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(54) Title: SWEETENER COMPOSITION AND A PROCESS FOR ITS PRODUCTION

(57) Abstract: The present invention relates to a sweetener composition comprising crystals of sucrose, with sucralose incorporated in the sucrose.

5 **TITLE:**

SWEETENER COMPOSITION AND A PROCESS FOR ITS PRODUCTION

FIELD OF THE INVENTION

The present invention relates to a sweetener composition and a process for its production.

10

BACKGROUND OF THE INVENTION

Sugar or sucrose is the most widely accepted sweetener, worldwide, with its organoleptic properties such as sweetness intensity, mouth feel, absence of after taste and visual looks of the crystals, unmatched yet, by any other sweetener. However sucrose is found to be highly calorific with the high calories providing no nutrient values to the user. The undesirable effects associated with the high consumption of sugar such as obesity, tooth decay and raised blood glucose in diabetics have resulted in an intensive search for alternative substitutes. Although a number of artificial sweeteners have been approved for public consumption, none have so far fulfilled the requirements of being safe, non-caloric, stable over a wide range of pHs and temperatures with a long shelf-life, and having the desirable organoleptic properties of sucrose.

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An important class of sugar substitutes is the high intensity sweeteners. Compounds like aspartame, saccharin, sucralose are all high intensity artificial sweeteners. However none of these sweeteners have the desirable organoleptic properties of sugar though their sweetness intensity is much higher than that of sucrose. Artificial sweeteners in general have a bitter and astringent aftertaste followed with the lingering sweetness. If the bitterness is controlled and also the lingering effect, then the taste buds responsible for identifying sweetness profile can be activated and results in sensing of high degree of sweetness.

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It seems logical that a mixture of sucrose with a high intensity sweetener may solve the aforementioned problems. However this is easier said than done. The prior art, as given below, have failed to give a sweetener composition with sucrose in combination with a high intensity sweetener such as sucralose in such a way that the desirable organoleptic

5 properties or palatability of sucrose are intact, with the sucrose being required in less amounts, thus contributing to less calories and also the undesirable after taste of the high intensity sweetener is masked.

10 United States Patent No. 3,011,897 relates to low calorie sweetening composition which is a porous, sponge like material made up of fine particles of sugar and of synthetic sweetener agglomerated into granules having one half bulk density as that of granulated sugar. The composition of the invention is made by combining fine pulverised sugar together with a fine synthetic sweetener, in proper proportions into porous sponge like agglomerates or granules of low bulk density. However the composition of this patent is
15 just a physical mixture of two sweeteners and has a dull appearance and lack of coherence causing it to undergo erosion to give a dusty product and a variable bulk density. Also for blending the sugar with the synthetic sweetener, the sugar has to be pulverized. The pulverized sugar absorbs moisture quickly making the resultant product hygroscopic.

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UK Patent Application No. 2216387A relates to low density crystalline sucrose and its use as carrier in high intensity sweetener compositions. The application discloses a sweetener composition comprising hollow spheroids or part spheroids of microcrystalline sucrose, generally bound to crystals of sucrose, the sweetener preferably containing one
25 or more high intensity sweeteners such as sucralose. The sweetener is prepared by spray drying a sucrose syrup with simultaneous injection of an inert pressurized gas and, generally, contacting the sprayed syrup during the spray drying step and/or after completion of said step, with crystals of sucrose, and preferably by incorporating a high intensity sweetener in the syrup or in the agglomeration step. The composition of this
30 invention has very fine particle size unlike the composition of the present invention which gives crystals similar to those of sucrose. Also the process of this application uses spray drying which would be expensive and time consuming.

European Patent Specification 0313234B1 relates to compositions of the high intensity
35 sucralose with saccharide sweeteners selected from the group consisting of fructose,

5 glucose, invert sugar, starch-derived glucose syrups, high fructose corn syrups and sugar alcohols. This patent discloses that no synergy is found in combinations of sucralose and sucrose and teaches away from using the said combination for sweetener compositions.

10 In spite of the various prior arts and prior efforts, it would be desirable to have a sweetener composition which has the organoleptic properties or palatability of sucrose but is much lesser calorific.

15 It would also be desirable to have a sweetener composition with sucrose in combination with a high intensity sweetener such as sucralose in such a way that the desirable organoleptic properties of sucrose are intact, with the sucrose being required in less amounts, thus contributing to less calories and also the undesirable after taste of the high intensity sweetener is masked.

20 **OBJECT OF THE INVENTION**

It is an object of the present invention to provide a sweetener composition which has the organoleptic properties or palatability of sucrose but is much lesser calorific.

25 It is another object of the present invention to provide a sweetener composition which has the organoleptic properties or palatability of sucrose but can be used for diabetics as it does elevate blood glucose levels like sucrose.

30 It is another object of the present invention to provide a sweetener composition with sucrose in combination with a high intensity sweetener such as sucralose in such a way that the desirable organoleptic properties of sucrose are intact, with the sucrose being required in less amounts, thus contributing to less calories and also the undesirable after taste of the high intensity sweetener is masked.

5 It is another object of the present invention to provide a process for the production of a sweetener composition with sucrose in combination with a high intensity sweetener such as sucralose.

At least one of the preceding objects is met, in whole or in part, by a sweetener
10 composition comprising crystals of sucrose, with sucralose incorporated in the said crystals of sucrose.

At least one of the preceding objects is also met, in whole or in part, by a process for the
15 production of a sweetener composition comprising crystals of sucrose, with sucralose crystals incorporated in the said crystals of sucrose.

SUMMARY OF THE INVENTION

The present invention provides a sweetener composition which has the organoleptic
20 properties or palatability of sucrose but is much lesser calorific.

The present invention also provides a sweetener composition which has the organoleptic
properties or palatability of sucrose but can be used for diabetics as it does not elevate blood
25 glucose levels like sucrose.

The present invention also provides a sweetener composition with sucrose in combination
with a high intensity sweetener such as sucralose in such a way that the desirable
organoleptic properties of sucrose are intact, with the sucrose being required in less
amounts, thus contributing to less calories and also the undesirable after taste of the high
30 intensity sweetener is masked.

The present invention also provides a process for the production of a sweetener
composition with sucrose in combination with a high intensity sweetener, such as
sucralose.

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- 5 Thus the present invention provides:
- A) A sweetener composition comprising crystals of sucrose, with sucralose incorporated in the sucrose.
- B) The sweetener composition as in A) above, wherein the composition has organoleptic properties or palatability similar to sucrose but has a lower glycemic index than sucrose.
- 10 C) The sweetener composition as in A) above, wherein the sucralose is entrapped within the sucrose crystals
- D) The sweetener composition as in A) above, wherein the sucrose crystals are coated by the sucralose.
- E) The sweetener composition as in A) above, wherein the sucrose used is from various
- 15 sources such as cane sugar, various fruits, vegetable juices and the like.
- F) The sweetener composition as in A) above, wherein the sucrose is used in amounts ranging from about 90% w/w to about 99% w/w.
- G) The sweetener composition as in A) above, wherein the sucralose is used in amounts ranging from about 1% w/w to about 10% w/w.
- 20 H) A process for the production of sweetener composition of crystals of sucrose, with sucralose incorporated in the sucrose comprising dissolving sucralose in a solution of sucrose, seeding with sucrose crystals and concentrating the resultant solution to get crystals of the said sweetener composition.
- I) A process for the production of sweetener composition of crystals of sucrose, with
- 25 sucralose incorporated in the sucrose comprising slowly adding a solution of sucralose to crystals of sucrose with agitation, to get crystals of the said sweetener composition.

DESCRIPTION OF THE INVENTION

- 30 Before the present formulations and methods are described, it is to be understood that this invention is not limited to particular compounds, formulas or steps described, as such may, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting, since the scope of the present invention will be limited only by the appended claims.

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5 Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates otherwise, between the upper and lower limit of that range and any other stated or intervening value in that stated range is encompassed within the invention. The upper and lower limits of these smaller ranges may independently be included in the smaller ranges is also encompassed
10 within the invention, subject to any specifically excluded limit in the stated range. Where the stated range includes one or both of the limits, ranges excluding either both of those included limits are also included in the invention.

Unless defined otherwise, all technical and scientific terms used herein have the same
15 meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any methods and materials similar or equivalent to those described herein can also be used in the practice or testing of the present invention, the preferred methods and materials are now described. All publications mentioned herein are incorporated herein by reference to disclose and describe the methods and/or
20 materials in connection with which the publications are cited.

It must be noted that as used herein and in the appended claims, the singular forms "a", "and", and "the" include plural referents unless the context clearly dictates otherwise. Thus, for example, reference to "a compound" includes a plurality of such compounds
25 and reference to "the step" includes reference to one or more step and equivalents thereof known to those skilled in the art, and so forth.

The publications discussed herein are provided solely for their disclosure prior to the filing date of the present application. Nothing herein is to be construed as an admission
30 that the present invention is not entitled to antedate such publication by virtue of prior invention. Further, the dates of publication provided may be different from the actual publication dates which may need to be independently confirmed.

We have surprisingly found that a sweetener composition with sucrose in combination
35 with a high intensity sweetener such as sucralose can be made in such a way that the

5 desirable organoleptic properties or palatability of sucrose is intact, with the sucrose being required in less amounts, thus contributing to less calories and also the undesirable after taste of the high intensity sweetener is masked.

10 The present invention provides a sweetener composition which has the organoleptic properties or palatability of sucrose but is much lesser calorific.

The present invention also provides a sweetener composition which has the organoleptic properties or palatability of sucrose but can be used for diabetics as it does not elevate blood glucose levels like sucrose.

15

The present invention also provides a sweetener composition with sucrose in combination with a high intensity sweetener such as sucralose in such a way that the desirable organoleptic properties of sucrose are intact, with the sucrose being required in less amounts, thus contributing to less calories and also the undesirable after taste of the high intensity sweetener is masked.

20

The present invention also provides a process for the production of a sweetener composition with sucrose from various sources such as cane sugar, various fruits and vegetable juices in combination with a high intensity sweetener such as sucralose.

25

Accordingly the present invention provides a sweetener composition comprising crystals of sucrose, with sucralose crystals incorporated in the sucrose.

30 The present invention also provides a sweetener composition comprising crystals of sucrose, wherein the sucralose crystals are entrapped within the sucrose crystals.

The present invention also provides a sweetener composition comprising crystals of sucrose, wherein the sucrose crystals are coated by the sucralose.

5 The present invention also provides a process for the production of sweetener composition of crystals of sucrose, with sucralose crystals incorporated in the sucrose comprising dissolving sucralose in a solution of sucrose, optionally seeding with sucrose crystals and concentrating the resultant solution to get crystals of the said sweetener composition.

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The present invention also provides a process for the production of sweetener composition of crystals of sucrose, with sucralose crystals incorporated in the sucrose comprising slowly adding a solution of sucralose to crystals of sucrose with agitation, to get crystals of the said sweetener composition.

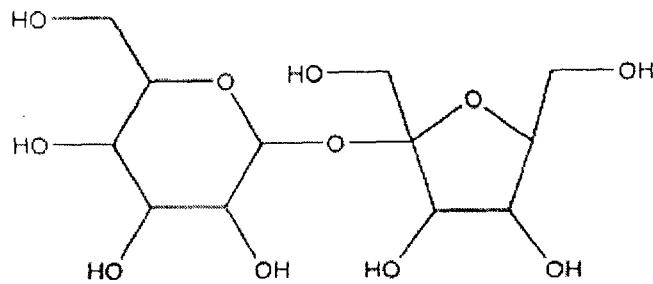
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The term “organoleptic properties” or “palatability” as used in this specification refers to the sweetness intensity, mouth feel and visual looks and absence of after taste. This would also include color, smell, aroma, taste and texture of the food product after addition of the sweetener.

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The term “incorporating the sucralose in the sucrose” means associating the sucralose molecule with the sucrose crystals. This may be done by either entrapping the sucralose crystals within the sucrose crystals or by coating the sucrose crystals by the sucralose

25 Sucrose is chemically β -D-fructofuranosyl- α -D-glucopyranoside [57-50-1]. Its various synonyms are: Beet sugar; cane sugar; α -D-glucopyranosyl- β -D-fructofuranoside; refined sugar; saccharose; sugar. Sucrose is a sugar obtained from sugar cane [*Saccharum officinarum* Linné (Fam. Gramineae)], sugar beet [*Beta vulgaris* Linné (Fam. Chenopodiaceae)], and other sources. It contains no added substances. Sucrose occurs as
30 colorless crystals, crystalline masses or blocks, or as a white, crystalline powder; it is odorless and has a sweet taste. Given below is the structural formula of sucrose.



5

The sweetener composition of the present invention uses sucrose crystals. The sucrose crystals used may be of any size desired and do not have to be pulverized unlike prior art compositions. Sucrose from various sources such as cane sugar, various fruits, vegetable juices and the like may be used in the sweetening composition of the present invention in order to impart an aesthetic flavor to it. Sucrose may be used in amounts ranging from about 90% w/w to about 99% w/w in the compositions of the present invention.

Sucralose is a zero-calorie artificial sweetener with the chemical name 1,6-Dichloro-1,6-dideoxy- β -D-fructofuranosyl-4-chloro-4-deoxy- α -D-galactopyranoside. It is approximately twice as sweet as saccharin and four times as sweet as aspartame. Unlike aspartame it is stable under heat and over a broad range of pH conditions and can be used in baking or in products that require a longer shelf life. Sucralose is nearly 600 times sweeter than sucrose. The composition of the present invention may use sucralose in amounts ranging from about 1% w/w to about 10% w/w.

20

The process of the production of sweetener composition of the present invention is achieved generally by incorporating the sucralose in the sucrose. This may be done by either entrapping the sucralose within the sucrose crystals or by coating the sucrose crystals by the sucralose. In an embodiment, the sucralose crystals may be entrapped in the sucrose crystals by dissolving sucralose in a solution of sucrose, optionally seeding with sucrose crystals and concentrating the resultant solution to get crystals of the said sweetener composition. In another embodiment, the sucrose crystals may be coated by sucralose by slowly adding a solution of sucralose to crystals of sucrose with agitation, to get crystals of the said sweetener composition.

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5

Sucrose from various sources such as cane sugar, various fruits, vegetable juices and the like may be used for incorporation of sucralose. This would give sweetening composition crystals which have the organoleptic appeal of sugar, the aesthetic flavor of the cane/fruits/vegetables used and the calorie saving advantage of the sucralose used.

10

The following examples are intended to illustrate the scope of the present invention in all its aspects but not to limit it thereto.

15

EXAMPLE 1

500 gms to 5 kg of sucralose was dissolved in 100 kg cane sugar juice having the brix of 40 (TSS) and concentrated using vacuum concentrators/evaporators to the brix of 70 - 75. The above solution was centrifuged and/or filtered and the supernatant liquid was siphoned out. Sugar crystals with approximate particle size of 1 mm – 2 mm were used for seeding for crystallization. The % of seeding was kept between 15 – 35% and the resultant solution was concentrated further using vacuum evaporators to get the crystals of the sweetener composition of the invention. The crystals were further subjected to bleaching and refining to get the sweetener composition crystals with good aesthetics in terms of size, shape and looks similar to sucrose.

25

EXAMPLE 2

Sucrose crystals of uniform size were taken in a rotary drum blender with constant agitation & to this, the solution of 1% - 10% sucralose dissolved in isopropyl alcohol (IPA) was added at a very slow flow rate of 5gms/minute using spray nozzles. The resultant crystals were subjected to atmospheric/room temperature drying and the solvent was evaporated to afford crystals of the sweetener composition of the present invention which had good aesthetic value aesthetics in terms of size, shape and looks similar to sucrose.

35

EXAMPLES 3-5

5 The sweetening compositions of the invention were prepared as per Table 1, by the process as given in example 1 and 2, above.

Following was the amount of sucrose/sugar and sucralose taken for the examples of the sweetening composition of this invention:

Table 1

SN	Amount of sucrose (%w/w)	Amount of sucralose (%w/w)	Sweetness Intensity as compared to sucrose	Quantity required and Calories from sucrose per cup of tea	Quantity required and Calories from sweetener composition of invention per cup of tea
Example 3	99	1	7	10 gm 40 calories	1.43 gm 5.71 calories
Example 4	95	5	30	10 gm 40 calories	0.33 gm 1.33 calories
Example 5	92	8	49	10 gm 40 calories	0.2 gm 0.8 calories

10

Thus it can be seen that the sweetener composition of the present invention is to be used in much lesser amounts than sugar for achieving the same amount of sweetness as sugar. In the process, it imparts only a fraction of the calories as compared to sugar for achieving a similar degree of sweetness.

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EXAMPLES 6-7

The sweetening compositions of the invention were prepared as per Table 2 by the process as given in example 1 above.

Following was the amount of sucrose/sugar and sucralose taken for the examples of the sweetening composition of this invention

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Table 2

SN	Amount of sucrose (%w/w)	Amount of sucralose (%w/w)	Sweetness Intensity compared to sucrose as to	Glycemic index for equivalent sweetness
Example 6	99	1	7	10
Example 7	99.5	0.5	4	16
Sucrose				65
Dextrose				100
Maltodextrin				150

5

This it can be seen that the sweetener composition of the present invention, though having sweetness intensity similar or slightly more than sucrose had much lesser glycemic index than sucrose, dextrose or maltodextrin.

10

EXAMPLES 8-11

The sweetening compositions of the invention were prepared as per Table 3 by the process as given in example 1 above.

Table 3

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	Example 8	Example 9	Example 10
Sucrose	70g	90g	99g
Sucralose	0.707g	0.85g	1g
Sweetness index	4.9	6	6.99
Glycemic index	13.26	11	9.29

20

The sweetener composition of example 8 was used in various food products as a sweetener. The food products were tasted by 25 volunteers and rated for its organoleptic properties or palatability as given in Table 4. This was compared to the food products with sucrose, whose palatability was treated as the benchmark. So sucrose would have 5 points in all parameters.

5

Table 4

	TEA	COFFEE	ORANGE JUICE	GAJAR HALWA	PASTRY	COOKIES
Colour, Smell, Aroma	3.5	3.8	4.1	3.45	3.87	3.95
Taste	3.43	3.7	3.87	3.5	3.67	3.4
Texture	NA	NA	NA	3.41	4	3.45

RATING ON 1 - 5 SCALE

EXCELLENT	5	
GOOD	4	
NEEDS IMPROVEMENT	3	
BAD	2	After taste
VERY BAD	1	

10 So it can be seen from the above results, that though the composition of the present invention has a lower glycemic index and similar sweetness index as sugar, it is almost as palatable as sugar with respect to color, smell, aroma, taste and texture (of the sweetener in) of the food item. This would be in sharp contrast to the prior art mixtures of sucrose and sucralose which lack the palatability of the present composition or sucrose.

15

Although the invention has been described in terms of particular embodiments and applications, one of ordinary skill in the art, in light of this teaching, can generate additional embodiments and modifications without departing from the spirit of or exceeding the scope of the claimed invention. It should be emphasized that the above-described embodiments of the present invention, particularly any "preferred" 20 embodiments, are merely possible examples of the invention of implementations, merely set forth for a clear understanding of the principles of the invention. Accordingly, it is to be understood that the drawings and descriptions herein are proffered by way of example to facilitate comprehension of the invention and should not be construed to limit the 25 scope thereof.

5 **Claims:**

1. A sweetener composition comprising crystals of sucrose, with sucralose incorporated in the sucrose.
2. The sweetener composition as in claim 1, wherein the composition has organoleptic properties or palatability similar to sucrose but has a lower glycemic index than sucrose.
- 10 3. The sweetener composition as in claim 1, wherein the sucralose is entrapped within the sucrose crystals
4. The sweetener composition as in claim 1, wherein the sucrose crystals are coated by the sucralose.
- 15 5. The sweetener composition as in claim 1, wherein the sucrose used is from various sources such as cane sugar, various fruits vegetable juices and the like.
6. The sweetener composition as in claim 1, wherein the sucrose is used in amounts ranging from about 90% w/w to about 99% w/w.
7. The sweetener composition as in claim 1, wherein the sucralose is used in amounts
- 20 ranging from about 1% w/w to about 10% w/w.
8. A process for the production of sweetener composition of crystals of sucrose, with sucralose incorporated in the sucrose comprising dissolving sucralose in a solution of sucrose, seeding with sucrose crystals and concentrating the resultant solution to get crystals of the said sweetener composition.
- 25 9. A process for the production of sweetener composition of crystals of sucrose, with sucralose incorporated in the sucrose comprising slowly adding a solution of sucralose to crystals of sucrose with agitation, to get crystals of the said sweetener composition.

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