Tentative Translation

JAS 0208

JAPANESE AGRICULTURAL

STANDARD

High fructose syrup and Sugar added high fructose syrup

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Ministry of Agriculture, Forestry and Fisheries

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Food and Agricultural Materials Inspection Center, Incorporated Administrative Agency

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Foreword

This Japanese Agricultural Standard has been revised by the Minister of Agriculture, Forestry and Fisheries through deliberations at the Council for the Japanese Agricultural Standards as the result of proposal for revision of Japanese Agricultural Standard submitted by Japan Starch and Sweeteners Industry Association and All Japan Starch Sweeteners Industry Association with the original bill being attached, based on the provision of Article 4, paragraph (1) of the Act on Japanese Agricultural Standards as applied mutatis mutandis pursuant to the provision of Article 5 of the Act. This edition replaces the previous edition of JAS for High fructose syrup and Sugar added high fructose syrup (JAS 0208:2019), which has been technically revised.

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JAPANESE AGRICULTURAL STANDARD JAS
(Tentative Translation) 0208 : 2024

High fructose syrup and Sugar added high fructose syrup

1 Scope

This document specifies the quality of high fructose syrup and sugar added high fructose syrup.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. The latest edition of the referenced document (including any amendments) applies.

ISO 1743, *Glucose syrup — Determination of dry matter content — Refractive index method*

JIS K 0557, *Water used for industrial water and wastewater analysis*

JIS R 3505, *Volumetric glassware*

JIS Z 8305, *Dimensions of printing types*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
fructose content percentage
proportion of fructose in sugar

3.2
high fructose (<50 %) syrup
sugar in liquid form, of which the main constituent is either glucose or fructose, obtained by isomerizing, with glucose isomerase or alkali, the liquid primarily consists of glucose obtained by hydrolyzing starch with enzymes such as amylase or acid; the fructose content percentage is less than 50 %

3.3
high fructose (≥50 %) syrup
sugar in liquid form, of which the main constituent is either glucose or fructose, obtained by isomerizing, with glucose isomerase or alkali, the liquid primarily consists of glucose obtained by hydrolyzing starch with enzymes such as amylase or acid; the fructose content percentage is 50 % or more and less than 90 %

3.4
high fructose (≥90 %) syrup
sugar in liquid form, of which the main constituent is either glucose or fructose, obtained by isomerizing, with glucose isomerase or alkali, the liquid primarily consists of glucose obtained by hydrolyzing starch with enzymes such as amylase or acid; the fructose content percentage is 90 % or more

3.5
high fructose syrup
high fructose (<50 %) syrup, high fructose (≥50 %) syrup and high fructose (≥90 %) syrup

3.6
sugar added high fructose (<50 %) syrup

sugar in liquid form prepared by adding white sugar to high fructose (<50 %) syrup , the amount of which does not exceed that of sugar in the high fructose (<50 %) syrup

3.7
sugar added high fructose (≥50 %) syrup
sugar in liquid form prepared by adding white sugar to high fructose (≥50 %) syrup, the amount of which does not exceed that of sugar in the high fructose (≥50 %) syrup

3.8
sugar added high fructose (≥90 %) syrup
sugar in liquid form prepared by adding white sugar to high fructose (≥90 %) syrup, the amount of which does not exceed that of sugar in the high fructose (≥90 %) syrup

3.9
sugar added high fructose syrup
sugar added high fructose (<50 %) syrup, sugar added high fructose (≥50 %) syrup and sugar added high fructose (≥90 %) syrup

4 Quality

4.1 High fructose syrup

The quality of high fructose syrup shall conform to the quality criteria of Table 1.

Table 1 — Quality criteria of high fructose syrup

Category	Criteria
Sugar content	70 % or more when tested by the method specified in 6.2
Ash content calculated from electrical conductivity	0,05 % or less when tested by the method specified in 6.3
Fructose content percentage	35 % or more when tested by the method specified in 6.4, and conforming to the declared content percentage
Proportion of reducing sugar other than glucose and fructose in sugar	When tested by the methods specified in 6.4 and 6.5, 15 % or less, on the syrup of which the fructose content percentage is less than 40 %; 8 % or less, on the syrup of which the fructose content percentage is 40 % or more and less than 50 %; and 6 % or less, on the syrup of which the fructose content percentage is 50 % or more
Hydrogen ion concentration	pH 3.5 or more and pH 6.0 or less when tested by the method specified in 6.6
Degree of coloring	0,20 or less when tested by the method specified in 6.7
Turbidity	0,15 or less when tested by the method specified in 6.8
Ingredients	Limited to starch
Additives	Not used
Net contents	Conforming to the declared weight

4.2 Sugar added high fructose syrup

The quality of sugar added high fructose syrup shall conform to the quality criteria of Table 2.

Table 2 — Quality criteria of sugar added high fructose syrup

Category	Criteria
Sugar content	70 % or more when tested by the method specified in 6.2
Ash content calculated from electrical conductivity	0,05 % or less when tested by the method specified in 6.3
Proportion of white sugar in sugar	10 % or more when tested by the method specified in 6.4, and conforming to the declared content percentage
Hydrogen ion concentration	pH 3.5 or more and pH 6.0 or less when tested by the method specified in 6.6
Degree of coloring	0,20 or less when tested by the method specified in 6.7
Turbidity	0,15 or less when tested by the method specified in 6.8
Ingredients	Limited to starch, high fructose syrup and white sugar
Additives	Not used
Net contents	Conforming to the declared weight

5 Labeling

5.1 Information on label

The information on label shall contain the following information, however, excluding information which must be indicated with the provisions of the Food Labeling Standards (Cabinet Office Ordinance No. 10 of 2015):

a) **High fructose syrup**:

1) name;
2) storage condition;
3) best-before date;
4) names of ingredients;
5) name and address of the food-related business operator;
6) name of the country of origin;
7) fructose content percentage;
8) net contents;

b) **Sugar added high fructose syrup**:

1) name;
2) storage condition;
3) best-before date;
4) names of ingredients;
5) name and address of the food-related business operator;
6) the name of the country of origin;

7) fructose content percentage of high fructose syrup;

8) content percentage of white sugar;

9) net contents.

NOTE Other Information on label must comply with the provisions of the Food Labeling Standards.

5.2 Method of labeling

The method of labeling shall be as follows:

a) **Name** The labeling of name shall be as follows:

1) For high fructose (<50 %) syrup, it shall be declared as "ぶどう糖果糖液糖" [which means "high fructose (<50 %) syrup" in Japanese]; for high fructose (≥50 %) syrup, it shall be declared as "果糖ぶどう糖液糖" [which means "high fructose (≥50 %) syrup" in Japanese]; and for high fructose (≥90 %) syrup, it shall be declared as "高果糖液糖" [which means "high fructose (≥90 %) syrup" in Japanese];

2) For sugar added high fructose (<50 %) syrup, it shall be declared as "砂糖混合ぶどう糖果糖液糖" [which means "sugar added high fructose (<50 %) syrup" in Japanese]; for sugar added high fructose (≥50 %) syrup, it shall be declared as "砂糖混合果糖ぶどう糖液糖" [which means "sugar added high fructose (≥50 %) syrup" in Japanese]; and for sugar added high fructose (≥90 %) syrup, it shall be declared as "砂糖混合高果糖液糖" [which means "sugar added high fructose (≥90 %) syrup" in Japanese];

b) **Fructose content percentage (limited to high fructose syrup)** The labeling of fructose content percentage shall be declared with the integer multiple of 5 which does not exceed the actual content percentage, in percentage terms, with the unit being clearly indicated; provided, however, that, for the products with the percentage being 42 % or more and less than 45 %, it may be declared as 42 %;

c) **Fructose content percentage of high fructose syrup (limited to sugar added high fructose syrup)** The labeling of fructose content percentage of high fructose syrup shall be declared with the integer multiple of 5 which does not exceed the actual content percentage, in percentage terms, with the unit being clearly indicated; provided, however, that, for the products with the percentage being 42 % or more and less than 45 %, it may be declared as 42 %;

d) **Percentage of white sugar content (limited to sugar added high fructose syrup)** The labeling of percentage of white sugar content shall be declared by the proportion of white sugar in sugar with the integer multiple of 10 which does not exceed the actual content percentage, in percentage terms, with the unit being clearly indicated;

e) **Names of ingredients** The labeling of names of the ingredients shall be as follows:

1) For high fructose syrup, it shall be declared as "でん粉" (which means "starch" in Japanese);

2) For sugar added high fructose syrup, it shall be declared as "でん粉，砂糖" (which means "starch, white sugar" in Japanese) or "異性化液糖，砂糖" (which means "high fructose syrup, white sugar" in Japanese);

f) **Net contents** The labeling of net contents shall be declared by the weight of content in grams, kilograms or tons, with the unit being clearly indicated.

NOTE Other method of labeling must comply with the provisions of the Food Labeling Standards.

5.3 Style, etc. of labeling

The style, etc. of labeling shall be declared on a noticeable part of a container or a package or on an invoice, as specified as follows:

a) A format of label shall conform to Figure 1; provided, however, that this does not apply to the cases where the information on label is well-gathered and as noticeable as that of Figure 1;

b) Colors of letters and a frame used on labeling shall be in contrast with the background color;

c) Letters used on labeling shall be set in 8-point or larger type specified in JIS Z 8305; provided, however, that letters may be set in 6-point or larger type specified in JIS Z 8305 when the space available for declaring the information is approximately 150 cm^2 or smaller;

d) Figure 1 may be written in vertical writing;

e) When the frame of Figure 1 is difficult to put, it may be omitted;

f) Other information which must be indicated pursuant to laws and regulations and other proper information which contributes to the consumers' choices may be declared within the frame of Figure 1.

NOTE Other style, etc. of labeling must comply with the provisions of the Food Labeling Standards.

名称 (Name) a)
果糖含有率 (Fructose content percentage) b)
異性化液糖の果糖含有率 (Fructose content percentage of high fructose syrup) c)
砂糖含有率 (Content percentage of white sugar) c)
原材料名 (Names of ingredients)
内容量 (Net contents)
賞味期限 (Best-before date) d)
保存方法 (Storage condition) e)
原産国名 (Name of the country of origin) f)
製造者 (Manufacturer) g)

a) In this format, "名称" (Name) may be replaced with "品名" (Product name);

b) For sugar added high fructose syrup, "果糖含有率" (Fructose content percentage) shall be omitted from this format;

c) For high fructose syrup, "異性化液糖の果糖含有率" (Fructose content percentage of high fructose syrup) and "砂糖含有率" (Content percentage of white sugar) shall be omitted from this format;

d) When it is difficult to declare a best-before date in accordance with this format, it may be put on a different part, as long as the part on which the best-before date is declared is indicated in the column of the best-before date of this format. In this case, the storage condition may be provided close to the part of the best-before date as well, as long as the part on which the storage condition is declared is indicated in the column of the storage condition of this format;

e) For the products of which the storage condition is omitted from labeling, "保存方法" (Storage condition) shall be omitted from this format;

f) For non-imported products, "原産国名" (Name of the country of origin) shall be omitted from this format;

g) When a food-related business operator is a vendor, a processor or an importer, "製造者" (Manufacturer) on this format shall be "販売者" (Vendor), "加工者" (Processor) or "輸入者" (Importer), respectively.

Figure 1 — Format

5.4 Information prohibited from labeling

The term which partially declares the name of some contained sugar with exaggeration, compared to other sugars (excluding the term declaring the content percentage of that sugar to the whole sugar, in percentage terms, in conjunction with the name of that sugar, in a size similar to that of the name) and the term which

contradicts the information indicated in 5.1 shall not be declared, as the information prohibited from labeling.

NOTE Other Information prohibited from labeling must comply with the provisions of the Food Labeling Standards.

6 Test methods

6.1 General

Reagents and apparatus for the testing shall be as follows:

a) **Water,** grade A2 specified in JIS K 0557, or of equivalent or higher quality;

b) **Reagents,** conforming to the standards such as the special grade of Japanese Industrial Standards; besides those specified in particular;

c) **Fructose,** of 99 % or higher purity;

d) **Maltose monohydrate,** of 98 % or higher purity;

e) **Maltotriose,** of 97 % or higher purity;

f) **Acetonitrile,** for a high performance liquid chromatograph;

g) **Volumetric glassware,** conforming to class A specified in JIS R 3505, or of equivalent or higher quality;

h) **Membrane filter,** 0,45 μm or less in pore diameter, suitable for filtration with each solution;

i) **High performance liquid chromatograph,** with column oven, differential refractometer detector and data system.

6.2 Sugar content

6.2.1 Measurement of refractive index

Carry out a measurement three times at a constant temperature between 20 °C and 40 °C, using a refractometer. The refractive index shall be the average value of the measurements. When bubbles in the sample affect the measurement, carry out a centrifugation.

6.2.2 Measurement of composition ratio of sugar

6.2.2.1 General

Carry out the measurement of composition ratio of sugar with a high performance liquid chromatograph.

6.2.2.2 Preparation of the mixed reference solution

The preparation of the mixed standard solution shall be as follows:

a) Weigh, with accuracy, fructose, glucose, sucrose, maltose monohydrate and maltotriose, which have been dried at 60 °C ± 2 °C, at 3 kPa or less, for 3 h, as much as the total mass of sugar will be approximately 10 g, with the same composition ratio of sugar as that of the sample;

b) Prepare the mixed standard solution by dissolving a) into water and add water to the 100 mL mark.

6.2.2.3 Preparation of the sample solution

The preparation of the sample solution shall be as follows:

a) Weigh, with accuracy, the sample as much as the mass of sugar will be approximately 10 g;

b) Dissolve a) into water, add water to the 100 mL mark, and filtrate part of the solution with a membrane filter; the filtrate shall be the sample solution.

6.2.2.4 Condition of high performance liquid chromatograph

The condition of the high performance liquid chromatograph shall be as follows:

a) **Analytical column,** equipped with a stainless-steel tube, 7,8 mm to 8,0 mm in inner diameter and 300 mm to 500 mm in length, filled with cation exchange resin;

b) **Guard column,** filled with the same resin as the analytical column when used;

c) **Column temperature,** at a constant degree 20 °C or more;

d) **Mobile phase,** water;

e) **Flow rate,** at 0,5 mL/min to 1 mL/min;

f) **Volume injected,** 5 µL to 10 µL.

6.2.2.5 Calculation of peak area

Calculate the peak areas of each sugar, using the data system.

6.2.2.6 Calculation of composition ratio of sugar

Calculate the percentage of each sugar within the sugar content of the sample solution by the following formula:

$$C_x = R_x \times A$$

where

C_x is the percentage of each sugar within the sugar content of the sample solution;

R_x is the correction factor of each sugar;

A is the percentage of peak areas of each sugar on the chromatogram of the sample solution.

Calculate $R_x$by the following formula; provided, however, that, the correction factor of polysaccharide other than sucrose, maltose and maltotriose shall be 1, and the correction factor of maltose monohydrate shall be converted to that of maltose:

$$R_x = \frac{A_1}{A_2}$$

where

R_x is the correction factor of each sugar;

A_1 is the mass fraction percentage of each sugar of the mixed standard solution;

A_2 is the percentage of peak area of each sugar on the chromatogram of the mixed standard solution.

6.2.3 Calculation

Calculate the sugar content (%) in accordance with ISO 1743, based on the values calculated in 6.2.1 and 6.2.2. In this case, the amount of sulfated ash content shall be the reference value (0,05 %) of the ash content calculated from the electrical conductivity.

6.3 Ash content calculated from electrical conductivity

6.3.1 Measurement

The measurement shall be as follows:

a) Weigh the sample as much as the amount of sugar will be 31,3 g ± 0,4 g. Prepare the sample solution by dissolving the sample with water and add water to the 100 mL mark;

b) Measure the electrical conductivity(mS/m) of the sample solution and water at 20 °C, using an electrical conductivity meter.

6.3.2 Calculation

Calculate the ash content calculated from the electrical conductivity by the following formula:

$$E = 6 \times 10^{-4} \times (K_1 \times 10 - 0{,}35 \times K_0 \times 10)$$

where

E is the ash content calculated from electrical conductivity (%);

K_0 is the electrical conductivity of water (mS/m);

K_1 is the electrical conductivity of the sample solution (mS/m).

6.4 Content percentages of fructose, glucose and white sugar

6.4.1 General

Carry out the measurement of the content percentages of fructose, glucose and white sugar by using an amino column or by using a column filled with a cation exchange resin (limited to the cases where the sample does not contain sucrose), using a high performance liquid chromatograph.

6.4.2 Preparation of mixed standard solution

The preparation of the mixed standard solution shall be as follows:

a) Weigh, with accuracy, fructose, glucose and sucrose, which have been dried at 60 °C ± 2 °C, at 3 kPa or less, for 3 h, as much as the concentration of each sugar will be within 0,3 mg/mL to 5 × 10 mg/mL; dissolve with 50 % ethanol, in volume fraction, when using an amino column, or with water, when using a column filled with a cation exchange resin, and add to the 100 mL mark;

b) Prepare the mixed standard solutions at 5 different concentrations for each sugar.

6.4.3 Preparation of sample solution

The preparation of the sample solution shall be as follows:

a) Weigh, with accuracy, approximately 6 g of the sample, dissolve with 50 % ethanol, in volume fraction, when using an amino column, or with water, when using a column filled with a cation exchange resing, and add to the 100 mL mark;

b) Filtrate part of a) with a membrane filter, and the filtrate shall be the sample solution.

6.4.4 Condition of high performance liquid chromatograph

The condition of the high performance liquid chromatograph shall be as follows:

a) **In the case of using an amino column**:

1) **Analytical column,** equipped with a stainless-steel tube, 4.6 mm in inner diameter and 250 mm in length, filled with the chemical compound of polyvinyl alcohol gel and pentaethylenehexamine; or an analytical column with a separating capability equal to the former;

2) **Guard column,** filled with the same packing material as the analytical column when used;

3) **Column temperature,** at a constant degree 20 °C or more;

4) **Mobile phase,** approximately 75 % acetonitorile in volume fraction;

5) **Flow rate,** at approximately 1 mL/min;

6) **Volume injected,** 5 μL to 10 μL (the amounts of injection of the sample solution and the mixed standard solution shall be the same.);

b) **In the case of using a column filled with a cation exchange resin**:

1) **Analytical column,** equipped with a stainless-steel tube, 7,8 mm to 8,0 mm in inner diameter and 300 mm to 500 mm in length, filled with a cation exchange resin;

2) **Guard column,** filled with the same resin as the analytical column when used;

3) **Column temperature,** at a constant degree 20 °C or more;

4) **Mobile phase,** water;

5) **Flow rate,** at 0,5 mL/min to 1 mL/min;

6) **Volume injected,** 5 μL to 10 μL (the amounts of injection of the sample solution and the mixed standard solution shall be the same.).

6.4.5 Construction of calibration curve

Calculate the peak areas of each sugar of the mixed standard solution with the data system, and construct a calibration curve from the concentration of each sugar and peak areas with the linear function which does not contain the origin of the calibration curve. In this case, the concentration of each sugar of the sample solution shall be the interpolation point of the calibration curve.

6.4.6 Calculation

The content percentage of each sugar shall be as follows:

a) Calculate the concentration of each sugar in the sample solution, by substituting the peak areas of each sugar of the sample solution, calculated with the data system, for each calibration curve, and calculate the concentration of each sugar in the sample by the following formula:

$$A_1 = \frac{A_2 \times 100}{B \times 1\ 000} \times 100$$

where

A_1 is the concentration of each sugar in the sample (%);

A_2 is the concentration of each sugar in the sample solution calculated from calibration curves (mg/mL);

B is the mass of the sample (g).

b) Calculate the mass of fructose, glucose and sucrose in the sample from the value calculated in a), and the mass fraction of each sugar in the mass of sugar in the sample, in percentage terms, shall be the content percentage of each sugar.

6.5 Proportion of reducing sugar other than glucose and fructose in sugar

Calculate the proportion of reducing sugar other than glucose and fructose in sugar, based on the value calculated in 6.4, by the following formula:

$$C_1 = 100(\%) - (C_2 + C_3)$$

where

C_1 is the proportion of reducing sugar other than glucose and fructose in sugar (%);

C_2 is the fructose content percentage (%);

C_3 is the glucose content percentage (%).

6.6 Hydrogen ion concentration

Weigh 30 g of the sample, calculated on the anhydrous basis, add water to the 100 mL mark. The reading at 20 °C, measured with a glass-electrode pH meter shall be the hydrogen ion concentration.

6.7 Degree of coloring

Weigh 30 g of the sample, calculated on the anhydrous basis, add water to the 100 mL mark, and measure the absorbance of this solution at two different wavelengths in 10 cm of liquid layer, one at 420 nm and the other at 720 nm, with a photoelectric spectrometer. The difference of absorbance between the two wavelengths shall be the degree of coloring.

6.8 Turbidity

The turbidity shall be the absorbance at 720 nm measured on the measurement of the degree of coloring.