

BUCKWHEAT STARCH SYRUP IN A POWDER FORM
AND METHOD FOR PREPARING THE SAME

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a buckwheat starch syrup in a powder form prepared by liquefying and spray-drying starch from buckwheat flour, as well as a method for preparing the same.

2. Description of the Prior Art

As raw materials for preparing starch syrups, there have been used various kinds of starch from corn, potato, sweet potato, tapioca, wrinkle-seeded pea, wheat, arrowroot, sago palm, rice, etc. Starch syrups are viscous, sweet materials prepared by decomposing and saccharifying the starch of these raw materials with saccharifying enzymes. They are widely used in candy products, such as caramels, drops and jellies; Japanese-style confections, such as bean jams and sweet jellies of beans; and other foods, such as jams, syrups and foods boiled down in soy sauce.

Recently, with a growing attention to health in society, maltoligosaccharides, branched oligosaccharides, sugar alcohols, etc. have attracted attention from the viewpoints of growing *Lactobacillus bifidus* in the testines, lowering sweetness and calory, preventing tooth decay, and so forth. In order to obtain a starch syrup which significantly contains these saccharides, various investigations have been made into the kinds and combinations of enzymes to be added at the time of



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saccharification. However, these investigations have intended only to improve the saccharide components in starch syrups. Among the starch syrups made from the above-mentioned raw materials, no syrup is known to contain any effective component having value added. In other words, they have no characteristics in those components other than saccharides. Furthermore, with respect to raw material starch, nothing has been reported except for the above-mentioned materials which have been conventionally used.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide, using a novel raw material starch not reported so far, a powder form starch syrup which is excellent in nutritive balance with respect to various amino acids and minerals, and thus good for health.

The present inventors have made an intensive study toward the solution of the above assignment, and given attention to "soba" (buckwheat noodles) which is a Japanese traditional food. As a result, the inventors have found that a powder form buckwheat starch syrup prepared by liquefying starch from buckwheat flour contains various amino acids and minerals, as well as rutin contained in buckwheat flour which is effective in preventing arteriosclerosis. Thus, the buckwheat starch syrup is found to be very healthy in components and excellent in nutritive balance. The present invention has been achieved with these findings.

The present invention relates to a powder form buckwheat starch syrup prepared by liquefying and spray-drying starch from buckwheat flour, as well as a method for preparing the same.

BRIEF DESCRIPTION OF DRAWINGS

Fig. 1 is a chart showing the results of analysis of the powder form buckwheat starch syrup of the present invention by HPLC chromatography.

DETAILED DESCRIPTION OF THE INVENTION

Described below are preferred embodiments of a method for preparing the powder form buckwheat starch syrup of the present invention.

Generally, it is preferred that the raw material starch for a starch syrup contain as little protein as possible from the viewpoint of filtration and other treatment. Buckwheat flour is classified into surface layer flour, outside layer flour, inside layer flour, and whole layer flour containing the former three, according to the portion of buckwheat seeds ground into flour. In the present invention, not a whole layer flour having a high protein content but "*uchiko*" which is a flour mainly comprising medium layer flour is suitably used, since it has an extremely small protein content of about 3%. ("*Uchiko*" is a buckwheat flour used in the preparation of buckwheat noodles in order to prevent a dough from sticking on the board and the rolling pin.) In addition, roughly crushed buckwheat seeds ("*katsujitsu*") may also be used.

First, 2 - 3 volumes of water is added to the raw material buckwheat flour ("*uchiko*"), which is then mixed and swollen to thereby obtain a starch milk (B x 25 - 30). This starch milk is filtered to remove foreign substances, etc. The pH of the filtrate is adjusted at 5.0 - 6.0, and then a liquefying enzyme is added thereto to liquefy the filtrate.

As the liquefying enzyme to be used in this procedure, α -amylase is used. For example, Neospeedase manufactured by NAGASE BIOCHEMICALS, LTD. is suitably used.

For the liquefying, the liquefying enzyme is added in an amount of 0.1 - 1.0% by weight based on the solid content of the starch stock solution, and the resultant mixture is left at 88 - 90°C for 1 - 2 hours.

At the completion of the liquefying, the starch sugar has a DE (dextrose equivalent) value of about 10 - 20.

In addition to the above-mentioned enzyme saccharification method, the liquefying of starch can also be performed by using an acid, such as oxalic acid.

After the completion of the liquefying reaction, the reaction solution is decolored with active carbon (granular carbon). Then, the solution is subjected to centrifugation or passed through a filter press to remove proteins as solid residue.

The above protein fraction recovered as solid residue is excellent in digestion, containing nutrient proteins, various amino acids, vitamins and minerals. Therefore, the protein fraction can be used as a food extender to be added to bean jams, dough for bread and cakes, etc. in contrast to the corresponding protein fraction from the conventional process using corn starch which has been used only as feed for chickens.

The solution so far treated is then dried with a spray dryer in which the temperature at the air-feeding state is set at 90 - 150 °C. The moisture in the solution has been removed in an instant and the resultant product is air-dried. Then, the temperature at the open state is set at 80 - 90 °C, and the product is recovered.

Thus, a desired buckwheat starch syrup in a powder form is obtained.

The thus obtained powder form buckwheat starch syrup of the present invention has a slight sweet taste and a fragrance, compared to conventional enzyme-saccharified starch syrups (the so-called "high-maltose starch syrup") having a strong sweet taste like sugar. When used in combination with concentrated products (condensed products, extracts, etc.) from milk, fruit, nuts, coffee, tea, or the like, the powder form buckwheat starch syrup of the present invention has an effect of reinforcing the tastes of these products.

The powder form buckwheat starch syrup thus obtained contains various oligosaccharides represented by maltose, maltotriose, maltotetraose and maltopentaose; various amino acids, such as arginine, alanine, glycine, glutamic acid and aspartic acid; minerals; vitamins and the like in good balance. Furthermore, it also contains rutin from buckwheat which is effective in improving the resistance of capillary vessels. Therefore, the powder form buckwheat starch syrup of the present invention is effective in preventing adult diseases, such as arteriosclerosis and hypertension, and yet it is excellent in nutritive balance. Thus, the syrup is very useful as a healthy food.

Utilizing the characteristic of bein powder, the buckwheat starch syrup of the present invention can be suitably used in various foods. For example, the powder form syrup may be used in ham and sausage as an extender, in creamy powder for coffee, in ice cream as a substitute for butterfat component, in various products from *sake* brewing, in fish flours (to be dusted over cooked rice),

in powder seasonings such as bouillon powder, in powder spices, in sauces for broiling and *teriyaki* and so on.

EFFECT OF THE INVENTION

According to the present invention, there is provided a buckwheat starch syrup in a powder form which contains various amino acids and minerals as well as rutin effective in preventing arteriosclerosis, and is thus healthy and excellent in nutritive balance. In addition, there is also provided a method for preparing the powder form buckwheat starch syrup.

PREFERRED EMBODIMENTS OF THE INVENTION

Now the present invention will be described in more detail with reference to Examples, which should not be construed to be limiting the scope of the present invention.

EXAMPLE 1

Preparation of Powder Form Buckwheat Starch Syrup

Two liters of water was added to 1 kg of raw material buckwheat flour ("*uchiko*"), which was then mixed and swollen to obtain a starch milk (B x 25 °). The pH of the starch milk was adjusted at 6.0, and 3 g of liquefying α -amylase (Neospeedase manufactured by NAGASE BIOCHEMICALS, LTD.) was added thereto. The resultant mixture was left at 90 °C for 2 hours for liquefying. At the completion of the liquefying, the starch sugar had a DE (dextrose equivalent) value of 20.

After the completion of the liquefaction reaction, the reaction solution was decolorized with active carbon (granular carbon), and then subjected to centrifugation or passed through a

filter press to remove proteins as solid residue. Next, the resultant solution was air-dried with a spray dryer (manufactured by Nicro) in which the temperature at the air-feeding state was set at 130 °C. Then, the temperature at the open state was set at 80 °C, and the resultant product was recovered. Thus, 200 g of a desired starch syrup in a powder form was obtained.

TESTING EXAMPLE 1

Characteristic and Component Analysis of

Powder Form Buckwheat Starch Syrup

The powder form buckwheat starch syrup obtained in Example 1 was analyzed on the following items.

(1) General component analysis and calory

Moisture content	2.6%
	(Heat-drying under reduced pressure)
Proteins *1)	0.8% (Kjeldahl method)
Lipids	0% (Soxhlet extraction)
Fiber	0% (Improved Henneberg-Stohmann method)
Ash	0.9% (Direct ashing)
Sugars 2)	95.7%
Energy *3)	386 kcal/100 g
Iron	0.29 mg/100 g (o-phenanthroline absorp- tometry)
Calcium	109 mg/100 g (Potassium permanganate volumetric analysis)
Potassium	128 mg/100 g (Atomic absorption spectrometry)

*1) Nitrogen/Protein conversion factor: 6.25

*2) Calculation formula: $100 - (\text{moisture content} + \text{proteins} + \text{lipids} + \text{fiber} + \text{ash})$

*3) Energy conversion factors:

proteins; 4

lipids; 9

carbohydrates (fiber + sugars); 4

(2) Sugar composition

(Analytical conditions)

HPLC

Equipment used: Tosoh SC-8020 System (manufactured by
Tosoh Corp.)

Column: Shodex SC-1011 (manufactured by Showa Denko K.K.)

8 ϕ x 300 mm

Eluent: Distilled water

Temperature: 70°C

Detection: Differential refractive index detector

RI-8020 (manufactured by Tosoh Corp.)

(Results)

Glucose	8.06%
Maltose	13.7%
Maltotriose	11.1%
Maltotetraose	7.72%
Maltopentaose	9.59%
Maltohexaose	13.4%

(3) Amino acid composition (Amino acid automatic analyzing method)

Arginine 5 mg/100 g

Lysine	1 mg/100 g
Histidine	1 mg/100 g
Phenylalanine	1 mg/100 g
Tyrosine	not detected
Leucine	not detected
Isoleucine	1 mg/100 g
Methionine	not detected
Valine	2 mg/100 g
Alanine	8 mg/100 g
Glycine	9 mg/100 g
Proline	not detected
Glutamic acid	11 mg/100 g
Serine	1 mg/100 g
Threonine	1 mg/100 g
Aspartic acid	4 mg/100 g

(4) Measurement of rutin content

(Method and analytical conditions)

(i) Preparation of test solution

1 g of test sample was accurately measured out and water was added thereto to give a 10 ml solution, which was used as a test solution.

(ii) HPLC chromatography

A 20 μ l standard solution of rutin (0.04 - 0.4 μ g rutin/ml water) was applied to HPLC chromatography and its working curve was prepared. Next, 20 μ l of the test solution was applied to HPLC chromatography and the rutin

concentration in the test solution was determined based on the working curve. Then, the rutin concentration in the test sample was calculated. The detection limit was set at 0.01 mg/100 g.

Equipment used: Model LC-10AS (manufactured by Shimadzu Seisakusho Ltd.)

Detector: UV Spectrophotometer SPD-10A (manufactured by Shimadzu Seisakusho Ltd.)

Column: YMC Pack ODS-A A-312

Mobile phase : 2.5 % Acetic acid-Mehtanol-Acetonitrile
(35:5:10 V/V/V)

Wave length: 360 nm

Flow rate : 1 ml/min

(Results)

Rutin : 0.20 mg/100 g

The analysis results (chart) by HPLC chromatography are shown in Fig. 1.

REFERENCE EXAMPLE

Component Analysis of Buckwheat Flour "*Uchiko*"

Moisture content	14.0%	(Drying method)
Sugars	82.1%	(100 minus other components)
Ash	0.3%	(Drying method)
Crude protein	3.6%	(Kjeldahl method)
Degree of whiteness	72	(Atomic absorption spectrometry)



What is claimed is:

1. A buckwheat starch syrup in a powder form prepared by liquefying starch from buckwheat flour and spray-drying the liquefied starch.
2. The buckwheat starch syrup in a powder form according to claim 1, wherein said buckwheat flour is "uchiko" which is a flour with a low protein content used in the preparation of buckwheat noodles in order to prevent a dough from sticking on the board and the rolling pin.
3. A method for preparing a buckwheat starch syrup in a powder form comprising liquefying starch from buckwheat flour and spray-drying the liquefied starch.

This Sheet Has Been Replaced

