In a further embodiment, a sweetener composition comprises xylose, a sugar alcohol and a sulfated polysaccharide.

Title: NUTRITIONAL SWEETENER COMPOSITION

Abstract: A sweetener composition comprising: one or more glyconutrients and erythritol. In one embodiment, the sweetener composition comprises glucose, galactose, mannose, fucose, N-acetylglucosamine, N-acetylglactosamine, N-acetylneuraminic acid, xylose, and erythritol. In accordance with another aspect of the embodiment, the sweetener composition further comprises longevity fruit extract. In a further embodiment, a sweetener composition comprises xylose, a sugar alcohol and a sulfated polysaccharide.
NUTRITIONAL SWEETENER COMPOSITION

FIELD OF THE INVENTION

[0001] The present invention relates generally to nutritional compositions and, more particularly, to nutritional sweetener compositions.

BACKGROUND

[0002] A diet that is high in sugar or sucrose is known to have numerous adverse health effects and to contribute to a wide range of disease states, such as tooth decay, diabetes, obesity, high cholesterol, to name just a few. High sugar consumption also leads to decreased consumption of nutritious foods.

[0003] Artificial sweeteners have enjoyed increasing popularity as sugar substitutes. Artificial sweeteners, such as saccharin and aspartame, are widely used to duplicate the taste of sugar, but have fewer calories. Although artificial sweeteners do not contribute to the same sugar-related diseases, the safety of artificial sweeteners have been called into question. For example, Saccharin has been surrounded by controversy as to its safety after studies have linked saccharin to cancer. Similarly, aspartame has been subject to multiple claims against its safety, including supposed links to cancer, as well as complaints of neurological or psychiatric side effects.

[0004] The adverse health effects suggested by the use of saccharin and aspartame has intensified the search for new low calorie sweeteners. There is thus a need for low calorie sweeteners which are safe and, at the same time, will eliminate or substantially reduce the amount of sugar used in foods, beverages and confections.
In one embodiment, a sweetener composition consists of glucose, galactose, mannose, fucose, N-acetylglucosamine, N-acetylgalactosamine, N-acetylneuraminic acid, xylose, and erythritol.

In another embodiment, a sweetener composition comprises one or more glyconutrients and erythritol.

In accordance with a first aspect of the embodiment, the glyconutrients are one or more selected from the group consisting of: glucose, galactose, mannose, fucose, N-acetylglucosamine, N-acetylgalactosamine, N-acetylneuraminic acid, and xylose.

In accordance with a second aspect of the embodiment, the composition comprises glucose, galactose, mannose, fucose, N-acetylglucosamine, N-acetylgalactosamine, N-acetylneuraminic acid, and xylose as the one or more glyconutrients.

In accordance with a third aspect of the embodiment, the sweetener composition further comprises longevity fruit extract.

In a further embodiment, a sweetener composition comprises xylose, a sugar alcohol and a sulfated polysaccharide.

In accordance with a first aspect, the sugar alcohol is erythritol.

In accordance with a second aspect, the sulfated polysaccharide is fucoidan.

In accordance with a third aspect, the sweetener composition further comprises longevity fruit extract.

In accordance with a fourth aspect, the longevity fruit extract is obtained from Siraitia grosvenorii.

In accordance with a fifth aspect, the composition comprises xylose, erythritol and fucoidan.
[0016] In accordance with a sixth aspect, the sweetener composition comprises 50-90% by weight xylose, 10-50% by weight erythritol, 0.01-1%> by weight fucoidan.

[0017] In accordance with a seventh aspect, the sweetener composition further comprises longevity fruit extract obtained from Siraitia grosvenorii.

[0018] In accordance with an eighth aspect, the sweetener composition further comprises 1-20% by weight of the longevity fruit extract.

[0019] In accordance with a ninth aspect, the composition consists of: xylose, erythritol and fucoidan.

[0020] In accordance with a tenth aspect, the composition consists of: 50-90% by weight xylose, 10-50% by weight erythritol, 0.01-1%> by weight fucoidan.

[0021] Other objects, features and advantages of the described preferred embodiments will become apparent to those skilled in the art from the following detailed description. It is to be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the present invention, are given by way of illustration and not limitation. Many changes and modifications within the scope of the present invention may be made without departing from the spirit thereof, and the invention includes all such modifications.

**DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0022] Specific, non-limiting embodiments of the present invention will now be described with reference to the preferred embodiments. It should be understood that such embodiments are by way of example only and merely illustrative of but a small number of embodiments within the scope of the present invention. Various changes and modifications obvious to one skilled in the art to which the present invention pertains are deemed to be within
the spirit, scope and contemplation of the present invention as further defined in the appended claims.

[0023] The sweetening compositions disclosed herein have the advantages of having a mouth-feel or taste that is like sugar (sucrose) but is low in calories and does not produce an insulin response. In a preferred embodiment, the sweetening compositions do not contain any artificial flavors or coloring.

[0024] In one embodiment, the sweetening composition comprises a sugar alcohol and one or more glyconutrients.

[0025] Sugar alcohols are a class of polyols and have the general formula \( \text{H(HCHO)}_{i} \text{H} \). Sugar alcohols do not contribute to tooth decay and consumption of sugar alcohols does not affect blood sugar levels in the same way that sucrose does. Common sugar alcohols include methanol, glycol, glycerol, erythritol, threitol, arabinol, xylitol, ribitol, mannitol, sorbitol, galactitol, fucitol, iditol, inositol, volemitol, isomalt, maltitol, lactitol, maltotriitol, maltotetraitol, and polyglycitol. In a preferred embodiment, the sweetening composition comprises one or more sugar alcohol(s). In a particularly preferred embodiment, the sweetening composition comprises at least erythritol.

[0026] Glyconutrients are often important integral membrane proteins and they play a role in cell-cell interactions. The term "glyconutrients" is understood to encompass the following eight (8) essential sugars: glucose, galactose, mannose, fucose, N-acetylgalactosamine, N-acetylglucosamine, N-acetyleneuraminic acid, and xylose. The sweetening composition disclosed herein comprise at least one or any combination of the glyconutrients. In a particularly preferred embodiment, the glyconutrients comprise all eight (8) essential sugars.
Fucoidan can be provided in the sweetening composition in addition to or in place of any one or all of the sugar alcohol(s) or glyconutrient(s). Fucoidan is a sulfated alpha-L-fucan found in many sea plants and animals. Fucoidan is particularly abundant in the cell walls of brown algae and includes fucoidans derived from the genus Fucus (e.g., Fucus vesiculosus, Fucus evanescens, Fucus distichus, and Fucus serratus) or Laminaria (e.g., Laminaria japonica, Laminaria religiosa, and Laminaria abyssalis). Fucoidan also includes fucoidans derived from Chorda filum, Cladosiphon okamuranus, Undaria pinnatifida, Leathesia difformis, Ascophyllum nodosum, Ecklonia kurome, Pelvetia fastigiata, Soundsersella simplex, Chordaria flagelliformis, or any other species of sea plant or animal containing fucoidan. In addition, fucoidan includes biologically active fragments, derivatives, or analogues thereof. Fucoidan may include fragments of fucoidan generated by degradation (e.g., hydrolysis) of larger fucoidan molecules. Degradation can be achieved by any of a variety of means known to those skilled in the art including treatment of fucoidan with acid, base, heat, or enzymes to yield degraded fucoidan. Fucoidans may also be chemically altered and may have modifications, including but not limited to, sulfation, polysulfation, acetylation, esterification, and methylation.

Longevity fruit extract can be provided in the sweetening composition in addition to or in place of any of the foregoing constituents. In a preferred embodiment, the longevity fruit is derived from Siraitia grosvenorii, an herbaceous perennial vine of the cucurbitaceae (gourd) family native to southern China and northern Thailand. Longevity fruit extract is nearly 300 times sweeter than sugar.

The sweetening compositions can further comprise at least one additive selected from the group consisting of plasticizers, bulking agents, fillers, mineral adjuvants, coloring agents and mixtures thereof.
The relative amounts for the constituents of the sweetening composition may be optimized to provide the mouth feel and taste of sugar. Table 1 provides relative ranges of the constituents described above in accordance with one preferred embodiment:

Table 1.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Amount (% by weight)</th>
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<tr>
<td>xylose</td>
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<td>Fucoidan</td>
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<td>Longevity Fruit Extract</td>
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<td>Additives</td>
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EXAMPLE 1

A sweetener composition comprising 70% xylose, 29.86% erythritol and 0.14% fucoidan (sulfated polysaccharide or sulfated alpha-L-fucan).

EXAMPLE 2

A sweetener composition comprising 70% xylose, 29.86% erythritol and 0.14% of eight glyconutrients galactose, mannose, glucose, xylose, fucose, N-acetylglucosamine, N-acetylgalactosamine, and N-acetylneuraminic acid.

The invention described and claimed herein is not to be limited in scope by the specific preferred embodiments disclosed herein, as these embodiments are intended as illustrations of several aspects of the invention. Indeed, various modifications of the invention in addition to those shown and described herein will become apparent to those skilled in the art.
from the foregoing description. Such modifications are also intended to fall within the scope of the appended claims.
WHAT IS CLAIMED IS:

1. A sweetener composition comprising: a xylose, a sugar alcohol and a brown algae.

2. The sweetener composition of claim 1, wherein the sugar alcohol is erythritol.

3. The sweetener composition of claim 1, wherein the brown algae is selected from the group consisting of: *Laminaria japonica*, *Laminaria religiosa*, and *Laminaria abyssalis*.

4. The sweetener composition of claim 2, wherein the brown algae is *Laminaria japonica*.

5. The sweetener composition of claim 1 consisting of: the xylose, the sugar alcohol and the brown algae, wherein the sugar alcohol is erythritol and wherein the brown algae is *Laminaria japonica*.

6. A sweetener composition comprising: a xylose, a sugar alcohol and a sulfated polysaccharide.

7. The sweetener composition of claim 6, wherein the sugar alcohol is erythritol.

8. The sweetener composition of claim 6, wherein the sulfated polysaccharide is fucoidan.

9. The sweetener composition of claim 6, further comprising longevity fruit extract.

10. The sweetener composition of claim 9, wherein the longevity fruit extract is obtained from *Siraitia grosvenorii*.

11. The sweetener composition of claim 6, wherein the composition comprises: xylose, erythritol and fucoidan.

12. The sweetener composition of claim 11, comprising 50-90% by weight xylose, 10-50% by weight erythritol, 0.01-1%> by weight fucoidan.
13. The sweetener composition of claim 11, further comprising longevity fruit extract obtained from Siraitia grosvenorii.

14. The sweetener composition of claim 12, further comprising 1-20% by weight of the longevity fruit extract.

15. The sweetener composition of claim 6, wherein the composition consists of: xylose, erythritol and fucoidan.

16. The sweetener composition of claim 15, wherein the composition consists of: 50-90% by weight xylose, 10-50% by weight erythritol, 0.01-1% by weight fucoidan.
**INTERNATIONAL SEARCH REPORT**

**International application No.**
PCT/US2014/055670

A. **CLASSIFICATION OF SUBJECT MATTER**

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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)

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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(keyword delimited)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar

Search terms used: sweetener composition xylose sugar alcohol brown algae erythritol fucoidan sulfated polysaccharide Laminaria japonica Laminaria religiosa Laminaria abyssalis Siraitia grosvenorii

C. **DOCUMENTS CONSIDERED TO BE RELEVANT**

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<td>WO 2008/049258 A1 (HANSEN et al) 02 May 2008 (02.05.2008) entire document</td>
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Further documents are listed in the continuation of Box C.

* 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

  "V" 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 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

  "K" document member of the same patent family

Date of the actual completion of the international search

26 October 2014

Date of mailing of the international search report

**22 DEC 2014**

Authorized officer:

Blaine R. Copenheaver

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