component comprises an omega-3 polyunsaturated fatty acid selected from the group consisting of eicosapentaenoic acid, docosahexaenoic acid, alpha-linolenic acid, and combinations thereof. In one exemplary embodiment, the oxidizable component comprises an omega-6 polyunsaturated fatty acid selected from the group consisting of gamma-linolenic acid, linoleic acid, dihomo-gamma-linolenic acid, arachidonic acid, and combinations thereof.

[0013a] In one exemplary embodiment, a nutritional composition with reduced off-flavors and aromas comprising:

(a) a milk protein;

(b) a carbohydrate;

(c) a fat; and

(d) a water-soluble plant extract comprising rosmarinic acid and having a total phenolic content;

wherein the composition the fat includes an oxidizable component comprising marine oil;

wherein a ratio of the total phenolic content to the rosmarinic acid ranges from about 1.1:1 to about 3.5:1; and

wherein the nutritional composition has reduced off-flavors and aromas as compared with a nutritional composition without a water-soluble plant extract is provided.

[0013b] In one exemplary embodiment, a method of reducing off-flavors and aromas in a liquid nutritional composition, the method comprising:

(a) preparing an aqueous protein slurry comprising at least one milk protein; and

(b) adding a water-soluble plant extract to the aqueous protein slurry, wherein the water-soluble plant extract is extracted with a solvent system having an octanol-water partition coefficient of no more than 0.5;

(c) preparing an aqueous carbohydrate slurry comprising at least one carbohydrate;

(d) preparing an oil blend comprising a fat having an oxidizable component comprising marine oil;

(e) mixing together the aqueous protein slurry, the aqueous carbohydrate slurry, and the oil blend to form the liquid nutritional composition; and

wherein the nutritional composition has reduced off-flavors and aromas as compared with a nutritional composition without a water-soluble plant extract is provided.

DETAILED DESCRIPTION

[0014] While the general inventive concepts are susceptible of embodiment in many different forms, described herein in detail are specific embodiments thereof with the understanding that the present disclosure is to be considered as an exemplification of the principles of the general inventive concepts. Accordingly, the general inventive concepts are not intended to be limited to the specific embodiments illustrated and described herein.

[0015] The terminology as set forth herein is for description of the embodiments only and should not be construed as limiting the disclosure as a whole. Unless otherwise specified, "a," "an," "the," and "at least one" are used interchangeably. Furthermore, as used in the description and the appended claims, the singular forms "a," "an," and "the" are inclusive of their plural forms, unless the context clearly indicates otherwise.

[0016] Any combination of method or process steps as used herein may be performed in any order, unless otherwise specified or clearly implied to the contrary by the context in which the referenced combination is made.

[0017] The term "nutritional composition" as used herein, unless otherwise specified, refers to nutritional products in various forms including, but not limited to, liquids, solids, semi-solids, semi-liquids, and any other nutritional food product known in the art. A nutritional composition in powder form may often be reconstituted to form a nutritional composition in liquid form.

[0018] The term "oxidizable component" as used herein, unless otherwise specified, refers to a component of at least one of a protein, a carbohydrate, and a fat that is susceptible to oxidation. In one exemplary embodiment, the fat includes an oxidizable component and the oxidizable component comprises an unsaturated fatty acid.

WHAT IS CLAIMED IS:

1. A nutritional composition with reduced off-flavors and aromas comprising:

(a) a milk protein;

(b) a carbohydrate;

(c) a fat; and

(d) a water-soluble plant extract comprising rosmarinic acid and having a total phenolic content;

wherein the composition the fat includes an oxidizable component comprising marine oil;

wherein a ratio of the total phenolic content to the rosmarinic acid ranges from about 1.1:1 to about 3.5:1; and

wherein the nutritional composition has reduced off-flavors and aromas as compared with a nutritional composition without a water-soluble plant extract.

2. The nutritional composition of claim 1, wherein the rosmarinic acid comprises from about 0.0004 wt% to about 0.07 wt% of the nutritional composition.

3. The nutritional composition of any one of claims 1-2, wherein the total phenolic content is from about 1 mg to about 600 mg of gallic acid equivalents per serving of the nutritional composition, wherein a serving is 237 mL.

4. The nutritional composition of claim 1, wherein the water-soluble plant extract comprises a water-soluble rosemary extract.

5. The nutritional composition of claim 1, wherein the water-soluble plant extract comprises a water-soluble spearmint extract.

6. The nutritional composition of any one of claims 1-5, wherein the protein is about 1 wt% to about 30 wt% of the nutritional composition, the carbohydrate is about 5 wt% to about 25 wt% of the nutritional composition, and the fat is about 0.5 wt% to about 20 wt% of the nutritional composition.

7. The nutritional composition of any preceding claim, wherein the composition further comprises whey protein concentrates, whey protein isolates, whey protein hydrolysates, acid caseins, sodium caseinates, calcium caseinates, potassium caseinates, casein hydrolysates, milk protein concentrates, milk protein isolates, milk protein hydrolysates, nonfat dry milk, condensed skim milk, soy protein concentrates, soy protein isolates, soy protein hydrolysates, pea protein concentrates, pea protein isolates, pea protein hydrolysates, collagen proteins, collagen protein isolates, rice proteins, potato proteins, earthworm proteins, insect proteins, and a combination thereof.

8. The nutritional composition of any one of claims 1-7, wherein the carbohydrate is selected from the group consisting of maltodextrin, hydrolyzed starch, glucose polymers, corn syrup, corn syrup solids, rice-derived carbohydrates, sucrose, glucose, fructose, lactose, high fructose corn syrup, honey, sugar alcohols, isomaltulose, sucromalt, pullulan, potato starch, corn starch, fructooligosaccharides, galactooligosaccharides, oat fiber, soy fiber, gum arabic, sodium carboxymethylcellulose, methylcellulose, guar gum, gellan gum, locust bean gum, konjac flour, hydroxypropyl methylcellulose, tragacanth gum, karaya gum, gum acacia, chitosan, arabinoglactins, glucomannan, xanthan gum, alginate, pectin, low methoxy pectin, high methoxy pectin, cereal beta-glucans, carrageenan, psyllium, and combinations thereof.

9. The nutritional composition of any one of claims 1-8, wherein the oxidizable component of the marine oil comprises an unsaturated fatty acid.

10. The nutritional composition of any preceding claim, wherein the oxidizable component of the marine oil comprises an omega-3 polyunsaturated fatty acid selected from the group consisting of eicosapentaenoic acid, docosahexaenoic acid, alpha-linolenic acid, and combinations thereof.

11. The nutritional composition of claim 10, wherein the omega-3 polyunsaturated fatty acid comprises eicosapentaenoic acid and docosahexaenoic acid.

12. The nutritional composition of claim 11, wherein a weight ratio of eicosapentaenoic acid to docosahexaenoic acid is about 1:5 to about 5:1.

13. The nutritional composition of any one of claims 1-12, further comprising at least one antioxidant selected from the group consisting of ascorbic acid, ascorbyl palmitate, retinyl palmitate, tocopherols, ascorbate salts, carotenoids, oil-soluble rosemary extract, and combinations thereof.

14. The nutritional composition of any one of claims 1-13, wherein the nutritional composition is a liquid and has a caloric density of about 0.5 kcal/mL to about 3 kcal/mL.

15. The nutritional composition of any one of claims 1 and 4-14, wherein the nutritional composition is a powder, and the rosmarinic acid comprises from about 0.002 wt% to about 0.35 wt% of the nutritional composition.

16. The nutritional composition of any one of claims 1-15, wherein the nutritional composition is in the form of an aqueous emulsion having a continuous aqueous phase and a discontinuous non-aqueous phase.

17. A method of reducing off-flavors and aromas in a liquid nutritional composition, the method comprising:

(a) preparing an aqueous protein slurry comprising at least one milk protein; and

(b) adding a water-soluble plant extract to the aqueous protein slurry, wherein the water-soluble plant extract is extracted with a solvent system having an octanol-water partition coefficient of no more than 0.5;

(c) preparing an aqueous carbohydrate slurry comprising at least one carbohydrate;

(d) preparing an oil blend comprising a fat having an oxidizable component comprising marine oil;

(e) mixing together the aqueous protein slurry, the aqueous carbohydrate slurry, and the oil blend to form the liquid nutritional composition; and

wherein the nutritional composition has reduced off-flavors and aromas as compared with a nutritional composition without a water-soluble plant extract.

18. The method of claim 17, wherein the water-soluble plant extract comprises a water-soluble rosemary extract.

19. The method of claim 17, wherein the water-soluble plant extract comprises a water-soluble spearmint extract.

20. The method of any one of claims 17-19, further comprising heat treating the liquid nutritional composition and homogenizing the liquid nutritional composition.

21. The method of any one of claims 17-20, wherein the solvent system comprises ethanol.

22. The method of any one of claims 17-20, wherein the solvent system comprises acetone.

23. The method of claim 18, wherein the water-soluble rosemary extract comprises rosmarinic acid and has a total phenolic content, and wherein a ratio of the total phenolic content to the rosmarinic acid ranges from about 1.1:1 to about 3.5:1.

24. The method of claim 18, wherein the rosmarinic acid is about 4 wt% to about 20 wt% of the water-soluble rosemary extract.

25. The method of any one of claims 17-24, wherein the composition further comprises whey protein concentrates, whey protein isolates, whey protein hydrolysates, acid caseins, sodium caseinates, calcium caseinates, potassium caseinates, casein hydrolysates, milk protein concentrates, milk protein isolates, milk protein hydrolysates, nonfat dry milk, condensed skim milk, soy protein concentrates, soy protein isolates, soy protein hydrolysates, pea protein concentrates, pea protein isolates, pea protein hydrolysates, collagen proteins, collagen protein isolates, rice proteins, potato proteins, earthworm proteins, insect proteins, and a combination thereof.

26. The method of any one of claims 17-25, wherein the at least one carbohydrate is selected from the group consisting of maltodextrin, hydrolyzed starch, glucose polymers, corn syrup, corn syrup solids, rice-derived carbohydrates, sucrose, glucose, fructose, lactose, high fructose corn syrup, honey, sugar alcohols, isomaltulose, sucromalt, pullulan, potato starch, corn starch, fructooligosaccharides, galactooligosaccharides, oat fiber, soy fiber, gum arabic, sodium carboxymethylcellulose, methylcellulose, guar gum, gellan gum, locust bean gum, konjac flour, hydroxypropyl methylcellulose, tragacanth gum, karaya gum, gum acacia, chitosan, arabinoglactins, glucomannan, xanthan gum, alginate, pectin, low methoxy pectin, high methoxy pectin, cereal beta-glucans, carrageenan, psyllium, and combinations thereof.

27. The method of any one of claims 17-26, wherein the oxidizable component of the marine oil comprises an omega-3 polyunsaturated fatty acid selected from the group consisting of eicosapentaenoic acid, docosahexaenoic acid, alpha-linolenic acid, and combinations thereof.

28. The method of claim 27, wherein the omega-3 polyunsaturated fatty acid comprises eicosapentaenoic acid and docosahexaenoic acid.

29. The method of claim 28, wherein a weight ratio of eicosapentaenoic acid to docosahexaenoic acid is about 1:5 to about 5:1.

30. The method of any one of claims 14-29, wherein the oil blend further comprises at least one of coconut oil, fractionated coconut oil, medium chain triglycerides (MCT) oil, palm oil, palm kernel oil, and palm olein.