# GB

NATIONAL STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

# GB 5009.8-2016

# National food safety standard - Determination of fructose, glucose, sucrose, maltose and lactose in foods



**Issued on: December 23, 2016** **Implemented on: June 23, 2017**

**Issued by: National Health and Family Planning Commission of the PRC; China Food and Drug Administration.**

# Table of contents

# Foreword

This standard replaces GB/T 5009.8-2008 “Determination of sucrose in food”, GB/T 18932.22-2003 “Method for the determination of fructose, glucose, sucrose, maltose contents in honey – Liquid chromatography refractive index detection method”, and GB/T 22221-2008 “Determination of fructose, glucose, sucrose, maltose and lactose in foods – High-performance liquid chromatography”.

As compared with GB/T 5009.8-2008, the main changes of this standard are as follows:

- CHANGE the standard name into “National food safety standard - Determination of fructose, glucose, sucrose, maltose and lactose in foods”;

- ADD pretreatment of some samples.

# National food safety standard - Determination of fructose, glucose, sucrose, maltose and lactose in foods

## 1 Scope

This standard specifies the determination of fructose, glucose, sucrose, maltose and lactose in foods.

The first method of this standard applies to the determination of fructose, glucose, sucrose, maltose and lactose in food. AND the second method applies to the determination of sucrose in food.

Method 1: High performance liquid chromatography is applicable to the determination of fructose, glucose, sucrose, maltose and lactose in foods such as cereals, dairy products, fruit and vegetable products, honey, syrup and beverage.

Method 2: Acid hydrolysis – Lane - Eeynon method is applicable to the determination of sucrose in food.

**Method 1: High performance liquid chromatography**

## 2 Principle

The fructose, glucose, sucrose, maltose and lactose in the sample are extracted and separated by high performance liquid chromatography (HPLC), then detected by the differential refractive index detector or evaporative light scattering detector, AND quantified by external standard method.

## 3 Reagents and materials

Unless otherwise stated, the reagents used in this method are of analytical pure AND the water is level 1 water as specified in GB/T 6682.

### 3.1 Reagents

**3.1.1** Acetonitrile: Chromatography pure.

Honey and other perishable samples are preserved at 0 °C ~ 4 °C.

# 6 Analytical procedures

## 6.1 Sample treatment

### 6.1.1 Foods with less than 10% fat

WEIGH 0.5 g ~ 10 g of the crushed or uniformly mixed sample (weigh 10 g if the sugar content ≤ 5%; weigh 5 g if the sugar content is 5% ~ 10%; weigh 2 g if the sugar content is 10% ~ 40%; weigh 0.5 g if the sugar content ≥ 40%) (accurate to 0.001 g) in a 100 mL volumetric flask; ADD about 50 mL of water to dissolve it; slowly ADD 5 mL of zinc acetate solution and potassium ferrocyanide solution, respectively; ADD water to make its volume reach to the mark; MAKE it subject to magnetic stirring or ultrasonic for 30 min; USE dry filter paper to filter it; DISCARD the supernatant; USE the 0.45 μm microporous membrane to filter the follow-up filtrate or MAKE it subject to centrifugal to obtain the supernatant; MAKE the supernatant pass the 0.45 μm microporous membrane into the vial; PREPARE for liquid chromatography analysis.

### 6.1.2 Syrup, honey

WEIGH 1 g ~ 2 g of the uniformly mixed sample (accurate to 0.001 g) into a 50 mL volumetric flask; ADD water to make its volume reach to 50 mL; SHAKE it uniformly; USE dry filter paper to filter it; DISCARD the supernatant; USE the 0.45 μm microporous membrane to filter the follow-up filtrate or MAKE it subject to centrifugal to obtain the supernatant; MAKE the supernatant pass the 0.45 μm microporous membrane into the vial; PREPARE for liquid chromatography analysis.

### 6.1.3 Carbon dioxide-containing beverages

ABSORB the uniformly mixed sample into the evaporating dish; HEAT it slightly in the water bath and STIR it to remove the carbon dioxide; PIPETTE 50.0 mL into a 100 mL volumetric flask; slowly ADD 5 mL of zinc acetate solution and 5 mL of potassium ferrocyanide solution; USE water to make its volume reach to the mark; SHAKE it uniformly; LET it stand for 30 min; USE dry filter paper to filter it; DISCARD the supernatant; USE the 0.45 μm microporous membrane to filter the follow-up filtrate or MAKE it subject to centrifugal to obtain the supernatant; MAKE the supernatant pass the 0.45 μm microporous membrane into the vial; PREPARE for liquid chromatography analysis.

### 11.2 Reagent preparation

**11.2.1** Zinc acetate solution: WEIGH 21.9 g of zinc acetate; ADD 3 mL of glacial acetic acid; ADD water to dissolve it and MAKE its volume reach to 100 mL.

**11.2.2** Potassium ferrocyanide solution: WEIGH 10.6 g of potassium ferrocyanide; ADD water to dissolve it and MAKE its volume reach to 100 mL.

**11.2.3** Hydrochloric acid solution (1 + 1): MEASURE 50 mL of hydrochloric acid; slowly ADD it into 50 mL of water; COOL it and MIX it uniformly.

**11.2.4** Sodium hydroxide (40 g/L): WEIGH 4 g of sodium hydroxide; ADD water to dissolve it; COOL it naturally; ADD water to make its volume reach to 100 mL.

**11.2.5** Methyl red indicator solution (1 g/L): WEIGH 0.1 g of methyl red hydrochloride; USE 95% ethanol to dissolve it and MAKE its volume reach to 100 mL.

**11.2.6** Sodium hydroxide solution (200 g/L): WEIGH 20 g of sodium hydroxide; ADD water to dissolve it; COOL it naturally; ADD water to make its volume reach to 100 mL.

**11.2.7** Alkaline tartrate A solution: WEIGH 15 g of copper sulfate and 0.05 g of methylene blue; DISSOLVE it into water; ADD water to make its volume reach to 1000 mL.

**11.2.8** Alkaline copper tartrate: WEIGH 50 g of sodium potassium tartrate and 75 g of sodium hydroxide; DISSOLVE it into water; ADD 4 g of potassium ferrocyanide; after completely dissolved; USE water to make its volume reach to 1000 mL; STORE it into a glass bottle with rubber stopper.

### 11.3 Standard substance

Glucose ($C_6H_{12}O_6$, CAS number: 50-99-7) standard substance: purity ≥ 99%, OR the standard substance which is certified by the State and awarded a standard substance certificate.

### 11.4 Standard solution preparation

Glucose standard solution (1.0 mg/mL): WEIGH 1 g (accurate to 0.001 g) of glucose which had been dried in an oven at 98 °C ~ 100 °C for 2 h; ADD water to dissolve it; ADD 5 mL of hydrochloric acid; USE water to make its volume reach to 1000 mL; AND this solution corresponds to 1.0 mg of glucose per milliliter.

RECORD the total volume of glucose consumed; and meanwhile MAKE parallel operation for 3 sets; TAKE the average; CALCULATE the glucose mass (mg) equivalent to every 10 mL of alkaline copper tartrate solution (5 mL of alkaline copper tartrate solution A and 5 mL of alkaline copper tartrate solution B).

Note: It may also use the aforementioned method to calibrate the 4 mL ~ 20 mL alkaline copper tartrate solution (50% solution A and 50% solution B) to adapt to the concentration change of the reducing sugar in the sample.

### 14.4 Determination of sample solution

**14.4.1** Predictive titration: PIPETTE 5.0 mL of alkaline copper tartrate solution A and 5.0 mL of alkaline copper tartrate solution B into a 150 mL of conical flask; ADD 10 mL of distilled water; ADD 2 ~ 4 pieces of glass beads; PLACE it on the electric furnace to heat it to make it boil within 2 min; MAINTAIN the boiling state for 15 s; ADD the sample solution until the blue color of the solution is completely disappeared; READ out the volume of the sample solution used.

**14.4.2** Precise titration: PIPETTE 5.0 mL of alkaline copper tartrate solution A and 5.0 mL of alkaline copper tartrate solution B into a 150 mL of conical flask; ADD 10 mL of distilled water; ADD several glass beads; TRANSFER the sample solution (1 mL less than the predicted volume in 14.4.1) which is taken out from the burette (pre-conversion sample solution 14.2.1.1 or post-conversion sample solution 14.2.1.2) on the electric furnace; MAKE it boil within 2 min; MAINTAIN the boiling state for 2 min; slowly ADD the sample solution at the rate of one drop every two seconds, until the blue color of the sample solution is completely disappeared; respectively RECORD the volume (V) as consumed by the re-conversion sample solution (14.2.1.1) and the post-conversion sample solution (14.2.1.2), respectively.

Note: For samples with a sucrose content of 0.x%, it may use the reverse titration method to make determination.

## 15 Expression of analytical results

### 15.1 Converted sugar content

The content of the converted sugar in the sample (calculated as glucose) is calculated in accordance with the formula (2):

**This is an excerpt of the PDF (Some pages are marked off intentionally)**



**------ The End ------**