations can be used in different areas than intended. Hence, the institutional care formulation may also be used by private costumers or the industry and verca. Typically cleaning compositions are e.g. for the laundry, dishwashing, hard surface cleaning, food service and kitchen hygiene, food and beverage processing, commercial laundry, sanitation, institutional cleaning, industrial cleaning, and vehicle and transportation care.

[0055] The term "nutrition formulation" as used herein encompasses food and feed formulations. The nutrition formulation can have any suitable form, e.g. liquid or solid and can be administered or uptaken in any suitable manner, e.g. orally, parenterally, or rectally.

[0056] The term "pharmaceutical formulation" as used herein refers to any suitable pharmaceutical formulation, which may e.g. be administered in any suitable manner such as by oral, transdermal, parenteral, nasal, vaginal, or rectal application. Suitable solid pharmaceutical formulation can be in form of tablets, suppositories, or capsules or in form of a spray. Suitable transdermal pharmaceutical formulations encompass patches or formulations such as sprays, lotions, creams, oils, foams, ointments, powders, or gels. Liquid pharmaceutical formulations are preferably administered orally, parenterally, or nasal.

[0057] The term "liquid" as used herein also encompasses semi-solid conditions, wherein the fluid has an increased viscosity (e.g. creamy, gels, ointments).

[0058] The term "crop formulation" as used herein encompasses pesticide formulations, fungicide formulations, and herbicide formulations.

[0059] The term "oil yield in tons per hectare per year" as used herein is directed to the oil derived from the fruit of the plant via e.g. extraction, wherein the fruit comprises the pulp and the kernel. It refers to the oil produced per hectare. It is to be understood that the value refers to the oil yield obtained from a monoculture, wherein the plants are cultivated under standard conditions, which depend on the respective plant and are known to the skilled person. Hence, in the event that the plant is not cultivated in a monoculture (e.g. on a cattle field), the respective value for this particular cultivation may be reduced. Typically, oil palm has an oil yield in tons per hectare per year of about 3.8 t/ha/yr, rapeseed has an oil yield in tons per hectare per year of about 0.8 t/ha/yr, sunflower has an oil yield in tons per hectare per year of about 0.7 t/ha/yr, and soya has an oil yield in tons per hectare per year of about 0.6 t/ha/yr.

[0060] The term "monoculture" as used herein denotes the practice of growing one plant, e.g. Macaúba palm, in a field at a time. On the example of Macaúba palm, about 500 to about 600 palms can be planted per hectare. In this connection, it is preferred that the minimum distance between the tress is about 3.5 to 4.5 meters. This number varies depending on e.g. the soil.

[0061] The term "agroforestry" as used herein denotes a land use management system in which trees or shrubs are grown around or among other plant such as other trees or other shrubs or crops or pastureland. It is to be understood that not only one further plant can be present in agroforestry. On the example of Macaúba palm, e.g. about 250 to about 360 or about 325 to about 350, trees can be planted per hectare. In this connection, suitable crops that may be planted together with Macaúba palm are exemplarily beans, mandioca, corn, cereals, sunflower, peanut, rapeseed, soya, and mixtures thereof.

[0062] The term "silvopastoral" as used herein denotes a land use management system in which trees and optionally forage are planted within the grazing of domesticated animals. On the example of Macaúba palm, e.g. about 275 to about 450 or about 375 to about 400, trees can be planted per hectare.

[0063] Preferred embodiments regarding the process of manufacturing a fatty acid-based surfactant or a specific fatty acid-based surfactant, as well as the use thereof, and the products comprising the same are described hereinafter. It is to be understood that the preferred embodiments of the invention are preferred alone or in combination with each other.

[0064] As indicated above, the present invention relates in one embodiment to a process of manufacturing a fatty acid-based surfactant, the process comprising the steps of

- a) converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into a fatty acid composition,
- b) separating fatty acids selected from the group consisting of a C4 fatty acid, a C6 fatty acid, a C8 fatty acid, a C10 fatty acid, a C12 fatty acid, a C14 fatty acid, a C16 fatty acid, a C18 fatty acid, a C20 fatty acid, and a C22 fatty acid, from the fatty acid composition obtained in step a),
- c) optionally blending at least two of the separated fatty acids,
- d) subsequently converting at least one of the separated fatty acids selected from the group consisting of C4 fatty

acid, C6 fatty acid, C8 fatty acid, C10 fatty acid, C12 fatty acid, C14 fatty acid, C16 fatty acid, C18 fatty acid, C20 fatty acid, and C22 fatty acid, into the respective fatty acid-based surfactant.

[0065] In a preferred embodiment, the plant is a palm, preferably a palm of the genus *Acrocomia*, more preferably a Macaúba palm, still more preferably *Acrocomia hassleri*, *Acrocomia totei*, and/or *Acrocomia aculeata*, and in particular *Acrocomia aculeata*.

[0066] In a preferred embodiment, the plant is a palm and the oil is extracted from the palm pulp and/or the palm kernel.

[0067] In a preferred embodiment, the plant is Macaúba palm and the oil is extracted from the Macaúba kernel, preferably wherein the plant is *Acrocomia hassleri*, *Acrocomia totei*, and/or *Acrocomia aculeata* and the oil is extracted from more preferably *Acrocomia hassleri* kernel, *Acrocomia totei* kernel, and/or *Acrocomia aculeata* kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

[0068] In another preferred embodiment, plant is Macaúba palm and the oil is extracted from the Macaúba pulp, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* pulp.

[0069] In another preferred embodiment, plant is Macaúba palm and the oil is extracted from the Macaúba pulp and kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* pulp and kernel.

[0070] In a preferred embodiment, the plant can sufficiently grow under tropical and subtropical conditions.

[0071] In a preferred embodiment, the plant can sufficiently grow in regions from the 30th parallel north to the 28th parallel south, preferably from the 25th parallel north to the 25th parallel south.

[0072] In a preferred embodiment, the plant sufficiently grows at a temperature range of 18 to 30 °C, more preferably of 20 to 28 °C. In this connection it is to be understood that the temperature range is the average temperature over one year. Hence, the plant is preferably less vulnerable to temperature fluctuation.

[0073] The term "sufficiently grow" as used herein denotes that the claimed oil yield is achievable under standard cultivation.

[0074] In addition, particularly oil palm need tropical conditions and preferred temperatures between about 24 to 28 °C, monthly rainfalls of at least 100 mm/m², and a humidity between about 50 to 70%. These factors limit the possibility of a profitable cultivation.

[0075] In a preferred embodiment, the process provides a reduced water demand.

[0076] In a preferred embodiment, the process provides a reduction of the loss of biodiversity.

[0077] In a preferred embodiment, the process provides a reduction of loss of habitats for local tribes.

[0078] In a preferred embodiment, the process provides a reduction of deforestation.

[0079] In a preferred embodiment, the process provides an improved recovery of degraded areas and/or springs and watersheds.

[0080] In a preferred embodiment, the process provides an improved retention of moisture in the soil. In this connection it is to be understood that the above-outlined reductions or improvements are compared to plants having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably compared to oil palm.

[0081] In a preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr is the crude oil, i.e. not further treated after the extraction from the plant.

[0082] In another preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr is the filtered oil, i.e. wherein the crude oil is first filtered by any known in the art filtering systems and then used in the process. A suitable filtration process is e.g. press filtration.

[0083] In a preferred embodiment, in step a) the conversion is conducted under chemical or enzymatic conditions, preferably under chemical conditions.

[0084] In a preferred embodiment, step a) involves a hydrolysis. Any suitable hydrolysis method can be conducted.

In a preferred embodiment, the hydrolysis is preferably performed under chemical conditions, preferably in the presence of a catalyst. In another embodiment, the hydrolysis is preferably performed under enzymatic conditions, preferably at a temperature of 32 to 40 °C.

[0085] The process may further comprise partial or complete hydrogenation, wherein the double bonds of the fatty acid moieties are completely or partially removed. If the process comprises a complete hydrogenation, the fatty acid composition does not comprise unsaturated moieties. As a side product of the hydrolysis glycerol can be provided, preferably after a refine step.

[0086] In a preferred embodiment, the process further comprises the step of separating off glycerol.

[0087] In a preferred embodiment, the fatty acid composition in step a) comprises at least 45 wt.-%, based on the total weight of the fatty acid composition, of C4-C22 fatty acids, preferably C6-C20 fatty acids, more preferably C8-C18 fatty acids, even more preferably C8-C16 fatty acids or C16-C18 fatty acids, and in particular C10-C16 fatty acids.

[0088] In a preferred embodiment, the fatty acid composition in step a) comprises

1 to 20 of wt.-% of a C8 fatty acid,

1 to 8 of wt.-% of a C10 fatty acid,
 30 to 48 wt.-% of a C12 fatty acid,
 5 to 15 wt.-% of a C14 fatty acid,
 4 to 13 wt.-% of a C16 fatty acid,
 15 to 42 wt.-% of a C18 fatty acid, and
 0 to 5 wt.-% of a C20 fatty acid,
 each based on the total weight of the fatty acid composition. Said fatty acid composition is preferably obtained from oil extracted from Macaúba kernel.

[0089] In a preferred embodiment, the fatty acid composition in step a) comprises

3 to 7 wt.-%, preferably 4 to 6 wt.-%, of a C8 fatty acid,
 2 to 6 wt.-%, preferably 3 to 5 wt.-%, of a C10 fatty acid,
 36 to 46 wt.-%, preferably 38 to 42 wt.-%, of a C12 fatty acid,
 6 to 13 wt.-%, preferably 8 to 11 wt.-%, of a C14 fatty acid,
 5 to 11 wt.-%, preferably 6 to 9 wt.-%, of a C16 fatty acid,
 25 to 40 wt.-%, preferably 30 to 38 wt.-% of a C18 fatty acid, and
 0 to 4 wt.-%, preferably 0 to 3 wt.-%, of a C20 fatty acid,
 each based on the total weight of the fatty acid composition. Said fatty acid composition is preferably obtained from oil extracted from Macaúba kernel.

[0090] In a preferred embodiment, the fatty acid composition in step a) comprises

0 to 5 wt.-%, preferably 0 to 3 wt.-%, and in particular 0 to 2 wt.-%, of a C10 fatty acid,
 0 to 6 wt.-%, preferably 0 to 5 wt.-%, and in particular 1 to 4 wt.-%, of a C12 fatty acid,
 0 to 6 wt.-%, preferably 0 to 5 wt.-%, and in particular 1 to 4 wt.-%, of a C14 fatty acid,
 10 to 35 wt.-%, preferably 13 to 32 wt.-%, and in particular 15 to 30 wt.-%, of a C16 fatty acid,
 55 to 85 wt.-%, preferably 60 to 80 wt.-%, and in particular 65 to 75 wt.-%, of a C18 fatty acid,
 0 to 4 wt.-%, preferably 0 to 3 wt.-%, and in particular 0 to 2 wt.-%, of a C20 fatty acid,
 each based on the total weight of the fatty acid composition. Said fatty acid composition is preferably obtained from oil extracted from Macaúba pulp.

[0091] In a preferred embodiment, the fatty acid composition in step a) comprises at least 85 wt.-% based on the total weight of the fatty acid composition, of C4-C22 fatty acids, preferably C10-C22 fatty acids, more preferably C12-C20 fatty acids, even more preferably C12-C20 fatty acids, and in particular C12-C18 fatty acids.

[0092] In a preferred embodiment, the fatty acid composition in step a) comprises at least 10 wt.-% of C16 fatty acids and at least 75 wt.-% of C18 fatty acids, each based on the total weight of the fatty acid composition.

[0093] In a preferred embodiment, the fatty acid composition in step a) comprises 10 to 25 wt.-% of C16 fatty acids and 75 to 90 wt.-% of C18 fatty acids, each based on the total weight of the fatty acid composition.

[0094] In a preferred embodiment, the fatty acid composition in step a) comprises at least 80 wt.-%, preferably at least 90 wt.-%, and in particular at least 95 wt.-%, based on the total weight of the fatty acid composition, of C12-14 fatty acids.

[0095] In a preferred embodiment, the fatty alcohol composition comprises at least 80 wt.-%, preferably at least 90 wt.-%, and in particular at least 95 wt.-%, based on the total weight of the fatty alcohol composition, of C12-18 fatty acids.

[0096] In a preferred embodiment, the fatty acid composition in step a) comprises at least 2 wt.-% of C10 fatty acids, at least 35 wt.-% of C12 fatty acids, at least 5 wt.-% of C14 fatty acids, and at least 4 wt.-% of C16 fatty acids, each based on the total weight of the fatty acid composition.

[0097] In a preferred embodiment, the fatty acid composition in step a) comprises 3 to 7 wt.-% of C8 fatty acids, 2 to 6 wt.-% of C10 fatty acids, 35 to 45 wt.-% of C12 fatty acids, 5 to 13 wt.-% of C14 fatty acids, and 4 to 10 wt.-% of C16 fatty acids, each based on the total weight of the fatty acid composition.

[0098] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C8 fatty acids, based on the total weight of the fatty acid composition.

[0099] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C10 fatty acids, based on the total weight of the fatty acid composition.

[0100] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C12 fatty acids, based on the total weight of the fatty acid composition.

[0101] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C14 fatty acids, based on the total weight of the fatty acid composition.

[0102] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C16 fatty acids, based

on the total weight of the fatty acid composition.

[0103] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C18 fatty acids, based on the total weight of the fatty acid composition.

[0104] In a preferred embodiment, the plant has an oil yield in tons per hectare per year in the range of at least 7 t/ha/yr, preferably at least 8 t/ha/yr.

[0105] In a preferred embodiment, the plant has an oil yield in tons per hectare per year in the range of 6 to 30 t/ha/yr, preferably 7 to 20 t/ha/yr, more preferably of 8 to 15 t/ha/yr or of 8 to 12 t/ha/yr or of 8 to 11 t/ha/yr.

[0106] In a preferred embodiment, the fatty acid-based surfactant provided in step d) is selected from the group consisting of sulfonates, amides, isethionates, taurates, glycolipids, amino acids, esterquats, sophorolipids, rhamnolipids, and amphoacetates.

[0107] In a preferred embodiment, the fatty acid-based surfactant provided in step d) is an alpha-sulfo fatty acid disalts (A) of the general formula (I),



in which the radical R₁ is a linear or branched alkyl or alkenyl radical with 6 to 16 carbon atoms, preferably 12 to 14 carbon atoms, and the radicals M₁ and M₂ - independently of one another - are selected from the group H, Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamine such as triethanolammonium.

[0108] In a preferred embodiment, the fatty acid-based surfactant provided in step d) is an ester sulfonates (B) of the general formula (II),

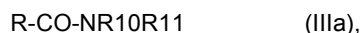


in which the radical R₂ is a linear or branched alkyl or alkenyl radical with 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, and the radical R₃ is a linear or branched alkyl or alkenyl radical with 1 to 20 carbon atoms, where the radical R₃ can be an alkenyl radical or be branched only above 3 carbon atoms, and the radical M₇ is selected from the group Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamines such as triethanolammonium.

[0109] Fatty acid-derived sulfonates are accessible via any suitable known in the art method.

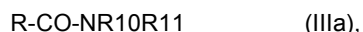
[0110] In a preferred embodiment, the fatty acid-based surfactant provided in step d) is an amide selected from the group consisting of secondary amides, ternary amides, (methyl)glucamides and alkanolamides. Fatty acid-derived amides are accessible via any suitable known in the art method.

[0111] Suitable secondary and ternary amides can be expressed by the general formula (IIIa)



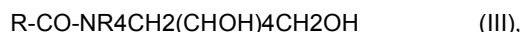
wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, and R₁₀ and R₁₁ are independently H, C₁-C₄-alkyl, or C₁-C₈-alkylene-NR₁₂R_{12'}, wherein R₁₂ and R_{12'} are independently C₁-C₄-alkyl.

[0112] In a preferred embodiment, the secondary amide has the general formula (IIia)



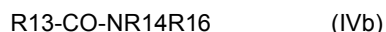
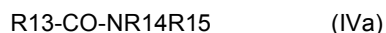
wherein R is saturated or unsaturated C₁₂-C₂₂-alkyl, preferably C₁₂-C₁₄-alkyl or C₁₅-C₁₉-alkyl, R₁₀ is H and R₁₁ is C₂-C₄-alkylene-NR₁₂R_{12'}, wherein R₁₂ and R_{12'} are independently C₁-C₃-alkyl.

[0113] Suitable (methyl)glucamides can be expressed by the general formula (III)



wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl or C₁₄-C₁₆-alkyl, and R₄ is H or methyl.

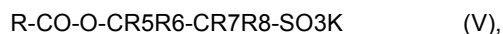
[0114] Preferably, the alkanolamine is selected from the group of compounds of general formulae (IVa), (IVb), and (IVc),



wherein R13 in compounds (IVa) is a linear or branched alkyl radical having 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, and R14 and R15, independently of each other, are a linear or branched hydroxyalkyl group having 1 to 4 carbon atoms;

wherein R13 in compounds (IVb) is a linear or branched alkyl radical having 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, R14 is a linear or branched hydroxyalkyl group having 1 to 4 carbon atoms and R16 is hydrogen; and wherein R13 in compounds (IVc) is a linear or branched alkyl radical having 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, R14 is a linear or branched hydroxyalkyl group having 1 to 4 carbon atoms and R17 is an alkyl group having 1 to 4 carbon atoms.

[0115] Suitable isethionates can be expressed by the general formula (V)



wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, R5 to R8 are independently H or C1-C4-alkyl, preferably H, and K is an optionally substituted ammonium (such as ammonium or triethanolamine) cation, alkali metal (such as sodium or potassium). Fatty acid-derived isethionates are accessible via any suitable known in the art method.

[0116] Suitable taurates can be expressed by the general formula (VI)



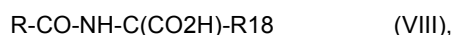
wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, R5 to R8 are independently H or C1-C4-alkyl, preferably H, R9 is H or methyl, and K is an optionally substituted ammonium (such as ammonium or triethanolamine) cation, alkali metal (such as sodium or potassium). Fatty acid-derived taurates are accessible via any suitable known in the art method.

[0117] Suitable glycolipids can be expressed by the formula (VII)



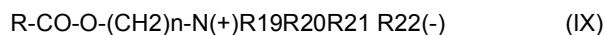
wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, L is a carbohydrate moiety, connected via the C1 carbon atom (i.e. by a glycosidic bond). In a preferred embodiment, L is a galactose moiety or a glucose moiety, and in particular a glucose moiety. Fatty acid-derived glycolipids are accessible via any suitable known in the art method.

[0118] Suitable amino acids can be expressed by the formula (VIII)



wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, and R18 is an amino acid moiety, which is bond via the amino group adjutant to the carboxylic group (i.e. the alpha amino group), to the carboxylic group of the fatty acid. In a preferred embodiment, R18 is C1-C6-alkyl or heteroaryl wherein each substitutable carbon in the aforementioned groups is independently unsubstituted or substituted with one or more, same or different substituents Rx, wherein Rx is halogen, SH, SMe, (CO)Ry, OH, NHCNHNH2, heteroaryl, aryl, or C1-C2-alkyl, wherein Ry is H, OH, or NH2. Fatty acid-derived amino acids are accessible via any suitable known in the art method.

[0119] Suitable esterquats can be expressed by the general formula (IX)



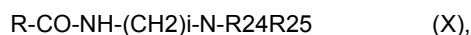
wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, n is an integer of 1 to 10, preferably of 1 to 5, (+) denotes a positive charge on the nitrogen, (-) denotes a negative charge on R22, R19 is C1-C6-alkyl or C1-C6-hydroxyalkyl, preferably C1-C3-alkyl or C1-C3-hydroxyalkyl, R20 is C1-C6-alkyl or C1-C6-hydroxyalkyl, preferably C1-C3-alkyl or C1-C3-hydroxyalkyl, R21 is -(CH2)m-O-CO-R23, wherein m is an integer of 1 to 10, preferably of 1 to 5 and R23 is linear, saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and R22 is halide, preferably chloride. In a preferred embodiment, R is R21. Esterquats are accessible via any suitable known in the art method.

[0120] Suitable sophorolipids are glycolipids having a hydrophobic fatty acid tail of C14-, C16-, or C18-alkyl and a hydrophilic carbohydrate head sophorose, a glucose-derived di-saccharide with an unusual β-1,2 bond and can be acetylated on the 6'-and/or 6"- positions and wherein one terminal or sub terminal hydroxylated fatty acid is β-glycosidically

linked to the sophorose module. The carboxylic end of this fatty acid is either free (acidic or open form) or internally esterified at the 4" or in some rare cases at the 6'- or 6"-position (lactonic form). Sophorolipids are accessible via any suitable known in the art method.

[0121] Suitable rhamnolipids are glycolipids having a glycosyl head group, i.e. a rhamnose moiety, and a 3-(hydroxy-alkanoyloxy)alkanoic acid (HAA) fatty acid tail, such as 3-hydroxydecanoic acid. Preferably, the fatty acid moiety encompasses 6 to 20 carbon atoms, and in particular 12 to 14 carbon atoms. It is to be understood that the present invention relates to the mono-rhamnolipids and the di-rhamnolipids, which comprise one or two of the rhamnose groups respectively. Preferably, the rhamnose groups in the di-rhamnolipids are connected via a 1,2-glycosidic bond. Rhamnolipids are accessible via any suitable known in the art method, preferably via *Pseudomonas aeruginosa*.

[0122] Suitable amphotacetates can be expressed by the general formula (X)



wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, i is an integer of 1 to 10, preferably 1 to 4, R₂₄ is C1-C5-alkyl or C1-C5-hydroxyalkyl, preferably C1-C4-hydroxyalkyl, and R₂₅ is C1-C4-alkylene-R₂₆, preferably C1-C2-alkylene-R₂₆, wherein R₂₆ is CO-O(-)U(+), wherein (-) denotes a negative charge on the oxygen, (+) denotes a positive charge U, and U is a suitable counter ion, such as triethanolammonium, Na⁺, K⁺ or NH₄⁺, preferably sodium. Amphotacetates are accessible via any suitable known in the art method. Dehyton PS, Dehyton MC, and Dehyton DC may be named in this connection.

[0123] In a preferred embodiment, step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from the plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr (preferably of 6 to 30 t/ha/yr, more preferably 7 to 20 t/ha/yr, even more preferably of 8 to 15 t/ha/yr or of 8 to 12 t/ha/yr or of 8 to 11 t/ha/yr) with a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably of less than 5 t/ha/yr, more preferably of less than 4.5 t/ha/yr. In a preferred embodiment, the fatty acid composition as above-disclosed applied in step a) is first blended with a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of 0.1 to less than 6 t/ha/yr, preferably of 0.3 to 5 t/ha/yr, more preferably of 0.5 to 4.5 t/ha/yr. In a preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO). In another preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0124] In yet another preferred embodiment the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), palm kernel oil (PKO), soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0125] In a preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), and/or palm kernel oil (PKO).

[0126] In a preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from palm oil (PO) and/or palm kernel oil (PKO).

[0127] In a preferred embodiment, step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with a fatty acid composition obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO).

[0128] In a preferred embodiment, step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with a fatty acid composition obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from coconut oil (CNO).

[0129] In a preferred embodiment, step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with a fatty acid composition obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO) and coconut oil (CNO).

[0130] In a preferred embodiment, step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba pulp, with a fatty acid composition obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm oil (PO).

[0131] In a preferred embodiment, the process comprises a step prior to step a), i.e. step

x) blending the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr with an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably of less than 5 t/ha/yr, more preferably of less than 4.5 t/ha/yr. In a preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr (preferably of 6 to 30 t/ha/yr, more preferably 7 to 20 t/ha/yr, even more preferably of 8 to 15 t/ha/yr or of 8 to 12 t/ha/yr or of 8 to 11 t/ha/yr) as above-disclosed applied in step a) is first blended with an oil extracted from a plant having an oil yield in tons per hectare per year of 0.1 to less than 6 t/ha/yr, preferably of 0.3 to 5 t/ha/yr, more preferably of 0.5 to 4.5 t/ha/yr. In a preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO). In another preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0132] In yet another preferred embodiment the oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), palm kernel oil (PKO), soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0133] In a preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), and/or palm kernel oil (PKO).

[0134] In a preferred embodiment, the oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from palm oil (PO) and/or palm kernel oil (PKO).

[0135] In a preferred embodiment, the process comprises a step prior to step a), i.e. step

x) blending the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO).

[0136] In a preferred embodiment, the process comprises a step prior to step a), i.e. step

x) blending the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from coconut oil (CNO).

[0137] In a preferred embodiment, the process comprises a step prior to step a), i.e. step

x) blending the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO) and coconut oil (CNO).

[0138] In a preferred embodiment, the process comprises a step prior to step a), i.e. step

x) blending the oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba pulp, with an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm oil (PO).

[0139] In a preferred embodiment, step b) is conducted by distillation.

[0140] Preferably, the respective fatty acids are separated via fractionation of the fatty acid composition. The skilled person is aware of suitable processes such as distillation. In a preferred embodiment, the alcohols are separated via fractional distillation. Preferably, the fractional distillation system is designed as add-on unit operations to produce high purity of single alcohol cuts. The single or two tower systems are preferably fitted with high performance structured packings for minimal pressure drop and highest product quality.

[0141] In a preferred embodiment, the process comprises a step b.i), which is downstream to step b) b.i) blending the separated fatty acid obtained in step b) with a fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably of less than 5 t/ha/yr, more preferably of less than 4.5 t/ha/yr. In a preferred embodiment, the fatty acid as above-disclosed obtained in step b) is first blended with a fatty acid obtained from a plant having an oil yield in tons per hectare per year of 0.1 to less than 6 t/ha/yr, preferably of 0.3 to 5 t/ha/yr, more preferably of 0.5 to 4.5 t/ha/yr. In a preferred embodiment, the fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO). In another preferred embodiment, the fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0142] In yet another preferred embodiment the fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), palm kernel oil (PKO), soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0143] In a preferred embodiment, the fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), and/or palm kernel oil (PKO).

[0144] In a preferred embodiment, the fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from palm oil (PO) and/or palm kernel oil (PKO).

[0145] In this connection it is to be understood that the fatty acid obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is preferably equal to the fatty acid obtained in step b). Hence, if step b) provides

a specific fatty acid, e.g. lauric acid, the additional fatty acid blended into the mixture is also the specific fatty acid, e.g. lauric acid (however obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr).

[0146] In a preferred embodiment, the process comprises a step b.i), which is downstream to step b) b.i) blending the separated fatty acid obtained in step b) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with a fatty acid obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO).

[0147] In a preferred embodiment, the process comprises a step b.i), which is downstream to step b) b.i) blending the separated fatty acid obtained in step b) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with a fatty acid obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from coconut oil (CNO).

[0148] In a preferred embodiment, the process comprises a step b.i), which is downstream to step b) b.i) blending the separated fatty acid obtained in step b) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, with a fatty acid obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO) and coconut oil (CNO).

[0149] In a preferred embodiment, the process comprises a step b.i), which is downstream to step b) b.i) blending the separated fatty acid obtained in step b) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba pulp, with a fatty acid obtained from a plant having an oil extracted from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm oil (PO).

[0150] In a preferred embodiment, the process further comprises the step c) blending at least two of the separated fatty acids, preferably lauric acid and myristic acid.

[0151] In a preferred embodiment, the process further comprises the step c) blending at least three of the separated fatty acids.

[0152] In a preferred embodiment, the fatty acid-based surfactant obtained in step d) is blended with fatty acid-based surfactants obtained from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably of less than 5 t/ha/yr, more preferably of less than 4.5 t/ha/yr, and a subsequent conversion into the respective fatty acid-based surfactant. In this connection it is to be understood that the subsequent conversion preferably provide a fatty acid-based surfactant, which is equal to the fatty acid-based surfactant obtained in step d). Hence, if step d) provides a specific fatty acid-based isethionate, the additional fatty acid-based surfactant blended into the mixture is also the specific fatty acid-based isethionate (however obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr).

[0153] In a preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO). In another preferred embodiment the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0154] In yet another preferred embodiment the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), palm kernel oil (PKO), soy oil, sunflower oil, olive oil, and/or rapeseed oil.

[0155] In a preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), and/or palm kernel oil (PKO).

[0156] In a preferred embodiment, the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from palm oil (PO) and/or palm kernel oil (PKO).

[0157] In a preferred embodiment, the fatty acid-based surfactant obtained in step d) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, is blended with a fatty acid-based surfactant from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO).

[0158] In a preferred embodiment, the fatty acid-based surfactant obtained in step d) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, is blended with a fatty acid-based surfactant from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from coconut oil (CNO).

[0159] In a preferred embodiment, the fatty acid-based surfactant obtained in step d) obtained from an oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba kernel, is blended with a fatty acid-based surfactant from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm kernel oil (PKO) and coconut oil (CNO).

[0160] In a preferred embodiment, the fatty acid-based surfactant obtained in step d) obtained from an oil extracted

from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, which is derived from Macaúba pulp, is blended with a fatty acid-based surfactant from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, which is derived from palm oil (PO).

[0161] In a preferred embodiment, the process further comprises the steps

- e) isolating a fatty acid-based surfactant selected from the group consisting of a C6 fatty acid-based surfactant, a C8 fatty acid-based surfactant, a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, a C16 fatty acid-based surfactant, a C18 fatty acid-based surfactant, and a C20 fatty acid-based surfactant, preferably a fatty acid-based surfactant selected from the group consisting of a C8 fatty acid-based surfactant, a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, a C16 fatty acid-based surfactant, and a C18 fatty acid-based surfactant, and in particular a fatty acid-based surfactant selected from the group consisting of a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, and a C16 fatty acid-based surfactant, and
- f) optionally blending at least two of the isolated fatty acid-based surfactants, preferably blending at least two fatty acid-based surfactants selected from the group consisting of C10 fatty acid-based surfactant, C12 fatty acid-based surfactant, C14 fatty acid-based surfactant, and C16 fatty acid-based surfactant.

[0162] It is to be understood that if the process provides a blend, that the blending step is not optional.

[0163] In a preferred embodiment, the process further comprises the steps

- e) isolating a fatty acid-based surfactant selected from the group consisting of a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, and a C16 fatty acid-based surfactant, and
- f) blending the isolated C10 fatty acid-based surfactant, the isolated C12 fatty acid-based surfactant, the isolated C14 fatty acid-based surfactant, and the isolated C16 fatty acid-based surfactant.

[0164] In a preferred embodiment, the process further comprises the step of

e) isolating a C12 fatty acid-based surfactant and/or a C14 fatty acid-based surfactant.

[0165] As indicated above, the present invention further relates to a fatty acid-based surfactant and blends thereof obtained by the above-outlined process.

[0166] In a preferred embodiment, the fatty acid-based surfactant is selected from the group consisting of sulfonates, amides, isethionates, taurates, glycolipids, amino acids, esterquats, sophorolipids, rhamnolipids, and amphotoacetates.

[0167] In a preferred embodiment, the fatty acid-based surfactant is an alpha-sulfo fatty acid disalts (A) of the general formula (I),



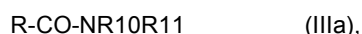
in which the radical R1 is a linear or branched alkyl or alkenyl radical with 6 to 16 carbon atoms, preferably 12 to 14 carbon atoms, and the radicals M1 and M2 - independently of one another - are selected from the group H, Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamine such as triethanolammonium.

[0168] In a preferred embodiment, the fatty acid-based surfactant is an ester sulfonates (B) of the general formula (II),



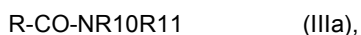
in which the radical R2 is a linear or branched alkyl or alkenyl radical with 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, and the radical R3 is a linear or branched alkyl or alkenyl radical with 1 to 20 carbon atoms, where the radical R3 can be an alkenyl radical or be branched only above 3 carbon atoms, and the radical M7 is selected from the group Li, Na, K, Ca/2, Mg/2, ammonium and

[0169] In a preferred embodiment, the fatty acid-based surfactant is an amide selected from the group consisting of secondary amides, ternary amides, (methyl)glucamides, and alkanolamides. Suitable secondary and ternary amides can be expressed by the general formula (IIIa)



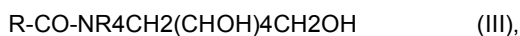
wherein R is saturated or unsaturated C4-C22-alkyl, preferably C6-C20-alkyl, and in particular C12-C14-alkyl, and R10 and R11 are independently H, C1-C4-alkyl, or C1-C8-alkylene-NR12R12', wherein R12 and R12' are independently C1-C4-alkyl.

[0170] In a preferred embodiment, the secondary amide has the general formula (IIia)



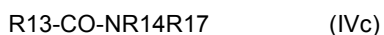
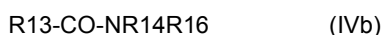
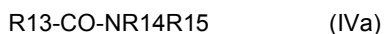
wherein R is saturated or unsaturated C₁₂-C₂₂-alkyl, preferably C₁₂-C₁₄-alkyl or C₁₅-C₁₉-alkyl, R₁₀ is H and R₁₁ is C₂-C₄-alkylene-NR₁₂R₁₂', wherein R₁₂ and R₁₂' are independently C₁-C₃-alkyl.

[0171] Suitable (methyl)glucamides can be expressed by the general formula (III)



wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl or C₁₄-C₁₆-alkyl, and R₄ is H or methyl.

[0172] Preferably, the alkanolamine is selected from the group of compounds of general formulae (IVa), (IVb), and (IVc),



wherein R₁₃ in compounds (IVa) is a linear or branched alkyl radical having 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, and R₁₄ and R₁₅, independently of each other, are a linear or branched hydroxyalkyl group having 1 to 4 carbon atoms;

wherein R₁₃ in compounds (IVb) is a linear or branched alkyl radical having 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, R₁₄ is a linear or branched hydroxyalkyl group having 1 to 4 carbon atoms and R₁₆ is hydrogen; and wherein R₁₃ in compounds (IVc) is a linear or branched alkyl radical having 6 to 18 carbon atoms, preferably 12 to 14 carbon atoms, R₁₄ is a linear or branched hydroxyalkyl group having 1 to 4 carbon atoms and R₁₇ is an alkyl group having 1 to 4 carbon atoms.

[0173] Suitable isethionates can be expressed by the general formula (V)



wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, R₅ to R₈ are independently H or C₁-C₄-alkyl, preferably H, and K is an optionally substituted ammonium (such as ammonium or triethanolamine) cation, alkali metal (such as sodium or potassium).

[0174] Suitable taurates can be expressed by the general formula (VI)



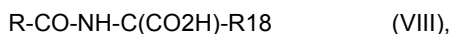
wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, R₅ to R₈ are independently H or C₁-C₄-alkyl, preferably H, R₉ is H or methyl, and K is an optionally substituted ammonium (such as ammonium or triethanolamine) cation, alkali metal (such as sodium or potassium).

[0175] Suitable glycolipids can be expressed by the formula (VII)



wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, L is a carbohydrate moiety, connected via the C₁ carbon atom (i.e. by a glycosidic bond). In a preferred embodiment, L is a galactose moiety or a glucose moiety, and in particular a glucose moiety.

[0176] Suitable amino acids can be expressed by the formula (VIII)



wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, and R₁₈ is an amino acid moiety, which is bond via the amino group adjutant to the carboxylic group (i.e. the alpha amino group), to the carboxylic group of the fatty acid. In a preferred embodiment, R₁₈ is C₁-C₆-alkyl or heteroaryl wherein each substitutable carbon in the aforementioned groups is independently unsubstituted or substituted with one or more, same or different substituents Rx, wherein Rx is halogen, SH, SMe, (CO)Ry, OH, NHCNHNH₂, heteroaryl, aryl, or C₁-C₂-alkyl,

wherein R_y is H, OH, or NH₂.

[0177] Suitable esterquats can be expressed by the general formula (IX)

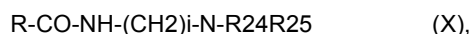


wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, n is an integer of 1 to 10, preferably of 1 to 5, (+) denotes a positive charge on the nitrogen, (-) denotes a negative charge on R₂₂, R₁₉ is C₁-C₆-alkyl or C₁-C₆-hydroxyalkyl, preferably C₁-C₃-alkyl or C₁-C₃-hydroxyalkyl, R₂₀ is C₁-C₆-alkyl or C₁-C₆-hydroxyalkyl, preferably C₁-C₃-alkyl or C₁-C₃-hydroxyalkyl, R₂₁ is -(CH₂)_m-O-CO-R₂₃, wherein m is an integer of 1 to 10, preferably of 1 to 5 and R₂₃ is linear, saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and R₂₂ is halide, preferably chloride. In a preferred embodiment, R is R₂₁.

[0178] Suitable sophorolipids are glycolipids having a hydrophobic fatty acid tail of C₁₄-, C₁₆-, or C₁₈-alkyl and a hydrophilic carbohydrate head sophorose, a glucose-derived di-saccharide with an unusual β-1,2 bond and can be acetylated on the 6'-and/or 6"-positions and wherein one terminal or sub terminal hydroxylated fatty acid is β-glycosidically linked to the sophorose module. The carboxylic end of this fatty acid is either free (acidic or open form) or internally esterified at the 4" or in some rare cases at the 6'- or 6"-position (lactonic form).

[0179] Suitable rhamnolipids are glycolipids having a glycosyl head group, i.e. a rhamnose moiety, and a 3-(hydroxy-alkanoyloxy)alkanoic acid (HAA) fatty acid tail, such as 3-hydroxydecanoic acid. Preferably, the fatty acid moiety encompasses 6 to 20 carbon atoms, and in particular 12 to 14 carbon atoms. It is to be understood that the present invention relates to the mono-rhamnolipids and the di-rhamnolipids, which comprise one or two of the rhamnose groups respectively. Preferably, the rhamnose groups in the di-rhamnolipids are connected via a 1,2-glycosidic bond.

[0180] Suitable amphotacetates can be expressed by the general formula (X)



wherein R is saturated or unsaturated C₄-C₂₂-alkyl, preferably C₆-C₂₀-alkyl, and in particular C₁₂-C₁₄-alkyl, i is an integer of 1 to 10, preferably 1 to 4, R₂₄ is C₁-C₅-alkyl or C₁-C₅-hydroxyalkyl, preferably C₁-C₄-hydroxyalkyl, and R₂₅ is C₁-C₄-alkylene-R₂₆, preferably C₁-C₂-alkylene-R₂₆, wherein R₂₆ is CO-O(-)U(+), wherein (-) denotes a negative charge on the oxygen, (+) denotes a positive charge U, and U is a suitable counter ion, such as triethanolammonium, Na⁺, K⁺ or NH₄⁺, preferably sodium.

[0181] As indicated above, the present invention further relates to a fatty acid-based surfactant obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, wherein the oil obtained from the plant is converted into a fatty acid composition, which is then converted into the fatty acid-based surfactant.

[0182] Preferred embodiments are already above-outlined in the process of manufacturing a fatty acid-based surfactant and shall apply for the fatty acid-based surfactant, as well. Particular preferred embodiment are mentioned in the following.

[0183] In a preferred embodiment, the plant is a palm, preferably a palm of the genus *Acrocomia*, more preferably a Macaúba palm, still more preferably *Acrocomia hassleri*, *Acrocomia totei*, and/or *Acrocomia aculeata*, and in particular *Acrocomia aculeata* and/or wherein the oil is obtained by extraction of the fruits, preferably wherein the plant is a palm and the oil is extracted from the palm pulp and/or the palm kernel, more preferably wherein the plant is Macaúba palm and the oil is extracted from the Macaúba kernel, still more preferably wherein the plant is *Acrocomia hassleri*, *Acrocomia totei*, and/or *Acrocomia aculeata* and the oil is extracted from more preferably *Acrocomia hassleri* kernel, *Acrocomia totei* kernel, and/or *Acrocomia aculeata* kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

[0184] In a preferred embodiment, the fatty acid composition comprises

1 to 20 of wt.-% of a C₈ fatty acid,
1 to 8 of wt.-% of a C₁₀ fatty acid,
30 to 48 wt.-% of a C₁₂ fatty acid,
5 to 15 wt.-% of a C₁₄ fatty acid,
4 to 13 wt.-% of a C₁₆ fatty acid,
15 to 42 wt.-% of a C₁₈ fatty acid, and
0 to 5 wt.-% of a C₂₀ fatty acid,
each based on the total weight of the fatty acid composition. Said fatty acid composition is preferably obtained from oil extracted from Macaúba kernel.

[0185] In a preferred embodiment, the fatty acid composition comprises

3 to 7 wt.-%, preferably 4 to 6 wt.-%, of a C₈ fatty acid,

2 to 6 wt.-%, preferably 3 to 5 wt.-%, of a C10 fatty acid,
 36 to 46 wt.-%, preferably 38 to 42 wt.-%, of a C12 fatty acid,
 6 to 13 wt.-%, preferably 8 to 11 wt.-%, of a C14 fatty acid,
 5 to 11 wt.-%, preferably 6 to 9 wt.-%, of a C16 fatty acid,
 25 to 40 wt.-%, preferably 30 to 38 wt.-% of a C18 fatty acid, and
 0 to 4 wt.-%, preferably 0 to 3 wt.-%, of a C20 fatty acid,
 each based on the total weight of the fatty acid composition. Said fatty acid composition is preferably obtained from
 oil extracted from Macaúba kernel.

[0186] In a preferred embodiment, the fatty acid composition comprises

0 to 5 wt.-%, preferably 0 to 3 wt.-%, and in particular 0 to 2 wt.-%, of a C10 fatty acid,
 0 to 6 wt.-%, preferably 0 to 5 wt.-%, and in particular 1 to 4 wt.-%, of a C12 fatty acid,
 0 to 6 wt.-%, preferably 0 to 5 wt.-%, and in particular 1 to 4 wt.-%, of a C14 fatty acid,
 10 to 35 wt.-%, preferably 13 to 32 wt.-%, and in particular 15 to 30 wt.-%, of a C16 fatty acid,
 55 to 85 wt.-%, preferably 60 to 80 wt.-%, and in particular 65 to 75 wt.-%, of a C18 fatty acid,
 0 to 4 wt.-%, preferably 0 to 3 wt.-%, and in particular 0 to 2 wt.-%, of a C20 fatty acid,
 each based on the total weight of the fatty acid composition. Said fatty acid composition is preferably obtained from
 oil extracted from Macaúba pulp.

[0187] In a preferred embodiment, the fatty acid composition comprises at least 85 wt.-% based on the total weight
 of the fatty acid composition, of C4-C22 fatty acids, preferably C10-C22 fatty acids, more preferably C12-C20 fatty acids,
 even more preferably C12-C20 fatty acids, and in particular C12-C18 fatty acids.

[0188] In a preferred embodiment, the fatty acid composition comprises at least 10 wt.-% of C16 fatty acids and at
 least 75 wt.-% of C18 fatty acids, each based on the total weight of the fatty acid composition.

[0189] In a preferred embodiment, the fatty acid composition comprises 10 to 25 wt.-% of C16 fatty acids and 75 to
 90 wt.-% of C18 fatty acids, each based on the total weight of the fatty acid composition.

[0190] In a preferred embodiment, the fatty acid composition comprises at least 80 wt.-%, preferably at least 90 wt.-%,
 and in particular at least 95 wt.-%, based on the total weight of the fatty acid composition, of C12-14 fatty acids.

[0191] In a preferred embodiment, the fatty alcohol composition comprises at least 80 wt.-%, preferably at least 90
 wt.-%, and in particular at least 95 wt.-%, based on the total weight of the fatty alcohol composition, of C12-18 fatty acids.

[0192] In a preferred embodiment, the fatty acid composition comprises at least 2 wt.-% of C10 fatty acids, at least
 35 wt.-% of C12 fatty acids, at least 5 wt.-% of C14 fatty acids, and at least 4 wt.-% of C16 fatty acids, each based on
 the total weight of the fatty acid composition.

[0193] In a preferred embodiment, the fatty acid composition comprises 3 to 7 wt.-% of C8 fatty acids, 2 to 6 wt.-% of
 C10 fatty acids, 35 to 45 wt.-% of C12 fatty acids, 5 to 13 wt.-% of C14 fatty acids, and 4 to 10 wt.-% of C16 fatty acids,
 each based on the total weight of the fatty acid composition.

[0194] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C8 fatty acids, based on
 the total weight of the fatty acid composition.

[0195] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C10 fatty acids, based
 on the total weight of the fatty acid composition.

[0196] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C12 fatty acids, based
 on the total weight of the fatty acid composition.

[0197] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C14 fatty acids, based
 on the total weight of the fatty acid composition.

[0198] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C16 fatty acids, based
 on the total weight of the fatty acid composition.

[0199] In a preferred embodiment, the fatty acid composition comprises at least 90 wt.-% of C18 fatty acids, based
 on the total weight of the fatty acid composition.

[0200] As indicated above, the present invention further relates to the use of a fatty acid composition obtained from
 the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr for manufacturing a fatty acid-
 based surfactant.

[0201] Preferred embodiments (e.g. regarding the fatty acid composition, the plant, and the fatty acid-based surfactant)
 are already above-outlined in the process of manufacturing a fatty acid-based surfactant and shall apply for the use, as
 well. Particular preferred embodiment are mentioned in the following.

[0202] In a preferred embodiment, the plant is a palm, preferably a palm of the genus *Acrocomia*, more preferably a
 Macaúba palm, still more preferably *Acrocomia hassleri*, *Acrocomia totei*, and/or *Acrocomia aculeata*, and in particular
Acrocomia aculeata and/or wherein the oil is obtained by extraction of the fruits, preferably wherein the plant is a palm

and the oil is extracted from the palm pulp and/or the palm kernel, more preferably wherein the plant is *Macaúba* palm and the oil is extracted from the *Macaúba* kernel, still more preferably wherein the plant is *Acrocomia hassleri*, *Acrocomia totei*, and/or *Acrocomia aculeata* and the oil is extracted from more preferably *Acrocomia hassleri* kernel, *Acrocomia totei* kernel, and/or *Acrocomia aculeata* kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

[0203] As indicated above, the present further invention relates to the use of the above-outlined fatty acid-based surfactant in a personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crops formulation.

[0204] In a preferred embodiment, the above-outlined surfactants are used in a personal care composition, preferably selected from the group consisting of face care composition, hair care composition, body care composition, oral care composition, or antiperspirants and deodorants.

[0205] Suitable cosmetic formulations containing active ingredients are, e.g., hormone preparations, vitamin preparations, vegetable extract preparations and antibacterial preparations.

[0206] According to the present invention the personal care composition may comprise one or more active agent(s), e.g., organic and inorganic UV filters and vitamins, as well as other ingredients or additives, e.g., pigments, emulsifiers, emollients, viscosity regulators, stabilizers, preservatives, or fragrances.

[0207] In a preferred embodiment, the above-outlined surfactants are used in a sunscreen.

[0208] In a preferred embodiment, the above-outlined surfactants are used in a decorative preparations, preferably selected from the group consisting of lipsticks, nail varnishes, eye shadows, mascaras, dry and moist make-up, rouge, powders, depilatory agents and suntan lotions.

[0209] The personal care composition is preferably in form of creams, ointments, pastes, foams, gels, lotions, powders, make-ups, sprays, sticks or aerosols.

[0210] Preferably, the surfactant is used to control the metal ions, improve the dispersing, improve the emulsifying, control the foaming, modify the surface, and/or protect the active agent(s).

[0211] In a preferred embodiment, the above-outlined surfactants are used in a cleaning composition, preferably selected from the group consisting of home care formulation, industrial care formulation, and institutional care formulation.

[0212] In a preferred embodiment, the cleaning composition is selected from the group consisting of laundry composition (personal and commercial), dishwashing composition, hard surface cleaning composition, food service and kitchen hygiene composition, food and beverage processing composition, sanitation composition, institutional cleaning composition, industrial cleaning composition, and vehicle and transportation care composition.

[0213] The cleaning composition may comprise at least one bleaching system known in the art in an amount of from 0 to 50 wt.-%. Suitable bleaching components include bleaching catalysts, photobleaches, bleach activators, sources of hydrogen peroxide such as sodium percarbonate and sodium perborates, preformed peracids, and mixtures thereof.

[0214] The cleaning compositions may furthermore comprise dirt-suspending agents, for example sodium carboxymethylcellulose; pH regulators, for example alkali metal or alkaline earth metal silicates; bactericides; foam regulators, for example soap; salts for adjusting the spray drying and the granulating properties, for example sodium sulfate; fragrances; antistatic agents; fabric conditioners; further bleaching agents; pigments; and/or toning agents.

[0215] Preferably, the surfactant is used to control the metal ions, improve the dispersing, improve the emulsifying, control the foaming, modify the surface, and/or protect the ingredient(s).

[0216] In a preferred embodiment, the above-outlined surfactants are used in a nutrition formulation, preferably from the group selected from food formulations and feed formulations. The nutrition formulation can have any suitable form, e.g. liquid or solid and can be administered or uptaken in any suitable manner, e.g. orally, parenterally, or rectally.

[0217] For the preparation of a nutrition formulation, or a premix or a precursor, the process may comprise mixing a stabilized solid and/or liquid formulation comprising at least one or more food substance(s) and at least one additional ingredient(s) such as stabilizing agent.

[0218] Suitable stabilizing agents may be selected from the group consisting of gummi arabicum, at least one plant protein and mixtures thereof. It is understood that the stabilizing agent can be selected from one agent, e.g. only gummi arabicum or be composed of a mixture of e.g. one plant protein and gummi arabicum or a mixture of two or three or more different plant proteins. In one embodiment, the stabilizing agent is gummi arabicum. In another embodiment, the stabilizing agent is at least one plant protein.

[0219] Preferably, the surfactant is used to control the metal ions, improve the dispersing, improve the emulsifying, control the foaming, modify the surface, and/or protect the ingredient(s).

[0220] In a preferred embodiment, the above-outlined surfactants are used in pharmaceutical formulation. The pharmaceutical formulation may be administered in any suitable manner such as by oral, transdermal, parenteral, nasal, vaginal, or rectal application. Suitable solid pharmaceutical formulation can be in form of tablets, suppositories, or capsules or in form of a spray. Suitable transdermal pharmaceutical formulations encompass patches or formulations such as sprays, lotions, creams, oils, foams, ointments, powders, or gels. Suitable liquid pharmaceutical formulations are preferably administered orally, parenterally, or nasal.

[0221] The pharmaceutical formulation is preferably in solid, semi-solid, or liquid form, preferably in form of tablets, suppositories, capsules, patches, as sprays, lotions, creams, oils, foams, ointments, powders, gels, or fluid.

[0222] The pharmaceutical formulation comprises at least one active agent, e.g. selected from the group consisting of anti-cancer agent, hormone, antiviral agent, antifungal agent, antibacterial agent, and inhibitor.

[0223] Preferably, the surfactant is used to control the metal ions, improve the dispersing, improve the emulsifying, control the foaming, modify the surface, and/or protect the active agent(s).

[0224] In a preferred embodiment, the above-outlined surfactants are used in crop formulation, preferably selected from the group consisting of pesticide formulations, fungicide formulations, and herbicide formulations.

[0225] The crop formulation is preferably in solid, semi-solid, or liquid form. Preferably, the crop formulation is suitable for a ready to use spray.

[0226] In a preferred embodiment, the pesticide formulation comprises a pesticide selected from the group consisting of chlorpyrifos, endosulfan, imazalil, DDT, toxaphene, lindane, methoxychlor, dieldrin, kelthane, chlordane, Perthane, endrin, aldrin, and heptachlor.

[0227] In a preferred embodiment, the fungicide formulation comprises a fungicide selected from the group consisting of azoxystrobin, pyraclostrobin, fluoxastrobin, trifloxystrobin, picoxystrobin, epoxiconazole, prothioconazole, myclobutanil, tebuconazole, propiconazole, cyproconazole, fenbuconazole, boscalid, penthiopyrad, bixafen, isopyrazam, sedaxane, fluopyram, and thifluzamide.

[0228] In a preferred embodiment, the herbicide formulation comprises a herbicide selected from the group consisting of glyphosate, glufosinate, imidazolinone (such as imazamethabenz, imazamox, imazapic (e.g. Kifix), imazapyr, imazaquin and imazethapyr), and cyclohexanediones (such as tepraloxym and clethodim).

[0229] Suitable herbicide formulation show enhanced herbicide action against undesirable harmful plants, in particular against *Acalypha* species such as *Acalypha indica*, *Dinebra* species such as *Dinebra Arabica*, *Cynotis spec* such as *Cynotis axillaris*, *Parthenium spec* such as *Parthenium hysterophorus*, *Physalis spec* such as *Physalis minima*, *Digera spec* such as *Digera arvensis*, *Alopecurus myosuroides*, *Apera spicaventi*, *Brachiaria spec.* such as *Brachiaria deflexa* or *Brachiaria plantaginea*, *Echinochloa spec.* such as *Echinochloa colonum*, *Leptochloa spec.* such as *Leptochloa fusca*, *Rottboellia cochinchinensis*, *Digitaria sanguinalis*, *Eleusine indica*, *Saccharum spontaneum*, *Cynodon dactylon*, *Euphorbia hirta*, *Euphorbia geniculata*, *Commelina benghalensis*, *Commelina communis*, certain undesired *Oryza spec.* such as weedy rice or red rice (*Oryza sativa*), *Phalaris spec.* such as *Phalaris canariensis*, *Celosia argentea*, *Xanthium strumarium*, *Papaver rhoeas*, *Geranium spec.*, *Brassica spec.*, *Avena fatua*, *Bromus spec.*, *Lolium spec.*, *Phalaris spec.*, *Setaria spec.*, *Digitaria spec.*, *brachiaria spec.*, *Amaranthus spec.*, *Chenopodium spec.*, *Abutilon theophrasti*, *Galium aparine*, *Veronica spec.*, or *Solanum spec.* and/or to improve their compatibility with crop plants, such as soybean, peanut, pea, bean, lentil, green gram, black gram, cluster bean, fenugreek, palm, other pulse or leguminous crops, or crops which are tolerant to the action of acetohydroxyacid synthase inhibiting herbicides, such as for example Clearfield® wheat, Clearfield® barley, Clearfield® corn, Clearfield® lentil, Clearfield® oilseed rape or canola, Clearfield® rice, Cultivance® soybean and/or Clearfield® sunflower. The formulation should also have a good pre-emergence herbicidal activity.

[0230] Preferably, the surfactant is used to control the metal ions, improve the dispersing, improve the emulsifying, control the foaming, modify the surface, and/or protect the crop.

[0231] In a preferred embodiment, the personal care composition, the cleaning composition, the nutrition formulation, the pharmaceutical formulation, or the crop formulation comprises at least two surfactants. In this connection it is to be understood that the personal care composition, the cleaning composition, the nutrition formulation, the pharmaceutical formulation, or the crop formulation may comprise at least two above-outlined surfactant, at least three of the above-outlined surfactant or at least one of the above-outlined surfactant in combination with at least one further, different surfactant. The at least one further, different surfactant may be selected from the group consisting of fatty alcohol-based surfactant, betains, amido alkanolamides, alkoxylated fatty acid ester, and fatty acid methyl esters or its sulfonates.

[0232] Potential mixtures of one of the above-outlined surfactants are listed in the following.

1	+ fatty acid methyl ester or its sulfonate	12	+ amphotenside
2	+ alkanolamide	13	+ sulfoacetate
3	+ isethionate	14	+ alkylbetaine
4	+ N-acyl-aminoacid (e.g. N-acylglutamic acid)	15	+ alkylethoxylate
5	+ taurate	16	+ cationic polymer
6	+ aminooxide	17	+ cationic surfactant
7	+ sulfonate	18	+ silicone

(continued)

8	+ carboxylate	19	+ sulfonated fatty acid salts
9	+ sulfosuccinate	20	+ proteinhydrolysate
10	+ (alkylether)sulfate	21	+ protein-derivative
11	+ betaine (e.g. cocamindopropylbetaine)	22	+ fatty alkyl polyglucoside

[0233] As indicated above, the present invention further relates to a personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crop formulation comprising a surfactant as above-outlined in more detail. It is to be understood that the further specification of the use of the surfactants in the respective personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crop formulation also applies for the personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crop formulation.

[0234] As indicated above, the present invention further relates to process of manufacturing glycerol, the process comprising the step

a) converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into glycerol.

[0235] Preferred embodiments (e.g. regarding fatty acid-based surfactants, plant, and process parameters) are already above-outlined in the process of manufacturing a fatty acid-based surfactant and shall apply for the method of manufacturing glycerol, as well. Particular preferred embodiment are mentioned in the following.

[0236] Glycerol may be provided as a side reaction of the above-outlined process of manufacturing a fatty acid-based surfactant.

[0237] In a preferred embodiment, the process further comprises the step of b) refining, which preferably is conducted via filtration, centrifugation, chemical addition, and/or fractional vacuum distillation.

Examples

[0238] The present invention is further illustrated by the following prophetic examples.

[0239] The following examples are considered for the Macaúba palm (e.g. having registration number AEB402A) having an oil yield in tons per hectare per year of about 9.0 t/ha/yr.

Example 1

[0240] The Macaúba palm is planted on a cattle field, e.g. about 380 trees per hectare. No deforestation is needed since the Macaúba palms are cultivated on already existing fields (silvopastoral) and the farmer can in addition to cattle breeding and/or milk production distribute the Macaúba fruits.

Example 2

[0241] The Macaúba palm is planted on soya plantation (having a growth height of about 20 to 80 cm and an oil yield in tons per hectare per year about 0.6 t/ha/yr), e.g. about 340 trees per hectare. Again, no deforestation is needed since the Macaúba palms are cultivated on an already existing plantation (agroforestry). As the Macaúba palm grows up to about 15 meters in height, the soya can be cultivated parallel. In this connection, it is also possible to cultivate at least one more additional different plant (having a growth height of about 1 to 7 m) such as sunflower (having an oil yield in tons per hectare per year of about 0.7 t/ha/yr) or beans parallel.

[0242] As can be seen from the above examples, deforestation can be significantly reduced by cultivating Macaúba palms. Further, the biodiversity can be increased. In addition, even if the Macaúba palm is not cultivated as a monoculture, the total oil yield can be comparable with an oil palm (having an oil yield in tons per hectare per year of about 3.8 t/ha/yr) monoculture since the oil yield as above-defined of the Macaúba palm is higher. Without being bound to any theory, using a plant having an improved oil yield, degraded areas and springs and watersheds can more easily recover. Further, the retention of moisture in the soil is improved.

Claims

1. A process of manufacturing a fatty acid-based surfactant, the process comprising the steps of

- a) converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into a fatty acid composition,
 b) separating fatty acids selected from the group consisting of a C4 fatty acid, a C6 fatty acid, a C8 fatty acid, a C10 fatty acid, a C12 fatty acid, a C14 fatty acid, a C16 fatty acid, a C18 fatty acid, a C20 fatty acid, and a C22 fatty acid, from the fatty acid composition obtained in step a),
 c) optionally blending at least two of the separated fatty acids,
 d) subsequently converting at least one of the separated fatty acids selected from the group consisting of C4 fatty acid, C6 fatty acid, C8 fatty acid, C10 fatty acid, C12 fatty acid, C14 fatty acid, C16 fatty acid, C18 fatty acid, C20 fatty acid, and C22 fatty acid, into the respective fatty acid-based surfactant.

2. The process according to claim 1, wherein the plant is a palm, preferably a Macaúba palm, and in particular *Acrocomia aculeata* and/or wherein the plant is a palm and the oil is extracted from the palm pulp and/or the palm kernel, preferably wherein the plant is Macaúba palm and the oil is extracted from the Macaúba kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

3. The process according to claims 1 or 2, wherein in step a) the conversion is conducted under chemical or enzymatic conditions, preferably under chemical conditions and/or wherein step a) involves a hydrolysis.

4. The process according to any one of claims 1 to 3, wherein the fatty acid composition in step a) comprises at least 45 wt.-%, based on the total weight of the fatty acid composition, of C4-C22 fatty acids, preferably C6-C20 fatty acids, more preferably C8-C18 fatty acids, even more preferably C8-C16 fatty acids or C16-C18 fatty acids, and in particular C10-C16 fatty acids and/or

- 1 to 20 of wt.-% of a C8 fatty acid,
 1 to 8 of wt.-% of a C10 fatty acid,
 30 to 48 wt.-% of a C12 fatty acid,
 5 to 15 wt.-% of a C14 fatty acid,
 4 to 13 wt.-% of a C16 fatty acid,
 15 to 42 wt.-% of a C18 fatty acid, and
 0 to 5 wt.-% of a C20 fatty acid,
 each based on the total weight of the fatty acid composition.

5. The process according to any one of claims 1 to 4, wherein the plant has an oil yield in tons per hectare per year in the range of 6 to 30 t/ha/yr, preferably 7 to 20 t/ha/yr, more preferably of 8 to 15 t/ha/yr.

6. The process according to any one of claims 1 to 5, wherein the fatty acid-based surfactant provided in step d) is selected from the group consisting of sulfonates, amides, isethionates, taurates, glycolipids, amino acids, esterquats, sophorolipids, rhamnolipids, and amphotacetates.

7. The process according to any one of claims 1 to 5, wherein the fatty acid-based surfactant provided in step d) is

an alpha-sulfo fatty acid disalts (A) of the general formula (I),



in which the radical R₁ is a linear or branched alkyl or alkenyl radical with 6 to 16 carbon atoms and the radicals M₁ and M₂ - independently of one another - are selected from the group H, Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamine, preferably triethanolammonium, or an ester sulfonates (B) of the general formula (II),



in which the radical R2 is a linear or branched alkyl or alkenyl radical with 6 to 18 carbon atoms and the radical R3 is a linear or branched alkyl or alkenyl radical with 1 to 20 carbon atoms, where the radical R3 can be an alkenyl radical or be branched only above 3 carbon atoms, and the radical M7 is selected from the group Li, Na, K, Ca/2, Mg/2, ammonium and alkanolamines, preferably triethanolammonium.

8. The process according to any one of claims 1 to 7, wherein step a) further comprises the step

a.i) blending the fatty acid composition obtained from the oil extracted from the plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr with a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr, preferably wherein the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO) and/or wherein the fatty acid-based surfactant obtained in step d) is blended with fatty acid-based surfactants obtained from a fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr and a subsequent conversion into the respective fatty acid-based surfactant, preferably wherein the fatty acid composition obtained from a plant having an oil yield in tons per hectare per year of less than 6 t/ha/yr is derived from coconut oil (CNO), palm oil (PO), and/or palm kernel oil (PKO).

9. The process according to any one of claims 1 to 8, further comprising the steps

e) isolating a fatty acid-based surfactant selected from the group consisting of a C6 fatty acid-based surfactant, a C8 fatty acid-based surfactant, a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, a C16 fatty acid-based surfactant, a C18 fatty acid-based surfactant, and a C20 fatty acid-based surfactant, preferably a fatty acid-based surfactant selected from the group consisting of a C8 fatty acid-based surfactant, a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, a C16 fatty acid-based surfactant, and a C18 fatty acid-based surfactant, and in particular a fatty acid-based surfactant selected from the group consisting of a C10 fatty acid-based surfactant, a C12 fatty acid-based surfactant, a C14 fatty acid-based surfactant, and a C16 fatty acid-based surfactant, and f) optionally blending at least two of the isolated fatty acid-based surfactants, preferably blending at least two fatty acid-based surfactants selected from the group consisting of C10 fatty acid-based surfactant, C12 fatty acid-based surfactant, C14 fatty acid-based surfactant, and C16 fatty acid-based surfactant.

10. A fatty acid-based surfactant and blends thereof obtained by a process according to any one of claims 1 to 9.

11. A fatty acid-based surfactant obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr, wherein the oil obtained from the plant is converted into a fatty acid composition, which is then converted into the fatty acid-based surfactant.

12. The fatty acid-based surfactant according to claim 11, wherein the plant is a palm, preferably a Macaúba palm, and in particular *Acrocomia aculeata* and/or wherein the oil is obtained by extraction of the fruits, preferably wherein the plant is a palm and the oil is extracted from the palm pulp and/or the palm kernel, more preferably wherein the plant is Macaúba palm and the oil is extracted from the Macaúba kernel, and in particular wherein the plant is *Acrocomia aculeata* and the oil is extracted from *Acrocomia aculeata* kernel.

13. Use of a fatty acid composition obtained from the fruits of a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr for manufacturing a fatty acid-based surfactant.

14. Use of the fatty acid-based surfactant according to any one of claims 10 to 12 in a personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crops formulation.

15. A personal care composition, a cleaning composition, a nutrition formulation, a pharmaceutical formulation, or a crop formulation comprising a surfactant according to any one of claims 10 to 12.

16. A process of manufacturing glycerol, the process comprising the step

a) converting oil extracted from a plant having an oil yield in tons per hectare per year of at least 6 t/ha/yr into glycerol.



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 8873

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Munich		19 July 2022	Stiegler, Petra
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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 8873

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X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)



EUROPEAN SEARCH REPORT

Application Number

EP 22 15 8873

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