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NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 23532-2024

Replacing GB/T 23532-2009

Quality requirements for D-xylose

D-木糖质量要求

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1 Scope

The document gives the molecular formula, the relative molecular mass and the structural

formula of D-xylose; sets its quality requirements, inspection rules and requirements for marking, packaging, transport and storage; and describes the matching test methods.

It applies to the production, inspection and sale of D-xylose, and also to D-xylose made by further processing a product containing D-xylose that has already gone through part of the process.

The foreword states that the document sets technical requirements related to food quality, and that requirements related to food safety are laid down in the relevant laws, regulations, policies and food safety standards.

2 Normative references

Five documents are cited: GB/T 191 on pictorial marking for handling of goods, GB 5009.3-2016 on the determination of moisture in food, GB/T 6678 on general rules for the sampling of chemical products, GB/T 6682 on water for analytical laboratory use, and GB/T 20880 on edible glucose.

3 Terms, formula and relative molecular mass

D-xylose is defined as a dextrorotatory five-carbon aldose made from plant material containing polypentose, such as corn cobs, corn husks, straw, bagasse, wood and bamboo, by acid or enzymatic hydrolysis followed by purification, crystallization, centrifugation and drying.

The molecular formula is C5H10O5 and the relative molecular mass is 150.13, calculated from the 2019 international relative atomic masses. The structural formula is given in 4.3; in the extracted text it is broken up and is not reproduced here.

5 Quality requirements

Table 1 fixes the sensory requirements: the colour is white; there is no off odour or off taste; the state is crystals or crystalline powder; and there is no foreign matter visible to normal eyesight.

Table 2 fixes the physicochemical indicators, with two grades, superior and first grade, for the first two items. D-xylose content on a dry basis is not less than 99.0 % for superior grade and 98.5 % for first grade. Light transmittance of a ten per cent aqueous solution is not less than 98.0 % for superior grade and 96.0 % for first grade. The remaining items apply to both grades: moisture not more than 0.30 %; residue on ignition not more than 0.05 %; specific rotation at 20 °C at the sodium D line from plus 18.5 to plus 19.5, expressed in degrees times square metre per kilogram; pH from 4.0 to 7.0; chloride not more than 0.005 %; and sulfate not more than 0.005 %.

6 Test methods

Unless otherwise stated the reagents are of analytical grade and the water is grade three water as defined in GB/T 6682.

Sensory examination: a suitable quantity of sample is placed in a clean dry white porcelain dish, the colour and state are observed in natural light, the odour is smelled, the taste is judged after rinsing the mouth with warm boiled water, and the presence of foreign matter is observed with normal eyesight.

D-xylose content: the sample is dissolved in water and measured by liquid chromatography, quantified from the retention time by the external standard method or by area normalization, the external standard method governing in arbitration. The apparatus is a high performance liquid chromatograph with a differential refractive index detector and column thermostat, an analytical balance reading to 0.0001 g, an ultrasonic dissolver and a 50 microlitre microsyringe or an autosampler. The reagents are grade one water as defined in GB/T 6682, a D-xylose reference substance of purity not less than 99.0 %, a D-xylose standard solution made up in water at 40 mg/mL, and aqueous microporous filter membranes of 0.22 micrometres.

The reference chromatographic conditions are an analytical column packed with polystyrene divinylbenzene resin, 300 mm by 7.8 mm, or a column of equivalent performance; water as the mobile phase; a column temperature of 75 °C; a flow rate of 0.6 mL/min to 0.8 mL/min; and an injection volume of 10 microlitres to 20 microlitres.

Sample preparation: 2 g of sample dried at 105 °C for 4 h is weighed to 0.0001 g, its D-xylose content lying within the linear range of the standard solutions, made up to 100 mL with water, shaken, filtered through a 0.22 micrometre aqueous microporous membrane, and the filtrate collected as the test solution.

Determination: the column is fitted, the differential refractive index detector is switched on and warmed up until steady, and the mobile phase is passed at 0.1 mL/min to equilibrate. Before analysis proper the mobile phase is fed to the reference cell at 0.1 mL/min for more than 20 min, then the normal flow path is restored so that the mobile phase passes the sample cell, the flow rate is set at 0.6 mL/min to 0.8 mL/min to run the baseline, and the column temperature is raised step by step to 75 °C; injection follows once the baseline is steady. A series of six standard solutions of different concentration is made up between 0.4 mg/mL and 40 mg/mL, each is injected, and a calibration curve of concentration against peak area is drawn; the linear correlation coefficient is above 0.9990, otherwise the concentration range is adjusted. Standard solutions and prepared test solutions are then injected; the chromatographic peaks of the sugar components in the sample are identified from the retention times of the standards, and the percentage of each component is calculated from the peak areas by the external standard method or by area normalization.

The percentage of D-xylose by the external standard method is calculated by formula (1), whose legend gives X1 as the percentage of D-xylose in the sample as a mass fraction, Ai as the peak area of D-xylose in the sample, ms as the mass of the D-xylose reference substance in grams, Vs as the dilution volume of the reference substance in millilitres, As as the peak area of the reference substance, m as the mass of sample weighed on a dry matter basis in grams and V as the dilution volume of the sample in millilitres. The percentage by area normalization is calculated by formula (2), whose legend gives X2 as the percentage of D-xylose as a mass fraction, Ai as the peak area of D-xylose and the sum of Ai as the total peak area of all components in the sample. Results are given to one decimal place, and under repeatability conditions the absolute difference between two independent determinations does not exceed 5 % of their mean. The printed equations are broken in the extracted text and are not reproduced here.

Light transmittance: the principle is that when a parallel beam of monochromatic light passes through a solution the absorbance is proportional to the concentration and to the path length, so the lower the absorbance the higher the transmittance and the clearer the solution. The apparatus is a spectrophotometer covering 380 nm to 850 nm and a 1 cm cuvette. Ten grams of sample are weighed, water is added to 100 mL until dissolution is complete and the solution is shaken; this is the ten per cent test solution. Water is used to set the zero and the transmittance is measured at 420 nm, the result given to one decimal place.

Moisture is determined by the first method, direct drying, of GB 5009.3-2016.

Residue on ignition: the apparatus is a porcelain crucible, a high temperature furnace, an electric furnace, crucible tongs and an ordinary desiccator, and the reagent is concentrated sulfuric acid. One gram of sample is weighed accurately to 0.0001 g into a porcelain crucible previously ignited to constant mass and is ignited gently on the electric furnace until fully carbonized, then cooled to room temperature. 0.5 mL of concentrated sulfuric acid is added to wet it and it is heated gently until the sulfuric acid vapour has gone; the crucible is then moved to the high temperature furnace and ignited at 800 °C +/- 25 °C until ashing is complete, moved to the desiccator, cooled to room temperature and weighed, and check ignitions follow until constant mass. The mass fraction of the residue is calculated by formula (3), whose legend gives X3 as the residue on ignition in per cent, m1 as the mass of the crucible and residue after ignition in grams, m2 as the mass of the empty crucible in grams and m as the mass of the sample in grams. Results are given to two decimal places and under repeatability conditions the absolute difference between two independent determinations is not more than 0.02 %. The printed equation is broken in the extracted text and is not reproduced here.

Specific rotation is determined by the method of GB/T 20880. For pH, the apparatus is a pH meter of resolution 0.01 with a glass electrode and a calomel electrode, or a combination electrode. The meter is adjusted and calibrated as its manual directs; 20.0 g of sample is