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[KR/KR]; 106-906, Doosan APT., Bugahyeon 2-dong, Seodaemun-gu, Seoul 120-795 (KR).

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(74) Agent: AIP PATENT & LAW FIRM; Shinwon Bldg. 8F, 823-14, Yeoksam-dong, Gangnam-gu, Seoul 135-933 (KR).

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(71) Applicant (for all designated States except US): CJ CHEILJEDANG CORP. [KR/KR]; 500, Namdaemunno 5-ga, Jung-gu, Seoul 100-749 (KR).

(72) Inventors; and

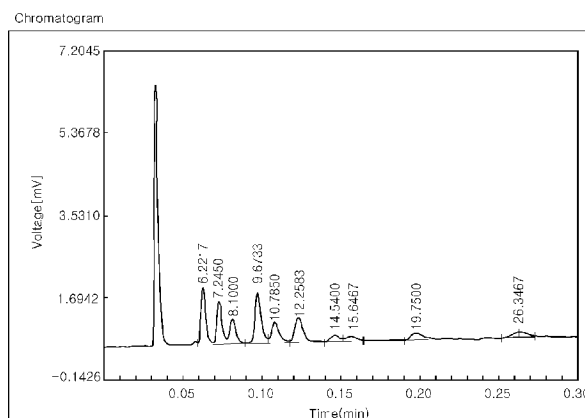
(75) Inventors/Applicants (for US only): JEE, Ho Soon [KR/KR]; 101-801, Hyundai Hanjin APT., Hwaseo-dong, Paldal-gu, Suwon-si, Gyeonggi-do 442-150 (KR). KIM, Sung [KR/KR]; 201, Seochon Villa, 318-7, Hongje 1-dong, Seodaemun-gu, Seoul 120-859 (KR). LEE, Min Hyun [KR/KR]; 503-202, Soejae Maeul APT., Geumchon 2-dong, Paju-si, Gyeonggi-do 413-773 (KR). KIM, Tae Jong [KR/KR]; 1-412, Shindonga APT., Seocho 2-dong, Seocho-gu, Seoul 137-772 (KR). LIM, Chun Son

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[Continued on next page]

(54) Title: FRUCTOOLIGOSACCHARIDE COMPOSITION FOR RAW MATERIAL OF ICE CREAM, A METHOD OF PREPARING THE SAME, AND ICE CREAM COMPRISING THE SAME

[Fig. 1]



(57) Abstract: The present invention relates to a fractooligosaccharide for raw material of ice cream, method of preparing the fractooligosaccharide, and ice cream comprising the fractooligosaccharide, and the fractooligosaccharide composition according to the present invention comprises 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to 10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose, and 15 to 20% by weight of maltopentaose, based on the total weight of the composition. The foregoing fractooligosaccharide composition according to the present invention is obtained by immobilizing a fructosyltransferase from the genus *Aureobasidium* sp. to a carrier, charging the immobilized fructosyltransferase into a column, and passing a mixture of starch syrup and sugar through the column.

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Description

FRUCTOOLIGOSACCHARIDE COMPOSITION FOR RAW MATERIAL OF ICE CREAM, A METHOD OF PREPARING THE SAME, AND ICE CREAM COMPRISING THE SAME

Technical Field

- [1] The present invention relates to a noble fructooligosaccharide composition for raw material of ice cream and a method of preparing the same. The fructooligosaccharide composition according to the present invention comprises 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to 10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose, and 15 to 20% by weight of maltopentaose, based on the total weight of the composition.
- [2] Further, the present invention relates to ice cream prepared by using the fructooligosaccharide composition as raw material.
- [3] Furthermore, the present invention relates to a method of preparing a fructooligosaccharide composition, comprising steps of charging immobilized fructosyltransferase into a column after immobilizing the fructosyltransferase from the genus *Aureobasidium* sp. to a carrier and passing a mixture of starch syrup and sugar through the column to produce the fructooligosaccharide composition.

[4]

Background Art

- [5] Fructooligosaccharides are presently widely being applied to food and beverage, confectionery, health food and the like due to functionalities of functional low calorie, a factor for proliferation of lactobacilli and bifidobacteria, improving of intestinal microbial flora, inhibiting the growth of harmful bacteria, improving defecation nature, enhancing immunity and etc. along with oligosaccharides already known (see Korean Patent Registration No. 411508; the Korean Patent Registration and following references are herein incorporated by reference in its entirety). In particular, United States Patent No. 5,827,526 discloses that ingesting fructooligosaccharides from 0.5 to 5 g per day results in an effect of inhibiting diarrhea, and Korean Patent Publication No. 2000-57520 discloses that fructooligosaccharides and galactooligosaccharides which were produced in mixture with various edible components effectively revealed an intestinal cleaning effect by improving intestinal flow to render a state of the flow good over other oligosaccharides. Further, a study for applying fructooligosaccharides to a diet for diabetics is actively considered since the fructooligosaccharides induce proliferation of *Lactobacillus bifidus* among enterobacteria of the human body

resulting in excellent defecation activity, don't influence blood glucose upon ingestion and are resistant to decomposition by digestive enzymes. In addition, action of reducing cholesterol in blood and liver has been shown, and thus a study on the action is also in progress.

[6] A conventional method of producing fructooligosaccharides is by using microorganisms which produce fructosyltransferase. For instance, there are methods by using *Aspergillus niger*, the genus *Penicillium* sp. or the genus *Fusarium* sp. However, fructooligosaccharides prepared by using the conventional methods had low freezing point and poor shape retention property to make ice cream melt down rapidly at ambient temperature, and thus it has been difficult to apply the fructooligosaccharides to preparation of the ice cream. Accordingly, the fructooligosaccharides have hardly been used as raw material for the ice cream.

[7] As such, a fructooligosaccharide composition suitable for raw material of ice cream during preparation of the ice cream has not been described in any documents of the prior art.

[8]

Disclosure of Invention

Technical Problem

[9] The present invention is conceived to solve the problems in the prior art.

[10] An object of the present invention is to overcome a demerit that the conventional fructooligosaccharides are difficult to apply to ice cream and to provide an improved fructooligosaccharide composition which is suitable for using as raw material of the ice cream wherein the fructooligosaccharide composition has a higher freezing point than sugar and reinforced texture to maintain shape retention property even at ambient temperature.

[11] Another object of the present invention is to provide ice cream which not only contains the above-described fructooligosaccharide composition having several advantageous health effects instead of or in addition to conventional saccharides used in the ice cream, but also, due to this, is easily scoopable by an ice cream scoop and does not have biased water in the ice cream such that the ice cream is excellent in the aspect of merchantability.

[12]

Technical Solution

[13] According to the present invention for achieving the objects, there is provided a fructooligosaccharide composition suitable for using as raw material of ice cream characterized in that the composition comprises 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to

10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose, and 15 to 20% by weight of maltopentaose, based on the total weight of the composition.

- [14] The composition of the present invention is prepared by performing the steps of charging immobilized fructosyltransferase into a column after immobilizing the fructosyltransferase from the genus *Aureobasidium* sp. to a carrier and passing a mixture of starch syrup and sugar at a mass ratio of 1:0.5 to 1:2 through the column to produce a fructooligosaccharide composition.

[15]

Advantageous Effects

- [16] According to the present invention, there is an advantage in that the present invention is capable of providing ice cream having excellent quality wherein an unique fructooligosaccharide composition of the present invention is used as raw material of the ice cream so as to impart an effect of the bulking agent while giving a sweet taste to the ice cream, to maintain shape retention property at ambient temperature, and to maintain texture of the ice cream that is scoopable by an ice cream scoop.

- [17] Furthermore, a fructooligosaccharide composition according to the present invention is not only beneficial to health by helping proliferation of probiotics such as bifidobacteria, but also is very suitably used as raw material of the ice cream by preventing water in the ice cream from being biased and increasing viscosity of the ice cream.

[18]

Brief Description of Drawings

- [19] Fig. 1 illustrates a result of HPLC (High Performance Liquid Chromatography) of a fructooligosaccharide composition prepared according to one embodiment of the present invention.

- [20] Fig. 2 illustrates a device used for measuring the hardness of ice cream prepared in the present invention.

[21]

Best Mode for Carrying out the Invention

- [22] Hereinafter, preferred embodiments of the present invention will be described with reference to the accompanying drawings. In the following description, details on specific techniques for known functions and constitutions may be omitted to avoid unnecessarily obscuring the subject matter of the present invention. The terms used herein are terms defined in consideration of functions in the present invention and may vary according to intentions or practices of users or operators. Thus, the definitions of the terms should be determined on the basis of the description throughout the speci-

fication.

- [23] In the present invention, a fructooligosaccharide composition refers to a viscous phased liquid which has a sweet taste similar to that of starch syrup, has a higher freezing point than sugar, and is prepared to be applicable to a hard ice cream having reinforced texture.
- [24] Corresponding saccharides as important factors influencing physical properties of the ice cream are called as bulk sweeteners which impart volume sense. Meanwhile, they should impart a sweet taste to the ice cream and increase the solid content of the ice cream while maintaining the texture of the ice cream. Representative examples of such saccharides may include sugar, fructose, starch syrup, maltodextrin, maltitol, sorbitol, lactitol and the like, and water-soluble dietary fibers such as polydextrose, indigestible dextrin and the like are also used as a bulking agent giving the volume sense.
- [25] However, there are many saccharides of which shape retention property is hardly maintained even during a short period of time at the ambient temperature since the saccharides have relative low freezing points although the saccharides have a sweet taste. Examples thereof may include liquid fructose and sugar alcohols such as sorbitol, maltitol, erythritol and the like. Although examples of an additive capable of maintaining the shape retention property may include starch syrup, maltodextrin, polydextrose, and indigestible dextrin, the additives are known to be volume-increasing bases which are mixed with sugar before using since the additives generally have a weak or little sweet taste.
- [26] Although conventional fructooligosaccharides have freezing points similar to a freezing point of sugar, it is difficult to maintain the shape retention property due to their low viscosity. Therefore, it is a clear trend that the conventional fructooligosaccharides have not been adopted in the ice cream.
- [27] The present invention designed composition of saccharides in the ice cream such that fructooligosaccharides would be very suitable as material of the ice cream by improving demerits of conventional fructooligosaccharides to impart bulk-increasing effect and hardness to the fructooligosaccharides. Further, functionality of increasing intestinal microflora is also given to the fructooligosaccharides such that functional carbohydrate materials should be applied to the ice cream.
- [28] An important factor in the ice cream is to maintain texture of the shape retention property which enables the ice cream to be scoopable by the ice cream scoop, wherein although the texture is influenced by a drop in the freezing point, approximately hard texture is influenced by an ice nucleation crystal formed at predetermined temperature. Therefore, it is preferable that the texture of the ice cream has a hardness lower than that of sugar, based on the hardness of the sugar. However, in view of the fact that monosaccharides such as fructose, glucose, or the like have a freezing point lower than

that of sugar, and sugar alcohols such as maltitol would not generate an ice nucleation crystal resulting in the formation of an excessively soft ice cream, the fructooligosaccharides have a freezing point lower than that of sugar and a high factor of making ice cream soft in which an ice nucleation is not formed well. Therefore, the fructooligosaccharides seem to be carbohydrates in which the excessively soft texture may cause a problem when scooping up the ice cream.

[29] Accordingly, the present invention is characterized in that a mixture of starch syrup and sugar is used as raw sugar, and the present invention provides a fructooligosaccharide composition obtained by conversion of the mixture of starch syrup and sugar with immobilized fructosyltransferase, a fructooligosaccharide converting enzyme. The composition is a liquid carbohydrate having the composition of saccharides of 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to 10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose, and 15 to 20% by weight of maltopentaose, wherein such fructooligosaccharide composition is applied to the ice cream to provide ice cream having improved shape retention property.

[30] In a first embodiment of the present invention, a method of preparing a fructooligosaccharide composition according to the present invention comprises steps of charging immobilized fructosyltransferase into a column after immobilizing the fructosyltransferase from the genus *Aureobasidium* sp. to a carrier and passing a mixture of starch syrup and sugar through the column to produce the fructooligosaccharide composition. Thereafter, a fructooligosaccharide composition having a solid content of 75% by weight or more can be obtained by filtering, decolorizing, ion-refining, and concentrating the fructooligosaccharide composition, and the resulting fructooligosaccharide composition is used as raw material of the ice cream to provide ice cream with improved hardness. As long as the strains of the genus *Aureobasidium* sp. are a strain producing the fructosyltransferase, the strains of the genus *Aureobasidium* sp. are not particularly limited, and strains of the genus *Aureobasidium* sp. that are well known to those skilled in the art may be used in the present invention. For instance, the examples of the strains of the genus *Aureobasidium* sp. may include *Aureobasidium pullulans*, *Aureobasidium bolleyi*, *Aureobasidium caulivolum*, and the like.

[31] In a second embodiment of the present invention, a fructooligosaccharide composition according to the present invention, based on the total weight of the present composition, comprises 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to 10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose,

and 15 to 20% by weight of maltopentaose.

[32] Such fructooligosaccharide composition of the present invention has various merits compared to conventional saccharides of the ice cream by overcoming a demerit that it is difficult to apply the fructooligosaccharide composition to the ice cream, helping proliferation of probiotics such as bifidobacteria, reinforcing the texture of the ice cream wherein shape retention property thereof is difficult to be maintained at ambient temperature, and enabling the ice cream to be scoopable easily by an ice cream scoop.

[33] Furthermore, the fructooligosaccharide composition has a higher freezing point than sugar, can also serve as a bulking agent, and enables the ice cream to be stably fixed such that water in the ice cream is prevented from being biased.

[34] In the first embodiment, the fructose transferase enzyme immobilized to the carrier is charged into the column after immobilizing the fructose transferase enzyme called as fructosyltransferase from the strain of the genus *Aureobasidium* sp. to a carrier in order to prepare a fructooligosaccharide composition.

[35] Thereafter, the fructooligosaccharide composition is obtained by continuously passing the carbohydrate to react through the column at a concentration of 60% or higher for 6 hours, at a pH of 4.0 to 6.0, preferably 5.0 to 6.0, more preferably 5.5 and a temperature of 40 to 60 °C and preferably 55°C wherein the carbohydrate is obtained by mixing starch syrup with sugar at a weight ratio of 1:0.5 to 1:2, preferably 1:1. The fructooligosaccharide composition obtained through such preparation method is a unique composition having the composition of saccharides of 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to 10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose, and 15 to 20% by weight of maltopentaose.

[36] In a third embodiment of the present invention, hard ice cream comprising the above-mentioned fructooligosaccharide composition is provided, and the ice cream can be completed by performing an ice cream preparation process which is generally well known to those skilled in the art, e.g., a process of mixing sugar, a fructooligosaccharide composition, skim milk powder(if milk solids are necessary), butter (if milk fat content is necessary), fruit juice concentrate, flavor, acidulant, water and emulsifier, and sterilizing and homogenizing the mixture followed by freezing, molding and curing the mixture.

[37] A fructooligosaccharide composition prepared by such a method shows the significantly improved hardness.

[38]

Mode for the Invention

[39] Hereinafter, specific examples will be described to help understanding of the present

invention although the following examples are provided for illustrative purposes only, and the scope of the present invention should not be limited thereto in any manner.

[40]

[41] [Example 1] Preparation of a fructooligosaccharide composition

[42] 1,000 ml of a solution having a solid content of 60% was prepared by hydrolyzing starch with α -amylase, filtering the hydrolyzed starch, decolorizing the filtered starch, and then ion refining the decolorized starch to prepare a low saccharified starch syrup, and mixing white sugar with a solution containing 30% of the low saccharified starch syrup to dissolve white sugar into the solution. Separately, the fructosyltransferase enzyme was immobilized to an Agar carrier after cultivating *Aureobasidium pullulans* strain (*Aureobasidium* L-48 KFCC-10245) and separating a fructosyltransferase enzyme included in the strain therefrom. After charging 360 ml of the enzyme into a stainless steel tube of which a diameter to height ratio is 1:4 with pH of an undiluted solution of 5.5 and the liquid temperature of 55°C as operating conditions, the enzyme was flown into the stainless steel tube at a flow rate of 1.0 ml/min while in contact with the charged immobilized enzyme. 960 ml of resulting liquid material having a solid content of 58% was obtained after 16 hours since the enzyme had been in contact with the immobilized enzyme for total 6 hours. The composition of saccharides in the resultant solid contained in the liquid material was analyzed using an HPLC (High Performance Liquid Chromatography), and the composition was analyzed twice using an oligosaccharide analysis method of Korean Food Standards Codex. As a result of the analysis, a liquid composition having the composition of saccharides, based on the solid content, of 12% by weight of glucose, 7% by weight of sugar, 3% by weight of maltose, 12% by weight of kestose, 9% by weight of maltotriose, 14% by weight of nystose, 22% by weight of maltotetraose, and 21% by weight of maltopentaose was obtained.

[43] Such a fructooligosaccharide composition obtained as in the example 1 is a product intentionally obtained to apply the composition to ice cream.

[44] The present invention conceived saccharides for ice cream which imparted an effect of the bulking agent while giving a sweet taste to the ice cream, maintained shape retention property at ambient temperature, and maintained texture that enables the ice cream to be scoopable by an ice cream scoop with using a fructooligosaccharide composition as raw material of the ice cream after preparing the fructooligosaccharide composition. Methods of preparing the ice cream using the fructooligosaccharide composition as principal raw material of the ice cream were applied in the following examples.

[45]

[46] [Example 2] Application example of the fructooligosaccharide composition to ice

creams

[47] The present application example is an example of ice creams having standards of 6% or more of a milk fat content and 16% or more of total milk solid.

[48] Ice cream formulations having a solid content of 31% and a milk fat content of 8% were prepared by mixing skim milk powder as milk material and processed butter for the addition of milk fat into sugar for basically giving a sweet taste to prepare a mixture, adding a bulking agent and a fructooligosaccharide composition for the maintenance of shape retention property to the mixture to prepare raw material, and adding water to the raw material to dissolve and disperse the raw material. Emulsifier for emulsifying the milk fat and the water and thickening was added thereto. After mixing all formulations except flavor, the formulations were mixed for 20 minutes by using a high speed mixer such that the formulations could be homogenized. After performing the mixing step, the formulations were sterilized in a low temperature sterilizer at 75 °C for 20 minutes. After sterilizing the formulations at low temperature, the sterilized formulations were homogenized at 1700 psi by using a homogenizer, and the homogenized formulations were cooled to 4°C by using a cooling plate. After adding flavors such as vanilla flavor to the cooled formulations and mixing them well, the formulations were aged for one hour. The ice cream formulations were frozen to prepare samples using Tayler Freezer set at -6 °C with the overrun extent thereof controlled to 100%. The samples were completed through the freezing and aging processes by taking the samples into plastic containers with lids, putting the plastic containers containing the samples into a rapidly cooling freezer of which temperature was set at -30 °C to subject the samples to the curing process, and then storing the samples for five days in a state that the samples had been cured. Hardness values of ice creams were measured on the completed samples by using a texture measuring instrument. Also, hardness values of the samples were measured after preparing the samples by injecting starch syrup, fructooligosaccharide, sorbitol syrup, or maltitol syrup in same quantity, respectively, based on the same water content thereof.

[49]

[50] Table 1

[Table 1]

[Table]

Application example of the fructooligosaccharide composition to ice creams

Raw Materials	#1	#2	#3	#4	#5
White sugar	12.2	12.2	12.2	12.2	12.2
Fructooligosaccharide composition	9.2	-	-	-	9.2
Starch Syrup	-	9.2	-	-	-
Fructooligosaccharide	-	-	9.2	-	-
Sorbitol Syrup	-	-	-	9.2	-
Maltitol Syrup	-	-	-	-	9.2
Processed butter	10.6	10.6	10.6	10.6	10.6
Skim milk Powder	9.2	9.2	9.2	9.2	9.2
Emulsifier	0.5	0.5	0.5	0.5	0.5
Vanilla flavor	0.1	0.1	0.1	0.1	0.1
Water	58.2	58.2	58.2	58.2	58.2
Total	100.0	100.0	100.0	100.0	100.0

[51]

[52] [Example 3] Application example of the fructooligosaccharide composition to ice milks

[53] The present application example is an example of ice milks having standards of 2% or more of a milk fat content and 7% or more of total milk solid.

[54] Ice milk formulations having a solid content of 31% and a milk fat content of 8% were prepared by mixing powdered skim milk as milk material and processed butter for the addition of milk fat into sugar for basically giving a sweet taste to prepare a mixture, adding a bulking agent and a fructooligosaccharide composition for the maintenance of shape retention property to the mixture to prepare raw material, and adding water to the raw material to dissolve and disperse the raw material. Emulsifier for emulsifying the milk fat and the water and thickening was added thereto. After mixing all formulations except flavor, the formulations were mixed for 20 minutes by using a high speed mixer such that the formulations could be homogenized. After performing the mixing step, the formulations were sterilized in a low temperature sterilizer at 75 °C for 20 minutes. After sterilizing the formulations at low temperature, the sterilized formulations were homogenized at 1900 psi by using a homogenizer, and

the homogenized formulations were cooled to 4 °C by using a cooling plate. After adding flavors such as vanilla flavor to the cooled formulations and mixing them well, the formulations were aged for one hour. The ice milk formulations were frozen to prepare samples using Tayler Freezer set at -6 °C with the overrun extent thereof controlled to 100%. The samples were completed through the freezing and aging processes by taking the samples into plastic containers with lids, putting the plastic containers containing the samples into a rapidly cooling freezer of which temperature was set at -30 °C to subject the samples to the curing process, and then storing the samples for five days in a state that the samples had been cured. Hardness values of ice milks were measured on the completed samples by using a texture measuring instrument. Also, hardness values of the samples were measured after preparing the samples by injecting starch syrup, fructooligosaccharide, sorbitol syrup, or maltitol syrup in same quantity, respectively, based on the same water content thereof.

[55]

[56] Table 2

[Table 2]

[Table]

Application example of the fructooligosaccharide composition to ice milks

Raw Materials	#1	#2	#3	#4	#5
White sugar	12.5	12.5	12.5	12.5	12.5
Fructooligosaccharide composition	7.9	-	-	-	-
Starch syrup	-	7.9	-	-	-
Fructooligosaccharide	-	-	7.9	-	-
Sorbitol syrup	-	-	-	7.9	-
Maltitol syrup	-	-	-	-	7.9
Processed butter	4.0	4.0	4.0	4.0	4.0
Skim milk powder	6.6	6.6	6.6	6.6	6.6
Emulsifier	0.5	0.5	0.5	0.5	0.5
Vanilla flavor	0.1	0.1	0.1	0.1	0.1
Water	68.4	68.4	68.4	68.4	68.4
Total	100.0	100.0	100.0	100.0	100.0

[57]

[58] [Example 4] Application example of the fructooligosaccharide composition to frozen

desserts

[59] The present formulations are application examples of frozen desserts which do not include milk material.

[60] Sugar for giving a sweet taste, a fructooligosaccharide composition for giving chewy taste and shape retention property, and an orange concentrate for giving orange taste were mixed to prepare raw materials. Water was added into the raw materials so as to dissolve and disperse the raw materials, to prepare formulations for orange-tasted frozen desserts having a solid content of 23%. An emulsifier was added into the frozen dessert formulations to thicken the formulations, suppress the formation of ice crystals, and reinforce shape retention property of products, etc..

[61] After mixing and dissolving the formulations, the formulations were mixed for 20 minutes by using a high speed mixer such that the formulations could be homogenized. After performing the mixing step, the formulations were sterilized in a low temperature sterilizer at 75 °C for 20 minutes. After sterilizing the formulations at low temperature, the sterilized formulations were homogenized at 1700 psi by using a homogenizer, and the homogenized formulations were cooled to 4 °C by using a cooling plate. After adding orange flavor and acidulants such as citric acid into the cooled formulations and mixing them well, formulation mixtures were aged for one hour. After pouring the aged mixtures into rectangular ice cream molds and keeping the mixtures for 30 minutes in a rapidly cooling freezer of which temperature was set at -30 °C to subject the mixtures to the curing process, samples were completed through the freezing and aging processes by storing the mixtures for five days in a state that the mixtures had been cured. Hardness values of the frozen desserts were measured on the completed samples by the same method as in the example 2. Hardness values of the samples were measured after preparing samples by replacing the fructooligosaccharide formulation of the raw materials with starch syrup, fructooligosaccharide, sorbitol syrup, or maltitol syrup.

[62]

[63] Table 3

[Table 3]

[Table]

Application example of the fructooligosaccharide composition to frozen desserts

Raw Materials	#1	#2	#3	#4	#5
White sugar	12.7	12.7	12.7	12.7	12.7
Fructooligosaccharide composition	7.2	-	-	-	-
Starch syrup	-	7.2	-	-	-
Fructooligosaccharide	-	-	7.2	-	-
Sorbitol syrup	-	-	-	7.2	-
Maltitol syrup	-	-	-	-	7.2
Orange concentrate	8.6	8.6	8.6	8.6	8.6
Dextrin	1.7	1.7	1.7	1.7	1.7
Citric acid crystal	0.1	0.1	0.1	0.1	0.1
Emulsifier	0.3	0.3	0.3	0.3	0.3
Orange flavor	0.3	0.3	0.3	0.3	0.3
Water	69.1	69.1	69.1	69.1	69.1
Total	100.0	100.0	100.0	100.0	100.0

[64]

[65] [Example 5] Hardness measurement of samples

[66] Referring to Fig. 2, the following device was conceived in order to test measuring methods suitable for the hardness measurement on ice creams, ice milks, and frozen desserts during actual product distribution.

[67] After applying a pressing force to samples which were subjected to the freezing and aging processes at 25 °C using a weight of 700 g, heights of the samples were measured over the time to measure bearing power and harness of the products during the distribution of each of the samples.

[68] The results of the product hardness measured through the example are represented in the following table, wherein the height is in centimeter.

[69]

[70] Table 4

[Table 4]

[Table]

Hardness measurement results of ice creams

Time (minute s)	#1 (Fructooligosaccharid e composition)	#2(Starch syrup)	#3(Fructooligosacc haride)	#4(Sorbit ol syrup)	#5(Maltito l syrup)
0	30	30	30	30	30
8	27	27	22	23	26
10	24	25	19	20	25
12	23	22	15	18	23
14	20	19	14	15	19
16	18	17	11	12	18
18	17	15	-	11	16
20	15	13	-	-	15
22	13	11	-	-	11
24	10	-	-	-	-
26	-	-	-	-	-

[71]

[72] Table 5

[Table 5]

[Table]

Hardness measurement results of ice milks

Time (minutes)	#1 (Fructooligosaccharide composition)	#2(Star h syrup)	#3(Fructooligosac charide)	#4(Sorbitol syrup)	#5(Maltito l syrup)
0	30	30	30	30	30
8	29	30	29	27	29
10	27	28	25	24	26
12	25	26	21	20	23
14	24	23	18	16	21
16	20	20	14	14	18
18	17	17	11	10	17
20	16	14	-	-	13
22	13	13	-	-	11
24	11	-	-	-	-
26	-	-	-	-	-

[73]

[74] Table 6

[Table 6]

[Table]

Hardness measurement results of frozen desserts

Time (minutes)	#1 (Fructooligosaccharide composition)	#2(Starch syrup)	#3(Fructooligosaccharide)	#4(Sorbitol syrup)	#5(Maltitol syrup)
0	30	30	30	30	30
8	30	30	25	25	30
10	29	30	22	20	28
12	27	28	19	14	25
14	26	26	15	11	22
16	23	22	14	-	20
18	21	19	11	-	17
20	17	15	-	-	14
22	15	12	-	-	12
24	14	-	-	-	11
26	10	-	-	-	-
28	-	-	-	-	-

[75]

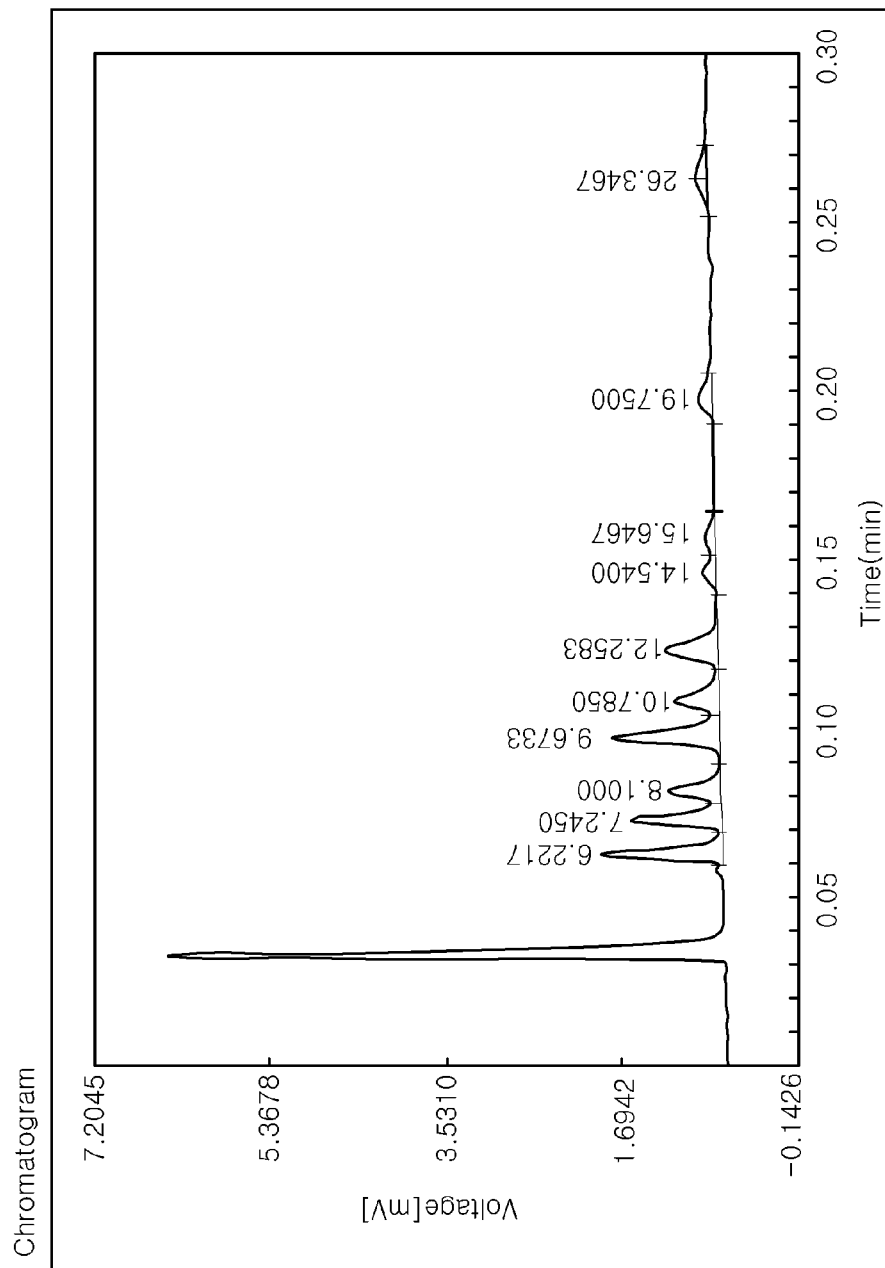
[76]

Hardness values of starch syrup, fructooligosaccharide, sorbitol, maltitol, and fructooligosaccharide composition were measured through the foregoing examples result in fructooligosaccharide composition > starch syrup > maltitol > fructooligosaccharide > sorbitol, wherein the hardness values were measured using an ice cream-hardness measuring instrument of Fig. 2. Therefore, the present invention provides an improved fructooligosaccharide composition capable of being applied to ice creams. In particular, it could be confirmed that hardness values of the ice creams could be significantly improved by using the fructooligosaccharide composition of the present invention.

Claims

- [1] A method of preparing a fructooligosaccharide composition comprising steps of charging immobilized fructosyltransferase into a column after immobilizing the fructosyltransferase from the genus *Aureobasidium* sp. to a carrier and passing a mixture of starch syrup and sugar through the column to produce the fructooligosaccharide composition.
- [2] The method as claimed in claim 1, wherein a mass weight of the starch syrup and the sugar is 1:0.5 to 1:2.
- [3] The method as claimed in claim 1 or 2, wherein the column has a pH of 5.0 to 6.0 and a temperature of 40 to 60 °C.
- [4] The method as claimed in claim 1 or 2, further comprising the steps of filtering, decolorizing, ion-refining, and concentrating the resulting fructooligosaccharide composition.
- [5] A fructooligosaccharide composition for raw material of ice creams comprising 10 to 12% by weight of glucose, 7 to 8% by weight of sugar, 2 to 3% by weight of maltose, 12 to 14% by weight of kestose, 9 to 10% by weight of maltotriose, 12 to 14% by weight of nystose, 20 to 25% by weight of maltotetraose, and 15 to 20% by weight of maltopentaose, based on the total weight of the composition.
- [6] Ice cream comprising the fructooligosaccharide composition according to claim 5.
- [7] A fructooligosaccharide composition for raw material of ice creams, which is prepared by the method according to claim 1.

[Fig. 1]



[Fig. 2]

