

FRUIT EXTRACTS FROM ESSENCE

TECHNICAL FIELD

5 The present disclosure relates to the field of fruit extracts and methods of making. More particularly, the present disclosure relates to a variety of fruit extract compositions and liquid consumables comprising extracts made from the fruit essence.

BACKGROUND

10 Water-based fruit essence are side-products of juice or puree concentration. During processing, large quantities of volatile fractions containing flavor ingredients are produced which, when concentrated, result in solutions enriched in flavor and aroma components providing about a 100-fold to 150-fold essence. That is, a material in which the flavor and aroma components are from about 100 times to about 150 times more concentrated than in fresh juice.

15 This essence may then be added back to the concentrated liquid product to restore the aroma and flavor of fresh juice. For example, during the production of orange juice concentrate, a water phase containing volatile flavor ingredients referred to as a 150-fold essence may be obtained which, after concentration, can be added to the orange juice concentrate to reconstitute the flavor.

 However, after concentrating, the fruit essence often loses the characterizing aroma of the
20 fruit it originated from. In other words, the ratio of the concentration of volatile ingredients in a 150-fold essence may significantly differ from the same ratio in the original fruit. This in turn has a negative impact on the flavor profile of the 150-fold essence, often described as lack of recognizability or presence of undesired off-notes.

 Accordingly, there remains a need to provide a fruit extract that lacks off-notes and more
25 closely resembles the aroma and authenticity of the natural fruit.

SUMMARY

 In one illustrative embodiment, a peach fruit extract comprises a water-miscible organic solvent; and a peach fraction. The final composition of the peach fruit extract includes at least
30 100 ppm of cis-3-hexenol; from about 100 ppm to about 500 ppm of benzaldehyde; at least 80 ppm of gamma-decalactone; and less than 1 ppm of diacetyl.

 In another illustrative embodiment, a strawberry fruit extract comprises a water-miscible organic solvent; and a strawberry fraction. The final composition of the strawberry fruit extract includes at least 40 ppm of gamma decalactone; and at least 200 ppm of one or more butyrate

components selected from the group consisting of ethyl butyrate, methyl butyrate, ethyl methyl butyrate and combinations thereof.

In yet another illustrative embodiment, a raspberry fruit extract comprises a water-miscible organic solvent; and a raspberry fraction. The final composition of the raspberry fruit
5 extract includes at least 50 ppm of cis-3-hexenol; at least 5 ppm of linalool; at least 7.5 ppm of alpha-ionone; and at least 10 ppm of beta-ionone.

These and other features, aspects and advantages of specific embodiments will become evident to those skilled in the art from a reading of the present disclosure.

10

DETAILED DESCRIPTION

The following text sets forth a broad description of numerous different embodiments of the present disclosure. The description is to be construed as exemplary only and does not describe every possible embodiment since describing every possible embodiment would be impractical, if not impossible. It will be understood that any feature, characteristic, component,
15 composition, ingredient, product, step or methodology described herein can be deleted, combined with or substituted for, in whole or part, any other feature, characteristic, component, composition, ingredient, product, step or methodology described herein. Numerous alternative embodiments could be implemented, using either current technology or technology developed after the filing date of this patent, which would still fall within the scope of the claims. All
20 publications and patents cited herein are incorporated herein by reference.

While flavoring substances may be directly obtained from processing whole foods by physical, biological, and chemical methods, doing so is not always cost effective and may even be prohibited by local governments when the primary use of a whole food material is for human nutrition. Therefore, the isolation of flavoring materials from side-streams is important to the
25 flavor industry for improving sustainability, reducing waste, and increasing responsible use of raw materials. Historically, side-streams have been considered a disposal problem. However, there are several technologies available to convert side-streams into value-added products, often called upcycling, and these are well known to those familiar in the art. Without wishing to be limited, such technologies include, for example, vacuum distillation, spinning cone column,
30 solvent extraction, semi-permeable membrane filtrations, and others that physically separate chemical compounds either by boiling point, volatility, chemical partitioning, mass diffusion, density, or by size exclusion principles. Such physical processes are accepted as natural processes for flavor ingredients in many countries across the world. The components of side-streams may additionally be chemically transformed into higher value compositions using natural

biological processes such as enzymatic transformations and fermentation. Surprisingly, it has been found in the context of the present disclosure that using chromatography to create fruit extracts from 150-fold essences makes it possible to provide new and fully recognizable fruit extracts for use in from the named source (FTNS), from the named fruit (FTNF) or from the
5 named juice (FTNJ) flavors. In particular, the combination of separation and concentration by chromatography yields the desired fruit extract(s) in terms of odor impression, taste impression and overall recognizability.

As previously mentioned, water-based fruit essences are side-streams of juice or puree concentration. When concentrated, the aroma of fruit essences often becomes unbalanced
10 compared to the original fruit juice or puree and most likely includes off-notes and problematic volatiles. In accordance with one embodiment, the resulting 150-fold essence contains fruit fraction, off-notes and water. This mixture is pumped through a vertical column as a separation technique. The column is packed with an adsorption material, for example, XAD4 resin. Applicants have identified the key exemplary volatile fractions that are to be trapped by the resin.
15 As a result of this separation step, a recognizable fruit fraction is trapped in the resin while the waste stream (water and off-notes) makes its way through the column.

In one embodiment, the key exemplary volatile fractions that are trapped in the column include the following components, peach fraction: cis-3-hexenol, benzaldehyde, and gamma-decalactone; strawberry fraction: gamma decalactone, and one or more butyrate components
20 selected from the group consisting of ethyl butyrate, methyl butyrate, ethyl methyl butyrate and combinations thereof; raspberry fraction: cis-3-hexenol, linalool, alpha-ionone, beta-ionone.

In accordance with the present disclosure, once the separation step is completed, the concentration step is performed in order to obtain the liquid desorbate, i.e. fruit extract. For the concentration step, an extraction solvent is used. In one embodiment, the extraction solvent may
25 be ethanol. In another embodiment, the extraction solvent may be a water-miscible organic solvent selected from the group consisting of water-miscible alcohols, such as glycerol, ethylene glycol, propylene glycol, or derivatives thereof, such as triacetine; or miglyol. Once the extraction solvent is passed through the column, the key exemplary volatile fraction is removed resulting in a fruit extract including the recognizable fraction and a solvent.

30 Thus, the desired components, in particular flavor compounds, are produced and ready for use in a wide variety of consumables or applications and is not restricted to any particular physical mode or product form. According to the present disclosure, the term “consumable” refers to products for consumption by a subject, typically via the oral cavity (although consumption may occur via non-oral means such as inhalation), for at least one of the purposes

of enjoyment, nourishment, or health and wellness benefits. Consumables may be present in any form including, but not limited to, liquids, solids, semi-solids, tablets, capsules, lozenges, strips, powders, gels, gums, pastes, slurries, syrups, aerosols and sprays. The term also refers to, for example, dietary and nutritional supplements. Consumables include compositions that are placed
5 within the oral cavity for a period of time before being discarded but not swallowed. It may be placed in the mouth before being consumed, or it may be held in the mouth for a period of time before being discarded.

Broadly, consumables include, but are not limited to, foodstuffs of all kinds, confectionery products, baked products, sweet products, savoury products, fermented products,
10 dairy products, beverages, oral care products, nutraceuticals and pharmaceuticals.

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

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

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

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

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

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

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

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

When added to a consumable, the extract from fruit essence is used in an amount effective to provide sufficient characteristic aroma and improve the authenticity without exhibiting any off-taste. According to certain embodiments, the amount of the extract in the consumable may be in a concentration of from about 300 ppm to about 1200 ppm, and in another embodiment from about 200 ppm to about 600 ppm.

In other embodiments, the desired components may be used in fragrance compositions, for example, suitable for use in all manner of perfumed products or articles for use in home care, personal care and fabric care.

According to the present disclosure, the extract may include components of a fraction in
5 varying amounts, for example, the peach fraction may include cis-3-hexenol in a concentration of
from about 100 ppm to about 250 ppm, in another embodiment of at least about 100 ppm, in
another embodiment of at least 150 ppm, in another embodiment of at least 200 ppm, in another
embodiment of at least 225 ppm, and in another embodiment of about 250 ppm; the peach
fraction may include benzaldehyde in a concentration of from about 100 ppm to about 500 ppm,
10 in another embodiment of from about 150 ppm to about 450 ppm, in another embodiment of from
about 200 ppm to about 400 ppm, in another embodiment of from about 250 ppm to about 350
ppm; the peach fraction may include gamma-decalactone in a concentration of from about 80
ppm to about 250 ppm, in another embodiment of at least about 80 ppm, in another embodiment
of at least 100 ppm, in another embodiment of at least 150 ppm, in another embodiment of at
15 least 200 ppm, and in another embodiment of at least 250 ppm; the peach fraction may include
diacetyl in a concentration of from about 0 ppm to about 1 ppm, in another embodiment of less
than 1 ppm, in another embodiment of less than 0.5 ppm, in another embodiment of less than
0.25 ppm, and in another embodiment of less than 0.1 ppm.

According to the present disclosure, the extract may include components of a fraction in
20 varying amounts, for example, the strawberry fraction may include gamma decalactone in a
concentration of from about 40 ppm to about 300 ppm, in another embodiment of at least about
40 ppm, in another embodiment of at least about 100 ppm, in another embodiment of at least 150
ppm, in another embodiment of at least 200 ppm, in another embodiment of at least 250 ppm, and
in another embodiment about 300 ppm; the strawberry fraction may include one or more butyrate
25 components selected from the group consisting of ethyl butyrate, methyl butyrate, ethyl methyl
butyrate and combinations thereof in a concentration of from about 200 ppm to about 400 ppm,
in another embodiment of at least about 250 ppm, in another embodiment of at least 300 ppm,
and in another embodiment about 400 ppm.

According to the present disclosure, the extract may include components of a fraction in
30 varying amounts, for example, the raspberry fraction may include cis-3-hexenol in a
concentration of from about 50 ppm to about 100 ppm, in another embodiment of at least about
50 ppm, in another embodiment of at least 60 ppm, in another embodiment of at least 70 ppm, in
another embodiment of at least 80 ppm, and in another embodiment of at least 100 ppm; the
raspberry fraction may include linalool in a concentration of from about 5 ppm to about 10 ppm,

in another embodiment of at least about 5 ppm, in another embodiment of at least 7 ppm, in another embodiment of at least 8 ppm, in another embodiment of at least 9 ppm, and in another embodiment of at least 10 ppm; the raspberry fraction may include alpha-ionone in a concentration of from about 7.5 ppm to about 20 ppm, in another embodiment of at least about 7.5 ppm, in another embodiment of at least 10 ppm, in another embodiment of at least 15 ppm, and in another embodiment of at least 20 ppm; the raspberry fraction may include of beta-ionone in a concentration of from about 10 ppm to about 20 ppm, in another embodiment of at least about 10 ppm, in another embodiment of at least 12 ppm, in another embodiment of at least 15 ppm, in another embodiment of at least 18 ppm, and in another embodiment of at least 20 ppm.

The disclosure is further described with reference to the following non-limiting examples.

EXAMPLES

The following examples are given solely for the purpose of illustration and are not to be construed as limitations of the present invention, as many variations of the invention are possible without departing from the spirit and scope of the present disclosure.

A pre-determined quantity of a fruit essence (peach) was loaded on a previously prepared column packed with XAD-4 resin (Bed height 10.4 cm, Bed volume 20.9 ml). After the loading phase was complete, the column was rinsed with water, followed by the unloading stage with ethanol (96 vol%). During the unloading stage, a series of 2.5 mL fractions were collected and evaluated for their sensory profiles. Fraction samples #18 to #41 were combined to form a peach extract (Example 3).

As seen in Table 1 below, Example 1 is the concentration in peach essence (water-based essence); Example 2 is the concentrations in a commercially available peach extract; and Example 3 is a peach extract according to the present disclosure. More specifically, Example 3 is an ethanolic extract made from Example 1.

Table 1 – Peach Extract

	Example 1	Example 2	Example 3
Ingredients (ppm)			
Cis-3-Hexenol	13.9	113	131
Benzaldehyde	28.6	61	452
Gamma-Decalactone	9.3	8	186
Diacetyl	213.6	318	Not detected

A pre-determined quantity of a fruit essence (strawberry) was loaded on a previously prepared column packed with XAD-4 resin (Bed height 10.4 cm, Bed volume 20.9 ml). After the loading phase was complete, the column was rinsed with water, followed by the unloading stage with ethanol (96 vol%). During the unloading stage, a series of 2.5 mL fractions were collected and evaluated for their sensory profiles. Fraction Samples #11 to #46 were combined to form a strawberry extract (Example 5).

As seen in Table 2 below, Example 4 is the concentration in strawberry essence (water-based essence); and Example 5 is a strawberry extract according to the present disclosure. More specifically, Example 5 is an ethanolic extract made from Example 4.

Table 2 – Strawberry Extract

	Example 4	Example 5
Ingredients (ppm)		
Methyl Butyrate	54	298
Ethyl Butyrate	22	35
Gamma-Decalactone	89	276

A pre-determined quantity of a fruit essence (raspberry) was loaded on a previously prepared column packed with XAD-4 resin (Bed height 21.5 cm, Bed volume 206.9 ml). After the loading phase was complete, the column was rinsed with water, followed by the unloading stage with ethanol (96 vol%). During the unloading stage, a series of 10 mL fractions were collected and evaluated for their sensory profiles. Fraction samples #10 to #77 were combined to form a raspberry extract (Example 7).

As seen in Table 3 below, Example 6 is the concentration in raspberry essence (water-based essence); and Example 7 is a raspberry extract according to the present disclosure. More specifically, Example 7 is an ethanolic extract made from Example 6.

Table 3 – Raspberry Extract

	Example 6	Example 7
Ingredients (ppm)		
Cis-3-Hexenol	17.4	59.3
Linalool	6.1	6.5
Alpha-Ionone	1.4	8.1

Beta-Ionone	1.1	12.3
-------------	-----	------

When expressed as “ppm”, the concentration is parts per million by weight based on the total weight of the consumable or additive, as the situation dictates. It should be understood that when a range of values is described in the present disclosure, it is intended that any and every value within the range, including the end points, is to be considered as having been disclosed.

5 For example, a range of from 100 ppm to 250 ppm of cis-3-hexenol is to be read as indicating each and every possible number along the continuum between 100 and 250. It is to be understood that the inventors appreciate and understand that any and all values within the range are to be considered to have been specified, and that the inventors have possession of the entire range and all the values within the range.

10 In the present disclosure, the term “about” used in connection with a value is inclusive of the stated value and has the meaning dictated by the context. For example, it includes at least the degree of error associated with the measurement of the particular value. One of ordinary skill in the art would understand the term “about” is used herein to mean that an amount of “about” of a recited value produces the desired degree of effectiveness in the compositions and/or methods of

15 the present disclosure. One of ordinary skill in the art would further understand that the metes and bounds of “about” with respect to the value of a percentage, amount or quantity of any component in an embodiment can be determined by varying the value, determining the effectiveness of the compositions or methods for each value, and determining the range of values that produce compositions or methods with the desired degree of effectiveness in accordance

20 with the present disclosure.

While particular embodiments of the present invention have been illustrated and described, it would be obvious to those skilled in the art that various other changes and modifications can be made without departing from the spirit and scope of the invention. It is therefore intended to cover in the appended claims all such changes and modifications that are

25 within the scope of this invention.

What is claimed is:

1. A peach fruit extract comprising:
a water-miscible organic solvent; and
5 a peach fraction;
wherein the final composition of the extract includes at least 100 ppm of cis-3-hexenol;
from 100 ppm to 500 ppm of benzaldehyde; at least 80 ppm of gamma-decalactone; and
less than 1 ppm of diacetyl.
- 10 2. A peach fruit extract according to claim 1, wherein the organic solvent is ethanol.
3. A consumable comprising the extract of claim 1.
4. A consumable according to claim 3, wherein the amount of the extract in the consumable
15 is in a concentration of from 300 ppm to 1200 ppm.
5. A consumable according to claim 4, wherein the consumable is a beverage.
6. A strawberry fruit extract comprising:
20 a water-miscible organic solvent; and
a strawberry fraction;
wherein the final composition of the extract includes at least 40 ppm of gamma
decalactone; and at least 200 ppm of one or more butyrate components selected from the
group consisting of ethyl butyrate, methyl butyrate, ethyl methyl butyrate and
25 combinations thereof.
7. A strawberry fruit extract according to claim 6, wherein the organic solvent is ethanol.
8. A consumable comprising the extract of claim 6.
30
9. The consumable according to claim 8, wherein the amount of the extract in the
consumable is in a concentration of from 300 ppm to 1200 ppm.
10. A consumable according to claim 9, wherein the consumable is a beverage.

11. A raspberry fruit extract comprising:
a water-miscible organic solvent; and
a raspberry fraction;
5 wherein the final composition of the extract includes at least 50 ppm of cis-3-hexenol; at least 5 ppm of linalool; at least 7.5 ppm of alpha-ionone; and at least 10 ppm of beta-ionone.
12. A raspberry fruit extract according to claim 11, wherein the organic solvent is ethanol.
10
13. A consumable comprising the extract of claim 11.
14. The consumable according to claim 13, wherein the amount of the extract in the consumable is in a concentration of from 300 ppm to 1200 ppm.
15
15. A consumable according to claim 14, wherein the consumable is a beverage.