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(54) Title: NO SUGAR CRUNCHIES

(57) Abstract: The present invention relates a dry foodstuff composition comprising a foodstuff matrix and one or more soluble fibres. The present invention also relates to processes for providing such composition and uses of such composition.

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No sugar crunchies**Field of the Invention**

5 The present invention relates to a process for the preparation of a dry foodstuff composition wherein the process comprises the steps of:

- (i) mixing a foodstuff matrix with a fiber composition to form a mix; and
- (ii) drying the product of (i) with a roll drum dryer to provide a foodstuff dry composition.

10

The present invention also relates to the dry compositions and uses of such compositions.

Background of the Invention

15

The listing or discussion of an apparently prior-published document in this specification should not necessarily be taken as an acknowledgement that the document is part of the state of the art or is common general knowledge.

20 Crunchies of fruit juices or fruit purees are obtained by drum drying. This technology heats the premix that is deposited in a thin layer on its surface. Water evaporates from the film and the resulting film can have different textures and colours depending on the product to be dried and on the carriers used. To give a good thickness and crunchiness to the product, sugar is added into the premix.

25

Market demands for healthier products push us toward clean label products and removal of added sugars.

30 The present invention seeks to address the abovementioned problems associated with the sugar substitution and provides a new process for producing a dry food matrix using fibres such as soluble fibres.

Disclosure of the Invention

35 The process for obtaining flakes and crunchies out of food matrices is quite complex and challenging because the fruit or vegetable food matrices need to have a certain consistency to allow the drying using the roll drum dryer. Normally in the art, high

quantities of sugar are added to provide films with a consistency than do not brake and do not stick to the drum or roll dry machines, while the final product has enough thickness. The present invention provides flakes and crunchies produced by roll drum dryer without adding sugar to the fruits or vegetables and that have the desired
5 properties of fruit and vegetable flakes obtained using sugars: that is thick flakes (i.e. more than 1mm thickness) that are crunchy (make a sharp noise when bitten or crushed).

The present inventors have surprisingly found that the use of soluble fibres in combination or not with starch or carriers containing starch (i.e. flours) has shown good
10 results in texturizing different food products. The resulting crunchies or flakes have no added sugar and depending on the carrier used, some can be labelled with a clean list of ingredients.

According to the present invention, there is provided a process for the preparation of a
15 dry foodstuff composition wherein the process comprises the steps of:

- (i) mixing a food stuff matrix with a fibre composition to form a mix; and
- (ii) drying the product of (i) with a roll drum dryer to provide a dry foodstuff composition.

20 Such process may be referred to hereinafter as the “process of the invention” or “method of the invention”.

In step (i) a mix or intermediate product is produced by mixing a foodstuff matrix with a fibre composition. In certain embodiments, the foodstuff matrix is selected from juices,
25 purees, pulps or mixtures thereof from fruits, vegetables and/or cereals. In a preferred embodiment, the foodstuff matrix is selected from juices, purees, pulps or mixtures thereof from fruits and/or vegetables.

“Fibre” or “fiber” are exchangeable in the present invention.

30 “Fiber” in the present invention refers to the plant or algae material which is resistant to enzymatic digestion and includes the following components without restriction: cellulose, noncellulosic polysaccharides such as hemicellulose, pectic (or pectin) substances, gums, mucilages, non-carbohydrate component lignin and mixtures thereof.

35 The fibre composition is any composition that comprises fibers. The fibers may be any natural or synthetic fibre or a product containing such fibre.

The fibers that can be used in the method of the invention may be soluble fibres, non-soluble fibres or mixtures thereof.

In a preferred embodiment, the fibers (soluble or non-soluble) are of natural origin. In a preferred embodiment, the fibres are a food approved fibres or dietary fibers.

5

The fibers (soluble fibres, non-soluble fibres or mixtures thereof) of the present invention are exogenous fibers. "Exogenous fibers" in the present invention refers to fibers that have been added to the foodstuff matrix in step (i) and thus do not originate from the foodstuff matrix *per se*.

10

"Soluble fibers" fibre may be any natural or synthetic soluble fibre or a product containing such soluble fibre.

"Soluble fibers" are defined as dispersible in water, thereby giving rise to viscous gels in the gastrointestinal tract. By the term water soluble we mean that at least about 50%, such as at least about 60%, 70%, 80%, 90% or 95% of the fibres will dissolve in water at room temperature, i.e. a temperature of about 25 °C.

15

In a preferred embodiment, the soluble fibres are a food approved fibre or soluble dietary fibers. In a preferred embodiment, the soluble fibres are a food approved fibre or soluble dietary fibers from corn and/or citrus.

20

In another preferred embodiment, the fiber composition comprises soluble corn fibers, such as corn dextrin and/or maltodextrin.

Soluble fiber include, without limitation, plant, cereal and algae fibres such as: β -glucan, glucose oligosaccharides, psyllium, pectins, guar gum, arabinoxylans, inulin, FOS (fructo oligosaccharides), polydextrose, carrageenan (seaweed extracts) and mixture thereof.

25

Vegetal sources of fibers include without limitation: fruits, cereals, algae and vegetables. Examples of fruit sources of fibers are: apple, pear, peach, grape, raspberry, blackberry, gooseberry, blueberry, strawberry, cherry, plum, prune, raisin, cola, guarana, neroli, pineapple, apricot, banana, melon, apricot, cherry, tropical fruit, mango, mangosteen, pomegranate, papaya, and so forth.

30

Examples of vegetables sources of fibers included without limitation: carrots, beans, psyllium, etc. Examples of cereals sources of fibers include oats, barley, wheat, rice, rye, millet and sorghum.

35

Soluble fibres may also be derived from a variety of starch sources. In one embodiment, starch sources may include cereal grains (including corn, wheat, rice and combinations

thereof), potato, or tapioca. When corn is used as the starting material, the soluble fibre composition is sometimes referred to as SCF (soluble corn fibre). While certain embodiments of the invention are described herein with reference to soluble corn fibres, the person of ordinary skill in the art will appreciate that other soluble fibres could be used in place of the soluble corn fibres in certain embodiments of the invention.

In certain embodiments, the water soluble dietary fiber has a degree-of-polymerization (DP) or more than 8, preferably more than 10. For example the degree of polymerization is between 8-80, preferably between 10 -70, even more preferably between 12 -60.

Thus, the invention refers to a process for the preparation of a dry foodstuff composition wherein the process comprises the steps of:

- (i) mixing a foodstuff matrix from fruits and/or vegetables with a fiber composition comprising (or consisting essentially of/consist of) soluble cereal fibers (such as corn or wheat fibres) and/or soluble citrus fibers to form a mix; and
- (ii) drying the product of (i) with a roll drum dryer to provide a dry composition, wherein the dry composition obtained in step (ii) is in form of flakes or crunchies that are substantially free of added sugars and have a thickness of at least 1mm.

In certain embodiments, the soluble corn fiber is a digestion resistance dextrin, such as Nutriose (NUTRIOSE FM06 or FM10, maize dextrin available from Roquette America, Inc., Keokuk, Iowa).

Other suitable commercial soluble corn fibres are resistant maltodextrin products such as PROMITOR (Soluble Corn Fibre 70L or 70R or 85 GL available from Tate & Lyle Health & Nutrition Sciences, Hoffman Estates, Ill.)

The fibers compositions that can be used in the present invention may include one, two, three or more of the above mentioned soluble fibers i.e corn soluble fibers, citrus soluble fibers and other soluble fibers from other sources. The soluble fibre source may be any natural or synthetic soluble fibre or a product containing such a soluble fibre. Preferred soluble fibre sources include corn soluble fibers, citrus soluble fibers etc.

In certain embodiments, the fiber composition used in the present invention may further comprise one or more insoluble fibers (non-soluble fibres).

The insoluble fibre may be any natural or synthetic insoluble fibre or a product containing such an insoluble fibre, e.g. a farinaceous grain. The insoluble fibre source may be the

same as or different from the soluble fibre source. Preferred insoluble fibre sources include the whole farinaceous grains or brans of those grains.

In one preferred embodiment, the fiber composition may comprise soluble and insoluble.

- 5 In a preferred embodiment, both types of fibers are of natural origin. The source of both fibers may be the same or may be different.

- 10 The soluble fibers (such as soluble cereal fibers, like as corn or wheat fibres, and/or the citrus soluble fibers) and non-soluble fibers may be provided separately (can be added separately to the foodstuff matrix in step (i)) or can be provided as fiber composition that comprises both: soluble and non-soluble fibers (for example can be a natural extract or product that comprises both soluble and non-soluble fibers).

- 15 In a preferred embodiment, the fibres may be provided in the form of an extract or as a purified extract of fibres.

- In one embodiment, the fibre composition used in the mixture of step (i) comprises (or consisting essentially of/consist of) from about 30% to about 100% fibres, such as from about 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85% or 90% to about 95%, 90%, 85%, 80%, 75%, 70%, 65%, 60%, 55%, 50% or 45% fibres by weight of the fibre composition.
- 20

In one embodiment, the fiber containing product used in the mixture of step (i) comprises (or consisting essentially of/consist of) insoluble and soluble fibers.

- In one embodiment, the fiber composition is a purified fiber composition that comprises at least 50%, at least 60%, at least 70%, at least 80%, at least 90% at least 99% of soluble fibers.
- 25

In another embodiment, the fiber composition is a purified fiber composition that comprises at least 50%, at least 60%, at least 70%, at least 80%, at least 90% at least 99% of insoluble fibers.

- 30 In a preferred embodiment, the fiber composition comprises (or consisting essentially of/consist of) at least 50%, at least 60%, at least 70%, at least 80%, at least 90% at least 99% of soluble fibers and optionally, it comprises from about 1% to 20% of insoluble fibers, such as from about 5% to 10% of insoluble fibers.

- 35 The fibers (soluble or insoluble) can be used in a liquid or powder form.

In one embodiment, the fibres are added in the preparation of the intermediate mix of step (i) preferably in the form of powder.

After addition of the fibres (such as soluble fibers, insoluble fibers or mixtures thereof) to the mixture in the intermediate food preparation of step (i), a step of hydration of said mixture is advantageously carried out in intermediate. Some water can be also added to the mixture. For example water can be added to have concentration of solids in the intermediate food preparation of step (i) from about 20% to about 60%, such as about 30% to 60%, such as about 40%. The solids will comprise the exogenous fibers and the solids provided by the food matrix.

Preferably, this hydration is carried out for at least 1 minute, more preferably for at least about 5 minutes.

Preferably, the hydration step is carried out with stirring or with the help of kitchen blender.

As already mentioned, the fibres of the final composition are fibres added that are not included in the foodstuff used in step (i). Thus, when we refer in the present text to "fibers" we refer to exogenous added fibers.

In one embodiment the intermediate product of step (i) comprises from about 10% to about 80% of a matrix foodstuff such as from about 20% to about 65% of a matrix foodstuff. The matrix foodstuff can be more or less liquid depending of the source from which it was obtained and thus the ratio of solid components vs water can vary (for example if it is a more or less concentrate vegetable or fruit juice, a vegetable or fruit puree, a comminute, etc.). The intermediate product in step (i) may comprises from about 1% to about 95% of added fibres or exogenous fibers, such soluble cereal fibers (such as corn or wheat fibres) and/or soluble citrus fibers, by weight from about 1% to about 85% of added fibres by weight, such as from about 10% to about 60%, from about 20% to about 70%, from about 30% to about 60% w/w.

In one embodiment, the intermediate product comprises from about 1% to about 90% of soluble fibres (exogenous soluble fibers) by weight, such as from about 5%, 10%, 20%, 30% or 40% to about 50%, 60%, 70%, 80% or about 90% of soluble fibres (exogenous soluble fibers) by weight, such as from about 30% to about 70% of soluble fibres (exogenous soluble fibers) by weigh of intermediate product.

Preferably, the final product comprises (or consisting essentially of/consist of) from about 1% to about 95% of added fibres (such as soluble cereal fibers, like corn or wheat solube

fibres, and/or soluble citrus fibers) by weight such as from about 1% to about 85% of added fibres (such as soluble cereal fibers, like corn or wheat soluble fibres, and/or soluble citrus fibers) by weight, such as from about 10% to about 60%, from about 20% to about 70%, or from about 30% to about 60%, such as 30%, 35%, 40%, 45% 50%, 55% or 60% of exogenous fibers by weigh of final product.

The final product may comprise at least 1 %, at least 5%, at least 10%, at least 15%, at least 20%, at least 25%, at least 30%, at least 35%, at least 40%, at least 50%, at least 55%, at least 60%, at least 65%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 95% of exogenous fibers (such as soluble cereal fibers, like corn or wheat fibres, and/or soluble citrus fibers) % by weight of the final composition.

Preferably, the final product comprises from about 1% to about 90% of soluble fibres (such as soluble cereal fibers, like corn or wheat soluble fibres, and/or soluble citrus fibers) by weight, such as from about 5%, 10%, 20%, 30% or 40% to about 50%, 60%, 70%, 80% or about 90% of soluble fibres (exogenous soluble fibers) by weight, such as from about 30% to about 70% of soluble fibres (exogenous soluble fibers) by weigh of final product, such as 7%, 10%, 15%, 20%, 25%, 30%, 35%, 40%, 45% 50%, 55% or 60% of exogenous soluble fibers (such as soluble cereal fibers, like corn or wheat fibres, and/or soluble citrus fibers) by weigh of final product.

The final product may comprise at least 1 %, at least 5%, at least 10%, at least 15%, at least 20%, at least 25%, at least 30%, at least 35%, at least 40%, at least 50%, at least 55%, at least 60%, at least 65%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 95% of exogenous soluble fibers (such as soluble cereal fibers, like corn or wheat soluble fibres, and/or soluble citrus fibers) by weight of the final composition.

Preferably, the final product comprises from about 0 to about 50% of insoluble fibres by weight (exogenous non soluble fibers), such as from about 1%, 2%, 5%, 10%, 15% or 20 % to about 25%, 30%, 40% about 50% of soluble fibres (exogenous soluble fibers) by weight, such as from about 5% to about 20% of insoluble fibres (exogenous insoluble fibers) by weigh of final product.

The final product may comprise at least 1 %, at least 5%, at least 10%, at least 15%, at least 20%, at least 25%, at least 30%, at least 35%, at least 40% of insoluble fibers % by weight (exogenous non soluble fibers) of the final composition.

The intermediate mix of step (i) and the final product may optionally comprise one or more starch based carriers.

Starch based carries include any natural starch including but not limited to: native corn starch, potato starch, rice flour or any cereal grain flour or starch or mixtures thereof.

5 Representative flours include oat flour, wheat flour, corn flour, rice flour, and combinations thereof. The starch source (or exogenous starch based carrier) may be present in the final product from 0 to about 40 % by wt. and more preferably from about 10 to 25% by wt of final product.

10 In one embodiment, the starch based carrier comprises at least 30% of starch, at least 50% of starch, at least 80% of starch or at least 90% or 99% of starch.

In one embodiment, the final product comprises from 0 to 40% of one or more starch based carriers (exogenous starch based carriers), such as 10%, 15%, 20%, 25%, 30%,
15 35%, 40%, or more by weight of the final composition.

The intermediate mix of step (i) and the final product may optionally comprise one or more plant and/or vegetable oil. For example, the compositions may comprise plant and/or vegetable oils selected from the group consisting of coconut oil, corn oil,
20 cottonseed oil, olive oil, palm oil, peanut oil (ground nut oil), rapeseed oil, including canola oil, safflower oil, sesame oil, soybean oil, sunflower oil, and mixtures thereof. The plant and/or vegetable oil present in the compositions in an amount of from about 0.1% to about 20% plant and/or vegetable oil, such as from about 2.5% to about 10% or about 5% by weight of the composition.

25

The intermediate mix of step (i) and the final product may optionally comprise at least one active component that may be encapsulated or not. In one embodiment, the at least one active component is not restricted to a specific class of molecules. It may refer to a substance, a compound, and/or an ingredient, alone or a mixture thereof.

30

In one embodiment, the at least one active component is selected from flavours and fragrances. The terms "flavour or fragrance" encompass flavour or fragrance ingredients or compositions of current use in the flavour and/or fragrance industry, of both natural and synthetic origin. It includes single compounds and mixtures. Specific examples of
35 such flavour or fragrance ingredients may be found in the current literature, e.g. in Fenaroli's Handbook of flavour ingredients, 1975, CRC Press; Synthetic Food adjuncts, 1947 by M. B. Jacobs, edited by Van Nostrand; or Perfume and Flavor Chemicals by S.

Arctander, 1969, Montclair, N.J. (USA). The flavoring or perfuming ingredients may be present in the form of a mixture with solvents, adjuvants, additives and/or other components, generally those of current use in the flavours and fragrance industry.

- 5 In another embodiment, the at least active component may be selected from pharmaceuticals, nutraceuticals, antioxidants, vitamins and dyes or colours.

Flavour and fragrance compositions may include a broad variety of mixtures of aromatic and fragrant ingredients, such as terpenes, terpene derivatives, esters, alcohols, ethers,
10 ketones, lactones, aldehydes, anthranilates, nitriles, mercaptans, N- and S-heterocycles and the like.

Examples of suitable flavour ingredients include, but are not limited to, natural flavours, artificial flavours, spices, seasonings, synthetic flavour oils and flavoring aromatics
15 and/or oils, oleoresins, essences, and distillates, and a combination comprising at least one of the foregoing.

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

Additional exemplary flavours imparted by a flavour ingredient include a milk flavour, a butter flavour, a cheese flavour, a cream flavour, and a yogurt flavour, a vanilla flavour,
30 tea or coffee flavours, such as a green tea flavour, an oolong tea flavour, a tea flavour, a cocoa flavour, a chocolate flavour, and a coffee flavour; mint flavours, such as a peppermint flavour, a spearmint flavour, and a Japanese mint flavour; spicy flavours, such as an asafetida flavour, an ajowan flavour, an anise flavour, an angelica flavour, a fennel flavour, an allspice flavour, a cinnamon flavour, a chamomile flavour, a mustard
35 flavour, a cardamom flavour, a caraway flavour, a cumin flavour, a clove flavour, a pepper flavour, a coriander flavour, a sassafras flavour, a savory flavour, a Zanthoxyli Fructus flavour, a perilla flavour, a juniper berry flavour, a ginger flavour, a star anise

flavour, a horseradish flavour, a thyme flavour, a tarragon flavour, a dill flavour, a capsicum flavour, a nutmeg flavour, a basil flavour, a parsley flavour, a matjoram flavour, a rosemary flavour, a bayleaf flavour, and a wasabi (Japanese horseradish) flavour; a nut flavour such as an almond flavour, a hazelnut flavour, a macadamia nut flavour, a peanut flavour, a pecan flavour, a pistachio flavour, and a walnut flavour; floral flavours; and vegetable flavours, such as an onion flavour, a garlic flavour, a cabbage flavour, a carrot flavour, a celery flavour, mushroom flavour, and a tomato flavour.

According to some embodiments, flavour ingredients may also include aldehydes and esters such as cinnamyl acetate ((E)-3-phenylprop-2-en-1-yl acetate); cinnamaldehyde ((2E)-3-phenylprop-2-enal); citral diethylacetal ((E)-1,1-dimethoxy-3,7-dimethylocta-2,6-diene), dihydrocarvyl acetate (2-methyl-5-prop-1-en-2-ylcyclohexyl acetate), eugenyl formate ((2S)-1,3,3-trimethylbicyclo[2.2.1]heptan-2-yl acetate), p-methylanisol (1-methoxy-4-methylbenzene), and so forth can be used. Further examples of aldehyde flavourings include acetaldehyde (apple), benzaldehyde (cherry, almond), anisic aldehyde (4-methoxybenzaldehyde) (licorice, anise), cinnamic aldehyde ((2E)-3-phenylprop-2-enal) (cinnamon), citral (E)-3,7-dimethylocta-2,6-dienal, i.e., alpha-citral ((EE)-3,7-dimethylocta-2,6-dienal (lemon, lime), neral, i.e., beta-citral ((EZ)-3,7-dimethylocta-2,6-dienal (lemon, lime), decanal (orange, lemon), ethyl vanillin (vanilla, cream), heliotrope, i.e., piperonal (benzo[d][1,3]dioxole-5-carbaldehyde) (vanilla, cream), vanillin (vanilla, cream), alpha-amyl cinnamaldehyde ((E or Z)-2-benzylideneheptanal) (spicy fruity flavours), butyraldehyde (butanal) (butter, cheese), valeraldehyde (pentanal) (butter, cheese), citronellal (3,7-dimethyloct-6-enal) (modifies, many types), decanal (citrus fruits), aldehyde C-8 (octanal) (citrus fruits), aldehyde C-9 (nonanal) (citrus fruits), aldehyde C-12 (dodecanal) (citrus fruits), 2-ethyl butyraldehyde (2-ethylbutanal) (berry fruits), hexenal, i.e., trans-2 hexenal (berry fruits), tolyl aldehyde (4-methylbenzaldehyde) (cherry, almond), veratraldehyde (3,4-dimethoxybenzaldehyde) (vanilla), 2,6-dimethyl-5-heptenal, i.e., melonal (melon), 2,6-dimethyloctanal (green fruit), and 2-dodecenal (citrus, mandarin), and the like.

In another embodiment, flavour ingredients include natural compounds derived from Maillard reactions.

Examples of suitable fragrance ingredients include, but are not limited to hex-3-en-1-yl butyrate; 2-methyl-1-phenylpropan-2-yl acetate; 2-methyl-1-phenylpropan-2-yl butyrate; 4-(tert-butyl)cyclohexyl acetate; undecan-2-one; 2-benzylideneoctanal; 3,7-dimethylnona-1,6-dien-3-yl acetate; 3,7-dimethylocta-2,6-dien-1-yl acetate; 3,7-

dimethylocta-2,6-dienal; non-6-enal; tridec-2-enenitrile; 1-((1,8a)-1,4,4,6-tetramethyl-
 2,3,3a,4,5,8-hexahydro-1-5,8a-methanoazulen-7-yl)ethanone; 1-(2,3,8,8-tetramethyl-
 1,2,3,4,5,6,7,8-octahydronaphthalen-2-yl)ethanone; 1-butoxy-1-oxopropan-2-yl butyrate;
 2-methyl -1-phenylpropan-2-ol; allyl 2-(isopentyloxy)acetate; allyl 3-
 5 cyclohexylpropanoate; methyl non-2-ynoate; undec-9-enal; 1,3,4,5,6,7-hexahydro-.beta.,
 1,1,5,5-pentamethyl-2,2,4a-ethanonaphthalene-8-ethanol; 1-(1-ethoxyethoxy)hex-3-ene;
 1-(2,6,6-trimethylcyclohex-3-en-1-yl)but-2-en-1-one; 1-(2,6,6-trimethylcyclohexa-1,3-
 dien-1-yl)but-2-en-1-one; 1,1-diethoxy-3,7-dimethylocta-2,6-diene; 2-ethyl-4-(2,2,3-
 trimethylcyclopent-3-en-1-yl)but-2-en-1-ol ; 3,7-dimethylnona-1,6-dien-3-ol ; 3,7-
 10 dimethylocta-2,6-dien-1-yl isobutyrate; 3-methyl -2-(pent-2-en-1-yl)cyclopent-2-enone; 4-
 (2,5,6,6-tetramethylcyclohex-2-en-1-yl)but-3-en-2-one; 4-(2,6,6-trimethylcyclohex-1-en-1-
 yl)but-3-en-2-one; 4-(2,6,6-trimethylcyclohex-2-en-1-yl)but-3-en-2-one; 1,3,3-
 trimethylbicyclo[2.2.1]heptan-2-yl acetate; (2,4)-1,7,7-trimethylbicyclo[2.2.1]heptan-2-yl
 acetate; (ethoxymethoxy)cyclododecane; 1-(2,6,6-trimethylcyclohexa-1,3-dien-1-yl)but-2-
 15 en-1-one; 3,4,5,6,6-pentamethylhept-3-en-2-one; 3,7,11-trimethyldodeca-1,6,10-trien-3-
 yl acetate; 3,7-dimethylocta-2,6-dien-1-ol; 3,7-dimethylocta-2,6-dienal ; 3-methyl-5-
 (2,2,3-trimethylcyclopent-3-en-1-yl)pent-4-en-2-ol ; 3-methyl cycl otetradec-5-enone; 4-
 ((3a,7a)-hexahydro-1-4,7-methanoinden-5(6)-ylidene)butanal; 4-(2,6,6-trimethylcyclohex-
 2-en-1-yl)but-3-en-2-one; 4,11,11-trimethyl-8-methylenebicyclo[7.2.0]undec-4-ene; 4-
 20 methyldec-3-en-5-ol; 5-methylheptan-3-one oxime; methyl non-2-enoate;
 oxacyclohexadec-12-en-2-one; 1-((2-(tert-butyl)cyclohexyl)oxy)butan-2-ol; 1-(3,3-
 dimethylcyclohex-1-en-1-yl)pent-4-en-1-one; 1,2,4)-1,3,3-trimethylbicyclo[2.2.1]heptan-2-
 ol ; 1,2,4)-2'-isopropyl-1,7,7-trimethylspiro[bicyclo[2.2.1]heptane-2,4'-[1,3]dioxane];
 1,2,5)-2-ethoxy-2,6,6-trimethyl-9-methylenebicyclo[3.3.1]nonane; 112) (4-(4-
 25 hydroxyphenyl)butan-2-one; 1-methyl-2-(5-methylhex-4-en-2-yl)cyclopropyl)-methanol; 1-
 methyl-4-(4-methylpent-3-en-1-yl)cyclohex-3-enecarbaldehyde; 1-methyl-4-propan-2-
 ylcyclohexa-1,4-diene; (1s,4s)-1,3,3-trimethyl-2-oxabicyclo[2.2.2]octane; 2-(4-
 methylcyclohex-3-en-1-yl)propan-2-yl acetate; 2)-ethyl 3-isopropylbicyclo[2.2.1]hept-5-
 ene-2-carboxylate; 2,2-dimethoxyethyl)benzene; 2,6)-3,7-dimethylnona-2,6-dienenitrile;
 30 2,6-dimethyloctan-2-ol; 2-isopropyl-5-methylcyclohexanol; 2-methyl-4-oxo-4-pyran-3-yl
 isobutyrate; 2-methyl -6-methyleneoct-7-en-2-yl acetate; 3-(4-isopropylphenyl)-2-
 methylpropanal ; 3,5,5-trimethylhexyl acetate; 3,5-dimethylhex-3-en-2-yl)oxy)-2-
 methylpropyl cyclopropanecarboxylate; 3,7-dimethyloct-6-en-1-yl acetate; 3,7-
 dimethyloct-6-en-1-yl formate; 3,7-dimethyloct-6-en-1-yl propionate; 3,7-dimethyloct-6-
 35 enenitrile; 3,7-dimethylocta-1,6-dien-3-yl acetate; (3a,4,7,7a)-ethyloctahydro-1-4,7-
 methanoindene-3a-carboxylate; (3a,6,7a)-3a,4,5,6,7,7a-hexahydro-1-4,7-methanoinden-
 6-yl acetate; (3a,6,7a)-3a,4,5,6,7,7a-hexahydro-1-4,7-methanoinden-6-yl isobutyrate;

(3a,6,7a)-3a,4,5,6,7, 7a-hexahydro-1-4, 7-methanoinden-6-yl propionate; (3-methyl-2-pentylcyclopent-2-enone; 4, 7-dimethyloct-6-en-3-one; 4-methylene-2-phenyltetrahydro-2-pyran; 6,6-dimethoxy-2,5,5-trimethylhex-2-ene; allyl heptanoate; cyclohexyl 2-hydroxybenzoate; ethyl 2,6,6-trimethylcyclohexa-1,3-diene-1-carboxylate; ethyl heptanoate; ethyl hexanoate; hexyl isobutyrate; pentyl 2-hydroxybenzoate; propanedioic acid 1-(1-(3,3-dimethylcyclohexyl)ethyl) 3-ethyl ester; 3-methyl -4-(2,6,6-trimethylcyclohex-2-en-1-yl)but-3-en-2-one; 1-(3,3-dimethylcyclohexyl)ethyl formate; 1-(3,5,5,6,8,8-hexamethyl-5,6,7,8-tetrahydronaphthalen-2-yl)ethanone; 1-(spiro [4.5]dec-6-en-7-yl)pent-4-en-1-one; 1,1,2,3,3-pentamethyl-2,3,6,7-tetrahydro-1-inden-4(5)-one; decanal; 2-methyl decanal ; undec-10-enal; undecanal; 2-methylundecanal; 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene; 1-methyl-4-(prop-1-en-2-yl)cyclohex-1-ene; 1-methyl-4-(propan-2-ylidene)cyclohex-1-ene; 2-(isopropyl 2-methyl butanoate; 2-(1-(3,3-dimethylcyclohexyl)ethoxy)-2-methylpropyl cyclopropanecarboxylate; 2-(2-(4-methylcyclohex-3-en-1-yl)propyl)cyclopentanone; 2-(2,4-dimethylcyclohexyl)pyridine; 2-(sec-butyl)cyclohexanone; 2-(tert-butyl)cyclohexyl acetate; 2,2,2-trichloro-1-phenylethyl acetate; 2,2,5-trimethyl-5-pentylcyclopentanone; 2,2-dimethyl-2-phenylethyl propanoate; 2,4,6-trimethyl-4-phenyl-1,3-dioxane; 2,4,6-trimethyl cyclohex-3-enecarbaldehyde; 2,6,10-trimethylundec-9-enal; 2,6-dimethylhept-5-enal; 2,6-dimethylheptan-2-ol; 2-cyclohexylidene-2-(o-tolyl)acetonitrile; 2-cyclohexylidene-2-phenylacetonitrile; 2-ethylmethyl-(m-tolyl)butanamide; 2-isopropyl-5-methylcyclohexanone; 2-methyl -4-methylene-6-phenyltetrahydro-2-pyran; 2-methyldecanenitrile; 2-pentylcyclopentanone; 3-(3-isopropylphenyl)butanal; 3-(4-(tert-butyl)phenyl)-2-methylpropanal ; 3-(4-ethylphenyl)-2,2-dimethylpropanal ; 3-(4-isobutyl-2-methylphenyl)propanal; 3-(4-isobutylphenyl)-2-methylpropanal; 3,7-dimethyloct-6-en-1-ol; 3,7-dimethyloct-6-enal; 3,7-dimethylocta-1,6-dien-3-ol ; 3,7-dimethyloctan-3-ol; 4-(4-methylpent-3-en-1-yl)cyclohex-3-enecarbaldehyde; 4-(tert-pentyl)cyclohexanone; 4,4 a, 5,9b -tetrahydroindeno[1,2-d][1,3]dioxine; 4-cyclohexyl-2-methylbutan-2-ol; 5-(sec-butyl)-2-(2,4-dimethylcyclohex-3-en-1-yl)-5-m ethyl -1,3-dioxane; 5-tert-butyl-2-methyl-5-propyl -2-furan; 6-(sec-butyl)quinoline; 6, 8-dimethylnonan-2-ol ; 6-ethyl-3-methyloct-6-en-1-ol; 8-(sec-butyl)-5,6,7, 8-tetrahydroquinoline; 8, 8-dimethyl -1,2,3,4,5,6,7, 8-octahydronaphthalene-2-carbaldehyde; allyl 2-(cyclohexyloxy)acetate; dec-4-enal; dec-9-en-1-ol; dodec-2-enal; dodecanal; dodecanenitrile; ethyl 2-ethyl-6,6-dimethylcyclohex-2-enecarboxylate; ethyl 2-methylpentanoate; ethyl octanoate; hex-3-en-1-yl methyl carbonate; hexyl 2-hydroxybenzoate; methyl 3-oxo-2-pentylcyclopentaneacetate; oxacyclohexadecan-2-one; and the like.

The at least one active component present in the compositions may be in an amount of from about 0.0001% to about 10 %, such as from about 0.5% to about 5% or about 2% by weight of the composition.

- 5 The “foodstuff matrix” in the present invention refers to any edible products that can be prepared as a liquid or semisolid matrix. Examples of foodstuff that may be used in the present invention include fruits, vegetables, cereals, meats, fish, dairy products, and mixtures thereof. The edible product has to be in the form of a liquid or semiliquid (such as a fruit or vegetable juice, puree, pulp, or mixture thereof).

10

The fluid or semifluid foodstuff matrix may be obtained by any method know in the art that permits to obtain a fluid or semifluid foodstuff matrix out of the foodstuff such as juices, concentrated juices, purees, pulp, etc. Also dry fruit or vegetable products may be used in the present invention. Those dry products (such as comminute fruit or vegetable products) may be rehydrated before being used in the present method.

15

One or more foodstuffs may be used in the process of the invention, such as a mixture of juices and pulps from different fruits and/or vegetables, or a mixture of fruits juices and dairy products, etc.

- 20 The foodstuff matrix (such as a fruit and/or vegetable juices, pulps, purees or mixtures thereof) and the soluble fibres (such as corn soluble fibres) of step (i) may be mixed by any known method as to obtain a homogenized mixture.

- 25 The mixture of (i) may be heated to obtain a better homogenization of the different components into the food matrix. Thus, in one embodiment of the process of the present invention, it is possible to implement a heat treatment before or after the mixing to improve the homogenization.

- 30 In one embodiment, the final product is substantially free of external or exogenous sugars. In a preferred embodiment no external sugars are added to the mix during the process of the invention.

- 35 “External or exogenous sugars” means any sugars present in the final product that do not came from the foodstuff matrix used in the method of the invention. “Sugars” in the present application include soluble carbohydrates like monosaccharides (such as glucose, fructose and galactose), disaccharides (such as sucrose, lactose, and maltose), oligosaccharides or biopolymers of any source.

“Substantially free of added sugars” means in the present invention that sugars that are present in the final product (such as flakes or crunchies) are mainly from the foodstuff used and that the final product comprises residual exogenous sugars such as less than
5 10%, less than 8%, less than 7%, less than 6%, less than 5%, less than 4%, less than 3%, less than 2%, less than 1%, less than 0.5%, less than 0.05%, less than 0.001% of exogenous sugars by wt of final product.

The fiber composition, the starch based carriers and the other active components (such
10 as pharmaceuticals, nutraceuticals, antioxidants, vitamins and dyes or colours) used in the present invention may be of natural origin and thus may contain some residual sugars.

In a preferred embodiment, the fiber composition, the starch based carrier or the active
15 components (such as pharmaceuticals, nutraceuticals, antioxidants, vitamins and dyes or colours) comprises less than 20% of sugars, such as less than 10% of sugars, such as less than 8% or less than 6%, less than 5%, less than 4%, less than 2%, less than 1% or less than 0.5% of sugars by wt.

In a preferred embodiment, the fiber composition comprises or consist of a purified fiber
20 composition that comprises at least 50%, at least 60%, at least 70%, at least 80%, at least 90% at least 99% of soluble fibers and that comprises less than 20% of sugars, such as less than 10% of sugars, such as less than 8% or less than 6%, less than 5%, less than 4%, less than 2%, less than 1% or less than 0.5% of sugars by wt.

In another embodiment, the fiber composition comprises or consist of a purified fiber
25 composition that comprises at least 50%, at least 60%, at least 70%, at least 80%, at least 90% at least 99% of insoluble fibers and that comprises less than 20% of sugars, such as less than 10% of sugars, such as less than 8% or less than 6%, less than 5%, less than 4%, less than 2%, less than 1% or less than 0.5% of sugars by wt.

In certain embodiments, the final product is substantially free of external or exogenous
30 proteins. In a preferred embodiment no external proteins are added to the mix during the process of the invention.

“Substantially free of added proteins” means in the present invention that proteins that
are present in the final product (such as flakes or crunchies) are mainly from the foodstuff used and that the final product comprises residual exogenous proteins such as
35 less than 10%, less than 8%, less than 7%, less than 6%, less than 5%, less than 4%, less than 3%, less than 2%, less than 1%, less than 0.5%, less than 0.05%, less than 0.001% of exogenous proteins by wt of final product.

In certain embodiments, the mixture obtained in step (i) comprises a about 10% of raspberry puree and 20% of raspberry concentrated juice and 55% of soluble corn fibre (>70% soluble fibers, <10% residual sugars) and 15% of rice flour. The mixture has about 40% of solids.

In certain embodiments, the mixture obtained in step (i) comprises 20% of orange juice, 10% of orange comminute and 50% soluble corn fibres (> 96% of soluble corn fibers) and 20% of rice flour. The mixture has about 40% of solids.

In certain embodiments, the mixture obtained in step (i) comprises 50% of banana puree, and 40% soluble corn fibres (> 96% of soluble corn fibers) and 20% of rice flour. The mixture has about 40% of solids.

When the fruits or vegetables have a low sugar contain (such as less than 25% or less than 20% of endogenous sugars, or less than 15% of endogenous sugars) then the exogenous soluble fibers (such as soluble cereal fibers like corn or wheat fibres and/or soluble citrus fibers) are in added to the mix (i) so as to reach at least 35% wt/wt of exogenous fibres, such as at least 40% wt/wt of exogenous fibres, such as at least 50% wt/wt of exogenous fibres.

The mixture obtained in step (i) will be dried using drum drying in the step (ii) or the present process of the invention.

Drum drying also known as Roll Drying is a continuous process that creates dry powders and flakes from a liquid food matrix.

In drum drying, the heated surface is the envelope of a rotating horizontal metal cylinder. The cylinder(s) are heated by steam condensing inside or by hot pressurized water, at a pressure in the range of 200 to 500 kPa bringing the temperature of the cylinder wall to 60°C–175°C, preferably between 120 and 155°C. The wet material is applied on the drum surface as a relatively thin layer by a variety of different methods (such as spay, manual hand ladle, automatic pumping, etc)

In one embodiment, the mix of (i) is poured onto or in between two rotating drums. The drums are heated internally with steam to increase the surface temperature. As the material is dropped onto the drums, it sticks and dries to the surface.

To obtain the desired specifications, the drum's rotation speed, premix composition steam pressure and the gap between the drums can be varied.

5 The dried foodstuff matrix is peeled from the main drum with the help of for example a blade or a knife system.

10 In one embodiment, the drum drying is vacuum drum drying. This is applied to materials highly sensitive to heat. In vacuum drum drying the drum and its accessories are enclosed in a vacuum chamber.

The mixture obtained in step (i) may need to have a viscosity adapted to the equipment used for the drum drying. In one embodiment, the viscosity of the mixture of (i) may be from 200cP to 50 000cP, preferably between 500 cP and 5000cP.

15 In some embodiments, the water content of the mixture obtained in step (i) may be from 30% to about 90%, such as 50% to 75%. In one embodiment, the mixture contains at least 60% water.

20 The temperature used during the drum drying may depend on the foodstuff matrix processed and the desired moisture content of the final product, for example, the temperature may be from 80°C to 175°C, such as 130°C to 145°C. In one preferred embodiment, the final products are flakes or crunchies and the temperature is about 140°C. The final product is then cooled down prior to milling at the desired sieve.

25 The release profile will differ based on the material characteristics. Some materials will dry into a powder, others as flakes or crunchies, and some will coil up as a cigar roll before full separation from the drum.

30 Once the material releases, an inline hammer mill will reduce the size down to the desired particle size. For example, the final product may be reduced to a powder with particles having a maximum size of from 0.3 mm to about 7 mm, such as from 1.2 mm to 5 mm or about 3 mm.

35 Materials that are Drum or Roll Dried will result in a flaky particle with variable bulk densities and a distinctive flavour note. The resulting particle size will be much larger (more than 1mm of thickness) than a spray dried particle, which will be fairly spherical in nature and have a consistent bulk density. The flaky particles are characterized by

having a thickness of more than 1mm, such as more than 1.2mm, more than 1.5mm, more than 1.8mm, such as more than 2 mm.

In one preferred embodiment, the flakes or crunchies obtained in step (ii) have a thickness from about 1mm to about 7mm, from about 1 mm to about 3mm, from about 1.5mm to about 3mm, from 1.2 mm to 5 mm, such as from 1mm to 2 mm, such as from 1.1 to 1.8mm.

In certain embodiments, the flakes or crunchies obtained in step (ii) have a thickness of about 1mm, 1.1mm, 1.2mm, 1.3mm, 1.4mm, 1.5mm, 1.6mm, 1.7mm, 1.8mm, 1.9mm, 2mm, 2.5 mm, 3mm, 3.5mm, 4mm, 4.5mm, 5mm, 5.5mm, 6mm, 6.5mm or about 7mm.

In one preferred embodiment, the material is dried in form of flakes or crunchies that are free of added sugars or are substantially free of added sugars and have a thickness of at least 1mm. In certain embodiments, the thickness of the flakes is from about 1mm to 7mm, such as from about 1.3mm to about 3mm.

The dried foodstuff matrix is in a solid form, such in form of powder, flakes, etc. By solid form, it is included that the compound may be provided as an amorphous solid, or as a crystalline or part-crystalline solid.

The final dry foodstuff matrix may be then transferred to a bag-house and conveyed through a screener, where it is finally packaged into bags or boxes.

The present invention is also related to the dried foodstuff matrix produced according to the process of the invention. For the avoidance of doubt, preferences, options, particular features and the like indicated herein for a given aspect, feature or parameter of the method of the invention should, unless the context indicates otherwise, be regarded as having been disclosed for the product of the invention.

Thus, the present invention is related to a dried foodstuff matrix comprising a food matrix and fibre (soluble and/or insoluble fibres) that is substantially free of added sugars.

In one embodiment, the dried foodstuff is in form of crunchy flakes. In a preferred embodiment, said crunchy flakes are free of added sugars or substantially free of added sugars.

The final product may have a water contain of less than 10 % of water, such as less than 5% of water.

Preferably, the final product comprises from about 1% to about 80% of soluble fibres (such as soluble cereal fibers, like corn or wheat soluble fibres, and/or soluble citrus fibers) by weight, and more preferably from about 10% to about 60%. The final product
5 may comprise at least 1%, at least 5%, at least 10%, at least 15%, at least 20%, at least 25%, at least 30%, at least 35%, at least 40%, at least 50%, at least 55%, at least 60%, at least 65%, at least 70%, or at least 75% of soluble fibres % by weight of the final composition.

10 Preferably, the final product comprises from about 0 to about 30% of insoluble fibres by weight (exogenous non soluble fibres), more preferably from about 1% to about 5%.
The final product may comprise at least 1 %, at least 5%, at least 10%, at least 15%, at least 20%, at least 25%, at least 30%, at least 35%, at least 40% of insoluble fibers % by weight of the final composition.

15 In one embodiment, the final product comprises from 0 to 40% of one or more starch based carriers, such as 10%, 15%, 20%, 25%, 30%, 35%, 40%, or more by weight of the final composition.

In certain embodiments, the final product has a sum of exogenous soluble fibers (such
20 as exogenous soluble corn and/or citrus fibres) and endogenous sugars from about 40 to 80, such as from 50 to 70, such as from 60 to 80 %w/w. For example, the ratio between the exogenous soluble fibers (such as exogenous soluble corn and/or citrus fibres) and the endogenous sugars is from about 1.5:5 to about 5:1.5, such as 3.5:2, or such as 5:1.5.

25

In certain embodiments, the final product comprises (or consisting essentially of/consist of) orange, soluble corn fibers and carbohydrates such as starches and has a % of about 40 to 50% wt/wt of exogenous fibers, from 2 to 5 % of endogenous fibers, from 20 to 25% wt/wt of endogenous sugars (provided by the orange product) and from 20 to 25%
30 wt/wt of starch based carrier.

In certain embodiments, the final product comprises (or consisting essentially of/consist of) orange, soluble corn fibers and carbohydrates such as starches and has a % of about 7 to 12% wt/wt of exogenous fibers, from 2 to 5 % of endogenous fibers, from 40 to 50%
35 wt/wt of endogenous sugars (provided by the orange product) and from 15 to 25% wt/wt of starch based carrier.

In certain embodiments, the final product comprises (or consisting essentially of/consist of) raspberry product, soluble corn fibers and carbohydrates such as starches and has a % of about 35 to 45% wt/wt of exogenous fibers, from 3 to 7 % of endogenous fibers, from 20 to 25% wt/wt of endogenous sugars (provided by the raspberry product) and from 10 to 15% wt/wt of starch based carrier.

In certain embodiments, the final product comprises (or consisting essentially of/consist of) banana product, soluble corn fibers and carbohydrates such as starches and has a % of about 35 to 40% wt/wt of exogenous fibers, from 3 to 10 % of endogenous fibers, from 35 to 40% wt/wt of endogenous sugars (provided by the banana product) and from 10 to 15% wt/wt of starch based carrier.

In certain embodiments, the final product comprises (or consisting essentially of/consist of) strawberry product, soluble corn fibers and carbohydrates such as starches and has a % of about 40 to 50% wt/wt of exogenous fibers, from 3 to 7 % of endogenous fibers, from 8 to 15% wt/wt of endogenous sugars (provided by the strawberry product) and from 10 to 25% wt/wt of starch based carrier.

According to the present invention, the dried foodstuff matrix of the invention (or composition of the invention) may be provided or may be added to a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a herbicide, a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation or may form a part of a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation.

The present invention also provides the use of the dried foodstuff matrix of the invention in a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation.

Where the dried foodstuff matrix of the invention are in the form of a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food

supplements), a herbicide, a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation or may form a part of a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation, the nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a herbicide, a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation may optionally further comprise a pharmaceutically/veterinary ingredients, such as excipients or carriers or (function) food acceptable ingredients and mixtures thereof as appropriate.

As used herein, references to pharmaceutically acceptable excipients may refer to pharmaceutically acceptable adjuvants, diluents and/or carriers as known to those skilled in the art.

Food acceptable ingredients include those known in the art (including those also referred to herein as pharmaceutically acceptable excipients) and that can be natural or non-natural, i.e. their structure may occur in nature or not. In certain instances, they can originate from natural compounds and be later modified (e.g. maltodextrin).

By “pharmaceutically/nutraceutically acceptable” we mean that the additional components of the composition are sterile and pyrogen free. Such components must also be “acceptable” in the sense of being compatible with the compositions and not deleterious to the recipients thereof. Thus, “pharmaceutically acceptable” includes any compound(s) used in forming a part of the formulation that is intended to act merely as an excipient, i.e. not intended to have biological activity itself. Thus, the pharmaceutically acceptable excipient is generally safe, non-toxic, and neither biologically nor otherwise undesirable.

Where the dried foodstuff matrix of the invention forms part of a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation, the dried foodstuff matrix of the invention may be present in the nutraceutical formulation, a dietary or food product

for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation in an amount from about 1 to about 99% by weight of the nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation, such as from about 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80% or 90% to about 90%, 80%, 70%, 60%, 50%, 40%, 30%, or 20% by weight of the nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation.

15

In particular, compositions of the invention and nutraceutical formulations, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation comprising the compositions may be administered orally. In such instances, pharmaceutical compositions according to the present invention may be specifically formulated for administration by the oral route.

Nutraceutical formulations, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation described herein, such as those intended for oral administration, may be prepared according to methods known to those skilled in the art, such as by bringing the components of the composition into admixture.

30

Unless otherwise stated herein, the weight percentages listed are based on the total weight of (dry) composition obtained.

For the avoidance of doubt, preferences, options, particular features and the like indicated for a given aspect, feature or parameter of the invention should, unless the context indicates otherwise, be regarded as having been disclosed in combination with

any and all other preferences, options particular features and the like as indicated for the same or other aspects, features and parameters of the invention.

The term “about” as used herein, e.g. when referring to a measurable value (such as an amount or weight of a particular component in the reaction mixture), refers to variations of $\pm 20\%$, $\pm 10\%$, $\pm 5\%$, $\pm 1\%$, $\pm 0.5\%$, or, particularly, $\pm 0.1\%$ relative to the specified amount. For example, a variation of $\pm 0.5\%$ with regards to the percentage of a component in the compositions, means a variation of 0.5% relative to the percentage given, i.e. $\pm 0.5\%$ of 10% would mean a variation from 9.5% to 10.5%.

For the avoidance of doubt, in this specification when we use the term “comprising” or “comprises” we mean that the extract or composition being described must contain the listed ingredient(s) but may optionally contain additional ingredients. When we use the term “consisting essentially of” or “consists essentially of” we mean that the extract or composition being described must contain the listed ingredient(s) and may also contain small (for example up to 5 % by weight, or up to 1 % or 0.1 % by weight) of other ingredients provided that any additional ingredients do not affect the essential properties of the extract or composition. When we use the term “consisting of” or “consists of” we mean that the extract or composition being described must contain the listed ingredient(s) only.

It is also intended that the terms “comprise” or “comprises” or “comprising” may be replaced with “consist” or “consisting” or “consisting essentially of” throughout the application as required.

Brief Description of Figures

Figure 1: Drum drying principle.

Figure 2: Pictures of 4 examples of crunchies: A Banana 350, B Orange 365, C Raspberry 330, and D Strawberry 335.

Examples

The present invention will be further described by reference to the following, non-limiting examples.

Material and methods:**Laboratory single cylinder feed roll drum dryer 0.45*0.45m from Simon Dryers LTD**

This single cylinder is equipped with 3 feeding cylinders and a lift-off blade. The main cylinder turns horizontally. The feeding product is poured on the top of the main cylinder and the 3 cylinders (also called applicators) can be adjusted in order to adapt the space between the main drum and the applicators. This space will define the thickness of the film to be dried as the product has to pass through the space in between the drum and the applicators before drying. The main cylinder is heated by injection of dry steam inside the drum so water evaporates from the product on its surface. A blade lift-off the product from the main cylinder at the end of the drum rotation. This product is then cooled down prior to milling at the desired sieve.

Example 1: Raspberry 330

10% of raspberry puree and 20% of raspberry concentrated juice are carefully blended at room temperature with 55% of promitor 70 (>70% corn soluble fibers, <10% residual sugars) and 15% of rice flour as carriers. The premix is diluted to about 40% solids with water. This premix is placed on the drum under rotation (about 2rpm) and steam heated (3 bars steam pressure). The resulting product is a raspberry crunchy, with typical raspberry color and flavor and the same texture than sugar based product. The thickness of the product was of about 1.2mm.

Example 2: Orange 330

20% of orange juice and 10% of orange comminuted are carefully blended at room temperature with 50% of nutriose (> 96% of soluble corn fibers) and 20% of rice flour as carriers. The premix is diluted to about 40% solids with water. This premix is placed on the drum under rotation (about 1.5rpm) and steam heated (3 bars steam pressure). The resulting product is an orange crunchy, with typical orange flavor and same texture than sugar based product. The thickness of the product was of about 1.2mm.

Example 3: Banana 350

50% of banana puree is carefully blended at room temperature with 40% of promitor 70 and 10% of rice flour as carriers. The premix is diluted to about 40% solids with water. This premix is placed on the drum under rotation (about 1 rpm) and steam heated (4 bars steam pressure). The resulting product is a banana crunchy, with typical banana color and flavor and the same texture than sugar based product. The thickness of the product was of about 1.2mm.

Example 4. Orange 365

65% of orange juice are carefully blended at room temperature with 10% of promitor 85 (>85% corn soluble fibers, < 2% residual sugars) and 25% of rice flour as carriers. The premix is diluted to about 40% solids with water. This premix is placed on the drum under rotation (about 1.5 rpm) and steam heated (3 bars steam pressure). The resulting product is an orange crunchy, with typical orange flavor and same texture than sugar based product. The thickness of the product was of about 1.2mm.

Example 5: Strawberry 335

20% of strawberry pulp is carefully blended at room temperature with 65% of promitor 70 and 15% of native corn starches as carriers. No water has been added to the blend. This premix is poured on the drum under rotation (about 7 rpm) and steam heated (4 bars steam pressure). The resulting product is a strawberry crunchy, with typical strawberry flavor and same texture than sugar based product. The thickness of the product was of about 1.2mm.

Samples	Exogenous fibers (%)	Endogeneous fibers (%)	Endogeneous sugars (%)	Exogenous carbohydrates such as starch (% fibers excluded)
Orange 330	40 to 50	2 to 5	20 to 25	20 to 25
Orange 365	7 to 12	2 to 5	40 to 50	15 to 25
Raspberry 330	35 to 45	3 to 7	20 to 25	10 to 15
Banana 350	35 to 40	7 to 10	35 to 40	10 to 15
Strawberry 335	40 to 50	3 to 7	8 to 15	15 to 25

Table 1. Concentration of exogenous fibers, endogenous fibers, endogenous sugars and exogenous carbohydrates in the 5 final dry compositions exemplified.

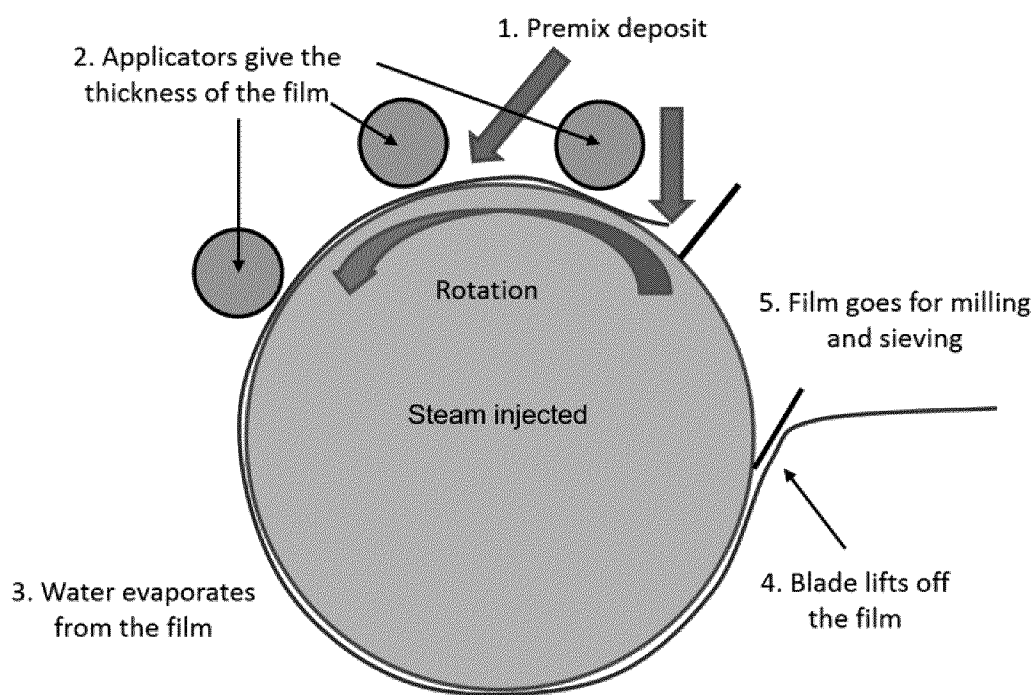
Claims

1. A process for the preparation of a dry foodstuff composition wherein the process
5 comprises the steps of:
 - (i) mixing a foodstuff matrix from fruits and/or vegetables with a fibre composition comprising soluble cereal fibers (such as corn or wheat soluble fibres) and/or soluble citrus fibers to form a mix; and
 - (ii) drying the product of (i) with a roll drum dryer to provide a dry
10 composition, wherein the dry composition obtained in step (ii) is in form of flakes or crunchies that are substantially free of added sugars and have a thickness of at least 1mm.
2. A process according to claim 1 wherein the soluble fibers are selected from
15 dextrin or maltodextrin.
3. A process according to claim 1 or 2, wherein the concentration of water in the mix of step (i) is of 30% to about 90%, such as 50% to 75% such as at least 60% wt/wt.
20
4. A process according to any of the claims 1 to 3, wherein the fibre composition further comprises one or more soluble fibers selected from β -glucans, psyllium, pectins, guar gum, arabinoxylans, inulin, polydextrose, carrageenan and mixtures thereof.
25
5. A process according to any of the preceding claim, wherein the fibre composition further comprises one or more insoluble fibers.
6. A process according to any of the preceding claims, wherein the dry composition
30 obtained in step (ii) comprises at least 1 %, at least 5%, at least 10%, at least 15%, at least 20%, at least 25%, at least 30%, at least 35%, at least 40%, at least 50%, at least 55%, at least 60%, at least 65%, at least 70%, at least 75%, at least 80%, at least 85%, at least 90%, at least 95% of soluble corn and/or soluble citrus fibre % by weight of the final composition.
- 35 7. A process according to claim 4 or 5, wherein the dry composition obtained in step (ii) comprises at least 1%, at least 5%, at least 10%, at least 15%, at least 20%,

at least 25%, at least 30%, at least 35%, at least 40% of insoluble fibers % by weight of the final composition.

8. A process according to any of the preceding claims, wherein additionally one or more starch based carriers are added to the mixture of (i).
9. A process according to any of the preceding claims, wherein the thickness of the dry composition obtained in step (ii) is of at least 1.2mm, at least 1.3mm, 1.4mm, 1.5mm, 2mm, 2.5 mm, 3mm, 3.5mm, 4mm, 4.5mm, 5mm, 5.5mm, 6mm, 6.5mm or of at least 7mm .
10. A process according to any of the preceding claims, wherein the viscosity of the mix of (i) is between 200cP and 50 000cP, preferably between 500 cP and 5000cP.
11. A dry composition obtained using the process of any of claims 1 to 10.
12. A dry composition according to claim 11, wherein the dry composition comprises less than 5%, less than 4%, less than 3%, less than 2%, less than 1%, less than 0.5%, less than 0.05%, less than 0.001% of exogenous sugars by weigh of final product.
13. A dry composition according to claim 11 or 12, wherein the dry composition comprises from 1% to about 90% of exogenous soluble fibers by weight, such as from about 5%, 10%, 20%, 30% or 40% to about 50%, 60%, 70%, 80% or about 90% of exogenous soluble fibres by weight of final product, such as from about 30% to about 60% of exogenous soluble fibres by weigh of final product.
14. The use of a dried composition according to any one of claims 11 to 13 in the preparation of a nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring, a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation.
15. A nutraceutical formulation, a dietary or food product for humans or animals (such as functional food formulations, i.e. food, drink, feed or pet food or a food, drink, feed or pet food supplements), a nutritional supplement, a fragrance or flavouring,

a pharmaceutical or veterinary formulation, an oenological or cosmetic formulation consisting of, consisting essentially of or comprising a dried composition as defined in any one of claims 11 to 13.

**Figure 1**

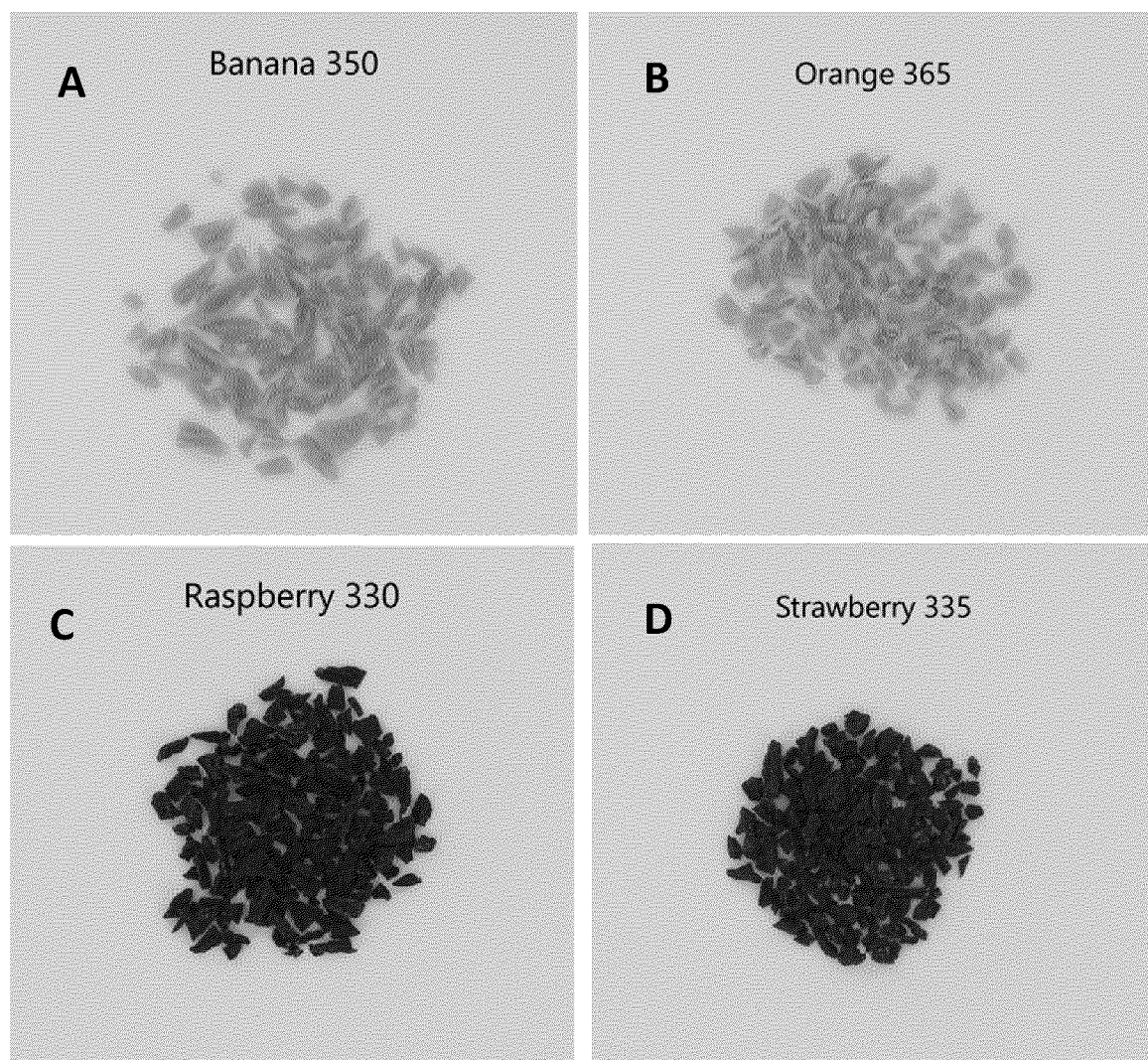


Figure 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2022/053876

A. CLASSIFICATION OF SUBJECT MATTER INV. A23L33/105 A23L3/48 A23L19/00 A23L33/21 A23B7/02 A23K40/20 A23L7/135 ADD. According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A23L A23B C11C A23K Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	Sonthiermpoon Wilai ET AL: "Effect of Maltodextrin on Glass Transition Temperature and Water Activity of Production Banana Flake", Kasetsart J., 1 January 2006 (2006-01-01), pages 708-715, XP055919345, Retrieved from the Internet: URL:https://www.thaiscience.info/journals/Article/TKJN/10471298.pdf [retrieved on 2022-05-10]	1-15
Y	abstract page 709, right-hand column, paragraph 3 -----	6
X	CN 106 360 463 A (HUNAN HUACHENG BIOTECH INC) 1 February 2017 (2017-02-01)	1-15
Y	claims 1-10; example 1 ----- -----	6
-/-		
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search	Date of mailing of the international search report	
10 May 2022	23/05/2022	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Stiegler, Petra	

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2022/053876

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 2018 0031101 A (KIM MYUNG HEE [KR]; KWON OH YUN [KR]) 28 March 2018 (2018-03-28)	1-15
Y	paragraph [0077] - paragraph [0082]; example 2	6

X	US 2004/013789 A1 (KLUKOWSKI HORST [DE]) 22 January 2004 (2004-01-22)	1-15
Y	paragraph [0020] - paragraph [0022]; example 1	6

X	JP 3 593196 B2 (TAIYO KAGAKU KK) 24 November 2004 (2004-11-24)	1-15
Y	example 2	6

X	US 3 940 505 A (NAPPEN BERNARD H ET AL) 24 February 1976 (1976-02-24)	1-15
Y	example 2	6

X	FR 2 796 814 A1 (DIANA INGREDIENTS [FR]) 2 February 2001 (2001-02-02)	1-15
Y	examples 1, 3	6

Y	Anonymous ET AL: "Soluble Corn Fibre*: Health Benefits and Product Applications Innovating to Meet Nutrition, Health, and Wellness Needs Every Day *PROMITOR Soluble Corn Fibre PROMITOR Soluble Gluco Fibre in Europe", / 1 January 2014 (2014-01-01), XP055336487, Retrieved from the Internet: URL: http://www.foodnutritionknowledge.info/sites/foodnutritionknowledge/files/media/pdf/SCF 2014 Final.pdf [retrieved on 2017-01-18] page 7, left-hand column, paragraph 1	6

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Information on patent family members

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