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NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA

GB 317-2006

Replacing GB 317-1998

White granulated sugar

白砂糖

(Codex Stan 212-1999, NEQ)

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Foreword

Article 6.1 and 6.2 in Chapter 3 of this Standard are compulsory; the rest are recommended articles.

The consistent degree between this Standard and Codex Stan 212–1999 *Codex standard for sugar* is not equivalent.

This Standard replaces GB 317-1998 *White granulated sugar*.

Compared with GB 317-1998, the main changes of this Standard are as follows:

- In hygienic requirements, indicators items are increased or decreased basically according to GB 13104-2005 “Hygienic standard for sugar”: it has added items for microzyme and mould, it has deleted copper item; except for sulphur dioxide (SO₂), all items of hygienic requirements have directly cited the corresponding indicators in GB 13104-2005; for sulphur dioxide (SO₂), it has respectively formulated the indicators equal to or more rigorous than those of GB 13104-2005, according to the grading level.
- In physiochemical requirements, modifications are made to the following items: the conductive ash content, loss on drying, turbidity, and insoluble impurity of white refined sugar; the superior-grade white granulated sugar’s reducing sugar content, conductive ash content, colour value, turbidity and insoluble impurity; the first-grade white granulated sugar’s colour value, turbidity and insoluble impurity; second-grade white granulated sugar’s reducing sugar content, conductive ash content, loss on drying, colour value, turbidity and insoluble impurity.
- It has changed the calculation and representation methods of turbidity. The unit is changed from “degree” to “milli-attenuation unit” (MAU).
- In labels, it has added the contents of “Recommended to indicate quality warranty period”.

This Standard was proposed by China National Light Industry Council.

This Standard shall be administered by Sugar Production Branch Technical Committee of National Food Industry Standardization Technical Committee.

Drafting organizations of this Standard: Guangzhou Sugarcane Industry Research Institute, Yangpu Nanhua Sugar Industrial Group, Guangxi Guitang (Group) Co., Ltd., Dongtang Group Co., Ltd., Guangxi Fengtang Biochemical Inc., Yunnan Ruili Sugar Industrial Group Co., Ltd., Yunnan Yongde Sugar Industrial Group Co., Ltd., Guangdong Jianlibao Group Co., Ltd., Wrigley Confectionery (Shanghai) Company Limited, Shanghai Precision Instruments Co., Ltd., Fujian Sugar Industry Co., Ltd., Zhengzhou Commodity Exchange, National Sugar Industry Standardization Center, and National Quality Supervision and Testing Center of Light Industry and Cane Sugar Industry.

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The historical editions replaced by this Standard are:

- GB 317-1998;
- GB 317.1-1991, GB/T 317.2-1991;
- GB 317-1984.

White granulated sugar

1 Scope

This Standard specifies the technical requirements, test methods, inspection rules, as well as the requirements on labelling, packing, transportation and storage of white granulated sugar.

This Standard is applicable to the white granulated sugar produced with cane or sugar beet as the direct or indirect raw material.

2 Normative References

The articles contained in the following documents have become the articles of this Standard after they are cited herein. For the dated documents so cited, all the modification list (excluding correction) or revised editions made thereafter shall not be applicable to this Standard. However, all parties who have entered into agreements on the basis of this Standard are encouraged to study the possibility to implement the latest version of these documents. For the undated documents so cited, the latest version shall be applicable to this Standard.

GB/T 4789 (all parts) *Microbiological examination of food hygiene*

GB/T 5009.55 *Method for analysis of hygienic standard of sugar*

GB 13104 *Hygienic standard of sugar*

GB 7718 *General Standard for the Labelling of Prepackaged Foods*

Measurement supervision and management methods for fixed quantity packaged commodity (General Administration of Quality Supervision, Inspection and Quarantine, [2005] No. 75 Order)

3 Technical Requirements

3.1 Grades

White granulated sugar are divided into 4 grades: refined, superior-grade, first-grade and second-grade.

3.2 Sensory requirements

3.2.1 Crystal grain shall be uniform and the grain size within the following range shall

scale. The measuring range is $-30^{\circ}\text{Z} \sim +120^{\circ}\text{Z}$; and calibrated by standard quartz tube. It may select 3 methods:

- a) Saccharimeter contains adjustable analyzer (disc type polarimeter); adopt monochromatic light source (wavelength is between 540 nm ~ 590 nm); usually adopt green mercury light or yellow sodium light.
- b) Quartz wedge saccharimeter:
 - 1) With monochromatic light source (wavelength is between 540 nm ~ 590 nm);
 - 2) Incandescent lamp acts as the light source; an appropriate colour filter separates the light with effective wavelength of 587 nm.
- c) Saccharimeter contains Faraday coil as compensator; adopt monochromatic light source (wavelength is between 540 nm ~ 590 nm).

Note: The saccharimeter with old sugar $^{\circ}\text{S}$ scale can still be used; however, the reading in $^{\circ}\text{S}$ must be multiplied by a coefficient 0.999 71 to convert into $^{\circ}\text{Z}$.

4.3.3.2 Volumetric flasks

Volume: (100.00 ± 0.02) mL, to be calibrated by weighing $(20.0 \pm 0.1)^{\circ}\text{C}$ water. The volumes of volumetric flasks shall be ranged within (100.00 ± 0.01) mL; they can be used without correction. When exceeding this range, it can only be used after it is corrected by the correction corresponding to 100.00 mL.

4.3.3.3 Optical rotation sighting tube

Length: (200.00 ± 0.02) mm, it must have the qualification certification issued by authorized measuring agency; or to be compared and inspected by a sighting tube that has such qualification certification.

4.3.3.4 Analytical balance

Sensitivity is 0.1g.

4.3.4 Reagent

Distilled water: not containing optically active substance.

4.3.5 Calibration of saccharimeter

Saccharimeter shall be calibrated by the standard quartz tube verified to be acceptable by authorized measuring agency.

4.3.5.1 Temperature correction for optical rotation of quartz tube

The temperature, when using saccharimeter (without quartz wedge compensator) to read

4.4.4.3 Permissible error

The difference between the 2 determinations shall not exceed 15% of the mean value.

4.5 Determination of conductive ash content

4.5.1 Abstract of method

Conductivity reflects the concentration of ionization water dissolvable salts. Determine the conductivity of known sugar solution; then work out the conductive ash content with conversion coefficient.

The concentration of sugar solution for this method shall be 31.3 g/mL.

4.5.2 Apparatus and equipment

Conductivity meter: in compliance with the following specifications.

Frequency: low cycle, about 140 Hz.

Measuring range: $0\mu\text{S}/\text{cm}$ ~ $300\mu\text{S}/\text{cm}$.

Measuring error: shall not be more than 0.5% of full range, scale unit: $\mu\text{S}/\text{cm}$.

4.5.3 Reagent

4.5.3.1 Distilled water or deionized water: refined white granulated sugar must use distilled water (distilled twice) or deionized water with conductivity to be lower than $2\mu\text{S}/\text{cm}$. The white granulated sugar of other grades can use distilled water with conductivity to be lower than $15\mu\text{S}/\text{cm}$.

4.5.3.2 0.01 mol/L potassium chloride solution: take analytically pure grade potassium chloride; heat to 500°C ; dehydrate for 30 minutes; weigh out 0.745 5g; dissolve into a 1 000 mL volumetric flask; add water to marking line.

4.5.3.3 0.002 5 mol/L potassium chloride solution: suck out 50 mL of 0.01 mol/L potassium chloride solution; put into a 200 mL volumetric flask; add water to marking line. The conductivity of such solution under 20°C shall be $328\mu\text{S}/\text{cm}$.

4.5.4 Steps

4.5.4.1 Determination

Weigh out $31.3\text{g}\pm 0.1\text{g}$ of white granulated sugar; put into a dry and clean beaker; add distilled water to dissolve; transfer to a 100 mL volumetric flask; wash beaker and glass rod with distilled water for multiple times; the washing water also pours into the volumetric flask; add water to marking line; stir up; use sample solution to wash the conductivity electrode for determination of conductivity; dry and clean small beaker for 2 ~ 3 times; then

m_1 -- mass of weighing bottle, in unit of gram (g).

4.6.3.3 Permissible error

The difference between the 2 determinations shall not exceed 15% of the mean value.

4.7 Determination of colour value

4.7.1 Abstract of method

Dissolve white granulated sugar sample with pH (7.00±0.02) buffer solution. After filtrated through filter membrane, measure the specific absorbance of such solution under 420nm wavelength condition. The specific absorbance multiplied by 1 000 shall be the colour value of International Commission for Uniform Methods of Sugar Analysis (ICUMSA). The result shall be represented in ICUMSA unit (IU).

4.7.2 Apparatus and equipment

4.7.2.1 Spectrophotometer shall conform to the following specifications. Measuring range: penetration rate is 0% ~ 100%. Wavelength error: wavelength error at 420nm shall not be more than ±1nm.

4.7.2.2 Cuvette: such thickness shall be selected that instrument transmittance reading shall be between 20% ~ 80%; the transmittance difference between the cuvettes so used with the same light path shall not be more than 0.2% (under 440nm wavelength condition, potassium dichromate standard solution shall be used for verification).

4.7.2.3 Abbe Refractometer: refractive index measuring range is 1.300 ~ 1.700. Minimum graduation of refractive index: 0.000 5. Mass fraction brix of sugar (°Bx) is 0 ~ 95; and the minimum graduation value: 0.2.

4.7.2.4 pH (acidity) meter: graduation value or minimum indication value shall be 0.02.

4.7.2.5 Membrane filter: the thickness of membrane shall be uniform; micro-pores of better penetrability are distributed on the membrane surface in a symmetric and even manner; pore diameter is 0.45µm; porosity is up to 80%; pore canal is in linear shape and without mutual interference; and the membrane shall be used in combination with 150nm sugar filter.

4.7.3 Reagent

4.7.3.1 0.1 mol/L hydrochloric acid solution: use measuring pipette to suck out 8.4 mL of concentrated hydrochloric acid (specific gravity is 1.19); place into a 1 000 mL volumetric flask that contains distilled water in proper quantity; dilute to specified scale.

4.7.3.2 Triethanolamine - hydrochloric acid buffer solution: weigh out 14.92g of triethanolamine [(HOCH₂CH₂)₃N]; dissolve with distilled water; the volume is fixed in a 1 000 mL volumetric flask; then, transfer to a 2 000 mL beaker; add about 800 mL of 0.1

4.10.2 Apparatus and equipment

4.10.2.1 Microscope.

4.10.2.2 Magnifier.

4.10.2.3 Glass pieces.

4.10.2.4 Triangle bottle (1 000 mL).

4.10.3 Steps

4.10.3.1 Weigh out 250g of white granulated sugar; put into a 1 000 mL triangle bottle; add distilled water with temperature not higher than 35°C while stirring, so that it can be completely dissolved; then, supplement distilled water to bottle neck without overflowing.

4.10.3.2 Cover the bottle mouth with clean glass piece, so that glass piece can touch with liquid surface; place for 15 minutes; take off the glass for inspection under microscope. This operation shall be repeated for several times to check all the floaters with microscope.

4.10.3.3 The number of acarid checked out shall be the total number of acarid contained in 250g white granulated sugar.

5 Inspection Rules

5.1 Type inspection

5.1.1 Sampling method: one serial-number shall be assigned to each can of sugar paste separated. When weighing package, it shall continuously collect samples for 3 kg; put into a container with cover; mix it; number the sample; in addition to be used for analysis, it shall take another 0.5kg of sample; put into the container with cover; accumulate for 24 hours; this is the daily collective sample.

Take 1.5kg of daily collective sample; hermetically pack with food level plastic bag of double layers, or contain in a ground glass stopper bottle; mark with serial product number, grade, production date, basic number of samples, inspection results and inspector. Store in a ventilated and dry environment for factory self-inspection and quality supervision inspection. When it is agreed by both supplier and purchaser, it can be used as the reserved sample for arbitration inspection. One-time sampling or arbitration inspection result shall be effective to the sugar with the same serial-number.

5.1.2 Under the condition that the manufacturer can guarantee the stability of product quality, each numbered product can be sampled for certain items based on actual situation in production; it shall use daily collective sample to test all the items under physiochemical requirements; in inspection results, if there is one or more items do not conform to the requirements for this grade, it shall be handled according to the grade that is actually

The test conditions for each item by this method shall strictly follow the stipulations of standards (including test solution quantity, Albright reagent quantity, boiling time, iodine solution consumption and time for iodine reaction, etc.).

4.4.2 Apparatus and equipment

4.4.2.1 Conical flask: volume is 300 mL.

4.4.2.2 Burette: 50 mL, scale made to 0.1 mL.

4.4.3 Reagent

4.4.3.1 Albright reagent: weigh out 5.0g of cupric sulphate ($\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$), 300g of sodium potassium tartrate ($\text{C}_4\text{H}_4\text{O}_6\text{KNa} \cdot 4\text{H}_2\text{O}$), 10.0g of anhydrous sodium carbonate (Na_2CO_3), and 50.0g of disodium hydrogen phosphate ($\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$) (or 19.8g of anhydrous sodium hydrogen phosphate) respectively. Dissolve into 900 mL of distilled water; and slightly heat it when necessary. Wait until complete dissolution. Put into boiling water bath to heat for 2 hours for sterilization. Then, cool it down to room temperature. Dilute to 1 000 mL. Filtrate it with fine hole sand core glass funnel or kieselguhr or activated carbon. Store in a brown reagent bottle.

4.4.3.2 Sodium thiosulfate stock solution: weigh out 20g of sodium thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) and 0.1g of anhydrous sodium carbonate (Na_2CO_3) (or 1 mL of 1 mol/L sodium hydroxide solution). Dissolve with boiled distilled water. Fix the volume to 500 mL. Store in a brown reagent bottle. Place for 8 ~ 14 days; filtered for standby.

4.4.3.3 Sodium thiosulfate standard titrimetric solution [$c(\text{Na}_2\text{S}_2\text{O}_3) = 0.032\ 3\ \text{mol}$]: suck 100 mL of sodium thiosulfate standard titrimetric solution. Transfer into volumetric flask. Dilute to 500 mL with boiled distilled water. This reagent shall be calibrated by reference potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$); and its concentration shall be corrected.

4.4.3.4 Iodine solution [$c(1/2\text{I}_2) = 0.032\ 3\ \text{mol/L}$]: weigh out about 10g of potassium iodide (no iodide). Dissolve into several milliliters of water first. Then weigh out another 2.050g of pure iodide. Dissolve into potassium iodide solution. Transfer all the solution into a 500 mL volumetric flask. Add water to marking line. Calibrate and store in a brown bottle with glass stopper sealing.

4.4.3.5 Starch indicator: weigh out 1.0g of dissolvable starch. Add 10 mL of water. Inject into boiling water while stirring. Boil slightly for 2 minutes. Cool down. The solution shall be prepared just before use.

4.4.3.6 Glacial acetic acid.

4.4.3.7 Hydrochloric acid solution [$c(\text{HCl}) = 1\ \text{mol/L}$].

4.4.4 Steps

pour in the sample solution; use conductivity meter to measure the conductivity of sample solution; write down the reading and the sample solution temperature when taking the reading.

Conductivity cell constant shall be checked and measured by 0.002 5 mol/L potassium chloride solution.

4.5.4.2 Calculation and results representation

The conductive ash content C of white granulated sugar shall be calculated by Formula (5), represented by %. The calculation results shall take to two decimal points.

$$C = 6 \times 10^{-4} (C_1 - 0.35C_2) \dots\dots\dots (5)$$

Where:

C -- conductive ash content, %;

C_1 -- conductivity of 31.3g/100 mL of sugar solution at 20°C temperature, in unit of $\mu\text{S}/\text{cm}$;

C_2 -- conductivity of distilled water to dissolve sugar at 20°C temperature, in unit of $\mu\text{S}/\text{cm}$;

4.5.4.3 Temperature correction

The temperature for determination of conductivity shall be 20.0°C; if it fails to be 20.0°C, correction shall be made by Formula (6); but the temperature measured shall usually not exceed 20.0°C±5.0°C. For the temperature correction to the conductivity of distilled water to dissolve sugar, it can be omitted as the influence is insignificant.

$$C_{20.0^\circ\text{C}} = \frac{C_t}{1 + 0.026(t - 20)} \dots\dots\dots (6)$$

Where:

C_t -- conductivity of sugar solution at $t^\circ\text{C}$ temperature, in unit of $\mu\text{S}/\text{cm}$;

t -- temperature when determination of conductivity of sugar solution, in unit of $\mu\text{S}/\text{cm}$;

4.5.4.4 Permissible error

The difference between the 2 determinations shall not exceed 10% of the mean value.

4.6 Determination of loss on drying

Determination methods are divided into a and b: Method a is arbitration method and Method b is normal method.

reached; if the indicators for second-grade white granulated sugar can not be reached, it shall be handled as unqualified product.

5.1.3 When there occurs one of the following conditions, it shall carry out the inspection on all items under technical requirements; the inspection results shall be used for overall assessment of product quality:

- a) When a production period is newly started, or production is resumed after machine cleaning;
- b) At pre-stage, mid-stage and later-stage of normal production;
- c) When there is unacceptable lot found in the delivery inspection;
- d) When the quality supervision agency requires for inspection.

5.2 Delivery inspection

5.2.1 The white granulated sugar delivered each time is deemed as one delivery lot; each lot of white granulated sugar must be attached with product qualification certification issued by the manufacturer; the receiver accepts the goods according to such qualification certification; both deliverer or receiver shall be entitled to propose on-site sampling or sealing up of samples. In case of dispute later on, the sealed samples that comply with the storage conditions shall be used as samples for arbitration inspection; and the inspection results issued by authorized quality arbitration testing agency shall be the arbitration inspection results of this lot of white granulated sugar.

5.2.2 Each lot of white granulated sugar delivered and received shall be deemed as one inspection lot.

5.2.3 Sampling rules

5.2.3.1 White granulated sugar shall be sampled in unit of pile; samples shall be taken from 4 sides and top surface, total 5 surfaces, of a sugar pile. Sample shall be taken only from the center of top surface; on each side, samples shall be taken from several points at one of the diagonals in a uniform manner and according to the following stipulations: it shall be taken from 3 points for the pile of 300 t or less (including 300 t); one more point shall be added for every 100t above 300t, that is, samples shall be taken from 13 points in each sugar pile less than 300t (including 300 t); while the number of points to take sample from the pile more than 300t shall be calculated by Formula (12).

$$n = 4 \times \frac{m}{100} + 1 \dots\dots\dots (12)$$

Where:

n -- number of points to take samples, taking integer number;

equal to zero. The packages of other sizes shall execute "*Methods for measurement, supervision and management of fixed quantity packaged commodities*".

6.3 Transportation and storage

6.3.1 Each lot of sugar delivered shall be attached with product qualification certification, and instructions for transportation and storage conditions, one copy for each.

6.3.2 Sugar carrying means and sugar storehouse must be clean and dry; it is forbidden to carry or store white granulated sugar in combination with harmful, toxic, peculiar-smelled or other pollution articles. When carried or stored in ship, a under-layer shall be put underneath sugar pile to prevent humidity.

6.3.3 Sugar bags shall be stacked at the place 1m away from wall, heating pipe or concrete column. The height of pile shall ensure safety. Sugar shall be allocated and transferred by the principle of first-in first-out.

6.3.4 Sugar storehouse shall be maintained dry; and high temperature shall be avoided.

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