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(71) Applicant (for all designated States except US): ABBA PHARMA LIMITED [AE/AE]; c/o BDO Chartered Accountants & Advisors, Al Futtaim Tower, Office No. 303-305, 3rd Floor, Al Maktoum Road, Deira, P.O. Box 1961, Dubai (AE).

(72) Inventors; and

(75) Inventors/Applicants (for US only): AURORA, Sundee [IN/IN]; Adarsh No. 411, 17Th Main, 4Th Block, Bangalore 560 034, Karnataka (IN). KULKARNI, Shrikant Ramachandra [IN/IN]; c/o. V.b. Medicare Pvt. Ltd., Plot No. 59, 61, 62, 63, 66a & 67, Sipcot Industrial Area, Phase II, Krishnagiri Road, Hosur 635 109, Tamil Nadu (IN).


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(54) Title: SWEETNESS ENHANCED SUGARS AND SUGAR LIKE PRODUCTS

(57) Abstract: This invention comprises a sucrose equivalent sweetness enhanced sweetener with cane sugar like crystalline appearance, free flowing, non-dusty and with uniform sweetness in each 6 gram portion, with optional ingredients for organoleptic or health benefits, and a method of making the same comprising steps of slow stirring, with or without seeding, accompanied with heating of a concentrated solution having dissolved solids concentration suitable for co-crystallization under above conditions comprising sucrose, a high intensity sweetener and optionally one or more of other ingredients. The sweetener of this invention has sucrose equivalent sweetness that is an integer or any other pre-defined sucrose equivalent sweetness, including SES precisely of 2 or 4. The high intensity sweetener ingredient in the sweetener may be sucralose or any other high intensity sweetener.
AMENDED CLAIMS
received by the International Bureau on 11 December 2012 (11.12.2012)

1. A method of making a sucrose equivalent sweetness enhanced sweetener with cane sugar like crystalline appearance, free flowing, non-dusty and with uniform sweetness in each 6 gram portion, comprising steps of:

a. Obtaining, in an aqueous solvent, a concentrated solution of sucrose and a high intensity sweetener without a step of concentration under reduced pressure with or without a stabilizer and with or without other optional ingredients accompanied by heating to a temperature, the resulting concentrated solution containing mixture of sucrose and the high intensity sweetener not containing impurities in a quantity that would result into formation of molasses or molasses like by-products, the final concentration of the solution of sucrose, the high intensity sweetener and other optional ingredients being at least enough for getting co-crystallization of the dissolved sucrose with the high intensity sweetener by stirring of the mixture of sucrose and the high intensity sweetener, with or without the other additional ingredients, for a period of time accompanied with heating to a temperature where caramelization will not occur, until co-crystallization is complete, the stirring being done, with or without seeding,

b. separating mother liquor and drying the moist co-crystallized mass at a temperature that promotes as much less residual moisture content as possible in the dried sweetener composition without caramelization to get a solid mass comprising free flowing crystals or comprising lumps of dried crystals, optionally, breaking lumps if
required, and sizing the dry crystalline solids to get a sweetener composition that passes through desired mesh size.

2. The method of claim 1 wherein:

   a. The said concentrated solution of sucrose and a high intensity sweetener, with or without other optional ingredients is obtained by:

      i. adding one or more of a high intensity sweetener, with or without other optional ingredients, to a concentrated solution of sucrose prior to co-crystallization, or

      ii. adding sucrose with or without other optional ingredients to concentrated solution of a high intensity sweetener prior to co-crystallization, or

      iii. adding one or more of a high intensity sweetener, with or without additional optional ingredients, to a concentrated solution made from process stream of regular sugar manufacturing process after removal of molasses from the crystallized sucrose, or

      iv. adding sucrose to a concentrated solution of process stream, containing a high intensity sweetener in purified state produced in a process of manufacture of the high intensity sweetener, the said concentrated solution being free from organic solvent/s to such an extent that residual solvent will not interfere in the co-crystallization process.
b. the said obtained concentrated solution of sucrose, high intensity sweetener with or without other ingredients is obtained at a temperature and heated, avoiding caramelization, to a higher temperature, more particularly at a temperature of 80°C to 45°C, or at 50 to 70°C, or at 60°C,

c. the said final concentration of the solution of sucrose and the high intensity sweetener being 250% dissolved solids or more,

d. the said stirring of mixture of sucrose and the high intensity sweetener with or without additional optional ingredients is done at 20-40 revolutions per minute,

e. the said stirring of mixture of sucrose and the high intensity sweetener with or without additional optional ingredients is stirred at a temperature of 80-40°C,

f. the said stirring of the mixture of sucrose and the high intensity sweetener is done at 30 revolutions per minute,

g. the said period of time of stirring of the mixture of sucrose and the high intensity sweetener, with or without the other additional ingredients, accompanied with heating is 3 to 32 hours, more particularly 16-32 hours.

h. the temperature of drying of co-crystallized moist mass being between 40-45°C,

i. the said residual moisture of the dried mass of co-crystal mass being 0.1 - 0.4 %.
3. A method of claim 1 wherein:

a. the high intensity sweetener comprises at least one selected from the group sucrase, Glycyrrihizin, Thaumatin, Monellin, Stevioside extract, Rebaudioside-A extract, Lo Han Guo Morgrosides extract, Brazzein, Curculin, pentadin, Mabinlin, Acesulfame K, Neotame, Talin, Citrose, Alitame, Cyclamate, Saccharin and Aspartame.

b. the said aqueous solvent being water,

c. wherein the said additional ingredients comprise one or more selected from a group consisting of an amino acid or derivative of an amino acid, a vitamin, a mineral, a flavor, an enhancer, or a prebiotic, or a probiotic, a Pharmaceutically active ingredient, an anti-oxidant, an energy booster, a derivative of a fat or an oil, a color and other natural products.

4. A method of claim 3 wherein:

a. the said amino acid comprise one or more selected from the group consisting of Taurine, L-Arginine, L-Ornithine, L-Lysine, L-Carnitine, L-Methionine, L-Phenylalanine, L-Tyrosine, L-Cysteine, L-Glycine and S-Adenosyl methionine,

b. the said vitamin comprises one or more selected from the group consisting of Vitamin-A, Vitamin-B1, Vitamin-B2, Vitamin-B3, Vitamin-B5, Vitamin-B6, Vitamin-B12, Vitamin-B complex, Beta-carotene, Vitamin-C, Vitamin-D, Vitamin-D1, Vitamin-D2, Vitamin-E, Biotine, Choline, Folic acid,
c. the said mineral comprises one or more selected from the group consisting of Selenium, Zinc, Boron, Calcium, Chromium, Iron, Magnesium and Potassium,

d. the said flavor comprises one or more selected from the group consisting of a Coca powder, Coffee, Vanillin, Pista, Strawberry, Mango, Orange, Chocolate, Dry Fruit, Dry vegetables, Ice-cream, Yogurt, Wheat flour, Multigrain flour, Peppermint, Ginger, Apple, Citrus, Grape, Cherry, Ginseng, Peach, Wild berry, Tropical, pomegranate and Blue berry,

e. the said pre-biotic comprises one or more selected from the group consisting Inulin and other fructooligosaccharides, Xylo-oligosaccharides, Gentio-oligosaccharides, Galacto-oligosaccharides, Nigero-oligosaccharides, Maltoligosaccharides, Soybean oligosaccharides,

f. the said probiotic comprises one or more selected from the group consisting a Yeast, Bacillus, Lactobacillus, Bifidobacterium bifidum, Bifidobacterium infantis, Bifidobacterium longum, Enterococcus faecium and Streptococcus thermophilus,

g. the said pharmaceutically effective ingredient comprises one or more selected from the group consisting of a Bromelain, Chitosan, Salicin, Inosin, Myoglobin, Glucomannan, Guaraine, Yerbamate, Pectin, Pancreatin, Pantothenic, Spirulina, ATP, Conjugated linoleic acid, Hydroxy citric acid, Phaseolamin, 5-HTP, Adenosine receptor, caffeine, Theobromine, Theophylline, SCH58261, KW6002, ZM241385, GABA and Dehydro epiandrosteron,
h. the said antioxidant comprises one or more selected from the group consisting of Alpha lipoic acid, Bilberry, CoQ10, Ginkgo bioba, Glutathione, Grape seed extract, Green tea extracts, malatonine, Oligomeric proanthocyanidins, Pycnogenol, Resveritrol, Astaxanthin and Ergothinoneine,

i. the said energy booster comprises one or more selected from the group consisting of a Gotukola, Saint John's Wort, Wheet grass, Fennel, Kelp, Alfalfa, Red clover, Adenosine A (2A) and Common oats,

j. the said fat or oil or their derivatives includes, without limitation, one or more of a Butter, Olive oil, Canola oil, Vegetable oil, Flax seed oil, Black currant seed oil, Primrose oil, Fish oil, Omega 3,6,9 poly unsaturated fatty acids, Milk, Condensed milk, Cheese, Nuts and Docosahexaenoic acid,

k. the said color comprises one or more selected from a group consisting of a Curcumin, Lycopene, Beta-carotene, Apocarotenal and Canthaxanthin.

l. the said other natural products comprises one or more selected from a group consisting of a Licorice root, Catnip, Passion flower, Lobelia, Hops, Skullcap, Gentian, Myrrh, Safflower, Bayberry root bark, Eucalyptus, Sarsaparilla, Slippery Elm, Valerian root, Ephedra, Guarana and kola nut.

5. A method of claim 1 of making a sucrose equivalent sweetness enhanced sweetener with cane sugar like crystalline appearance, free flowing, non-
dusty and with uniform sweetness in each 6 gram portion having pre-determined precise pre-defined target of "Sucrose Equivalent Sweetness", abbreviated as SES, wherein mother liquor is separated from the co-crystallized mass before drying in step b. claim 1, the said method comprising following steps:

a. performing a certain number of pilot experiments required statistically to find out what quantity of the high intensity sweetener is lost in mother liquor wherein a quantity of high intensity sweetener expected to give targeted sweetness is added in step a. of claim 1 to determine overages that need to be added to compensate for this loss,

b. dissolving the high intensity sweetener in step a. in a quantity with proper overages decided above that shall give the desired sweetness in the co-crystallized dried mass,

c. preparing more than two batches as required within the statistical requirement for statistical uniformity, evaluating for actual sweetness or the content of the high intensity sweetener in the co-crystallized product,

d. combining batches with lower and higher than targeted sweetness in such a way that desired sweetness is achieved in the uniformly mixed product.

6. The method of claim 5 wherein the pre-determined precise pre-defined target of desired SES is 1.15 times to 100 times, more particularly 2 times to ten times, still more particularly 2 times to six times, still more particularly 2 times to six times, still more particularly 2 times to four times.
7. The method of claim 6 wherein the target of desired SES is 2 times or four times.

8. (deleted)

9. A sucrose equivalent sweetness enhanced sweetener containing at least sucrose and at least one high intensity sweetener with cane sugar like crystalline appearance, free flowing, non-dusty and with uniform sweetness in each 6 gram portion having defined "Sucrose Equivalent Sweetness", abbreviated as SES, that is precisely an integer or a whole number without a fraction or any other pre-defined SES.

10. The sweetener composition of claim 5 or claim 9 wherein the SES comprises 2 times to 100 times, more particularly 2 times to 10 times, still more particularly 2 times to 8 times, still more particularly 2 times to 6 times, still more particularly 2 times to 4 times.

11. The sweetener composition of claim 10 having SES of 2 times or 4 times.

12. A method of claim 1 of making a sucrose equivalent sweetness enhanced sweetener wherein the high intensity sweetener is sucralose.

13. A sucrose equivalent sweetness enhanced sweetener of claim 9 wherein the high intensity sweetener is sucralose.

14. A method of claim 1 of making a sucrose equivalent sweetness enhanced sweetener with cane sugar like crystalline appearance of wherein drying of the moist co-crystallized mass is done without separation of mother liquor.

15. The method of claim 13 of making a sucrose equivalent sweetness enhanced sweetener with cane sugar like crystalline appearance, free

AMENDED SHEET (ARTICLE 19)
flowing, non-dusty and with uniform sweetness in each 6 gram portion having pre-determined target of "Sucrose Equivalent Sweetness" abbreviated as SES, comprising steps of

a. dissolving the high intensity sweetener in step a. of claim 1 in a quantity that is calculated to exactly give the desired sweetness in the co-crystallized mass, and

b. drying the co-crystallized mass without separating the mother liquor.
STATEMENT UNDER ARTICLE 19(1) (RULE 46.4)

FOR PCT/IB2012/001064

The applicant humbly presents his response to Re Item Box no. II and V in the Written Opinion of the International Searching Authority.

Claim 1 is amended to insert "without a step of concentration under reduced pressure". This amendment is supported by entire "as filed" specification in general and by lines 22 and 23 on page 23.

The phrase "after the step of co-crystallization during further steps of the process," has been deleted from claim 1. This deletion is supported by the "as filed" specification throughout, particularly on page 23 line 24 to page 24 line 1.

Word "and" has been added in claim 1 sub-claim (a.) to improve the construction for the purpose of greater clarity.

The phrase "with or without the separation of mother liquor" has been deleted from sub-claim (b.) of claim 1 and "separating mother liquor and" has been added at beginning of the same sub-claim. Thus, the added phrase is derived from the "as filed" same sub-clause. The deleted element of "without" (separation of mother liquor) has been made subject matter of new claim 14 which depends on claim 1. Consistent to the new claim 14, the "as filed" claim 8 that was dependent on the feature of "without" deleted from claim 1 has been deleted and made subject matter of a new claim 15 that depends on claim 14.

Letter "a" has been deleted from claim 9, since it is redundant.

Claim 1 has been amended to insert ", in an aqueous solvent," in sub-claim a. so as to insert an antecedent to a mention of "said" aqueous solvent in claim 3. This amendment is supported by entire "as filed" specification in general and in particular by lines 15-20 on page 21, line 22 of page 24.
Claim 2 has been amended to add letter "r" to the word "highe", which is a
correction of an obvious mistake.

Regarding lack of step c. in claim 1, claim 5 is amended to delete the expression
"c." and replace it by "b.".

Regarding incorrect dependencies of claims 10 and 11, the dependency of claim
10 is corrected to "5 or claim 9" and that of claim 11 is corrected to "10".

Further, claim 10 is corrected to delete "6" and replace it with "8", which is
consistent to the logic of progression of the ranges recited within claim 10. The
phrase "still more particularly 2 times to 6" has been repeated two times within
the claim 10, which is an obvious mistake, since looking at the progression of
range of SES recited in this claim, it is apparent to a person skilled in the art that
the first of the recitation should have been "still more particularly 2 times to 8"
instead of "still more particularly 2 times to 6". This is consistent to laws of
Interpretation of Statutes; a patent specification is the law of the relevant
invention.

Claim 13 is amended to insert a space.

Thus, all amendments are fully supported by "as filed" specification and no new
matter has been added.

With the amendments and explanations given in the informal response, the
applicants believe that objections of the Hon. ISR Authority mentioned in Box.II
and V are overcome and the claims meet the requirements of Articles 33(2) and
33(3) PCT.

There may be a need to amend the description.