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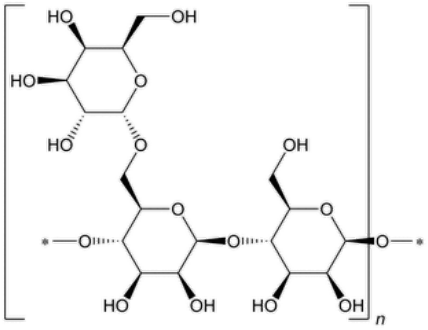
Guar Gum



CAS RN®: 9000-30-0.

DEFINITION

Guar Gum is the flour obtained by grinding the endosperms of seeds of *Cyamopsis tetragonolobus* (L.) Taub. (Fam. Leguminosae). It consists chiefly of high molecular weight hydrocolloidal polysaccharides composed of galactomannan. The content of galactomannan is NLT 66.0%. Galactomannan consists of a linear main chain of β-(1→4)-glycosidically linked mannopyranoses and single α-(1→6)-glycosidically linked galactopyranoses, and the ratio of the mannose and galactose is from 1.4:1 to 2.2:1.

IDENTIFICATION

• **A. Indication for a Polymeric Compound and Distinction from Locust Bean Gum**

Sample: 2 g

Analysis 1: Place the *Sample* in a 400-mL beaker, and moisten it with 4 mL of isopropyl alcohol. Add 200 mL of cold water with vigorous stirring, and continue stirring until the *Sample* is completely and uniformly dispersed.

Acceptance criteria 1: An opalescent, viscous dispersion results.

Analysis 2: Transfer 100 mL of the sample dispersion prepared above to a 400-mL beaker, heat in a boiling water bath for about 10 min, and then cool to room temperature.

Acceptance criteria 2: No appreciable increase in viscosity is produced (distinction from locust bean gum: see *Reagents, Indicators, and Solutions—Reagent Specifications*).

• **B. Identification of Constituting Mannose and Galactose by Thin-Layer Chromatography**

Mobile phase: Acetonitrile and water (85:15)

Standard solution: Dissolve 10 mg of USP Galactose RS and 10 mg of USP Mannose RS in 2 mL of water, and dilute with methanol to 20 mL.

Sample solution: Transfer 20 mg of Guar Gum to a test tube, add 4 mL of a 100 mg/mL solution of trifluoroacetic acid, and shake vigorously to dissolve the forming gel. Stopper the tube, and heat the mixture at 115° for 1 h 20 min in a dry bath (heating block) or oil bath. Cool, transfer the hydrolysate to a centrifuge tube, and centrifuge. Some suspended particles/gel are formed. Pass the supernatant solution through a 0.45-µm disc filter. Wash the test tube and the centrifuge tube with two 5-mL portions of water, and filter. Combine the washing filtrate with the filtered supernatant of the hydrolysate. Transfer the combined clear filtrate to a 50-mL flask, and evaporate the solution to dryness under reduced pressure. To the resulting residue add 0.2 mL of water and 1.8 mL of methanol.

Chromatographic system

(See *Chromatography ⟨621⟩, Thin-Layer Chromatography*.)

Mode: TLC

Absorbent layer: 0.25-mm silica gel 60 F_{254}

Application volume: 5 µL, as 9-mm bands, using an automated apparatus

Spray reagent: Dissolve 3 g of phthalic acid and 0.3 g of aminohippuric acid in ethyl alcohol, and dilute with ethyl alcohol to 100 mL.

Analysis

Samples: *Standard solution* and *Sample solution*

Develop over a path of 15 cm. Spray with *Spray reagent*, and dry at 120° for 5 min.

Acceptance criteria: The chromatogram from the *Standard solution* shows, in the lower region, two clearly separated brownish or yellowish zones due to galactose and mannose in order of increasing R_F value. The chromatogram from the *Sample solution* shows two zones due to galactose and mannose.

ASSAY

• **Content of Galactomannan and Ratio of Constituting Mannose and Galactose**

Mobile phase: Water

System suitability solution: 5 mg/mL of USP Galactose RS, 5 mg/mL of USP Mannose RS, 5 mg/mL of USP Xylose RS, and 5 mg/mL of USP Dextrose RS in *Mobile phase*

Standard solution: 10 mg/mL of USP Galactose RS and 10 mg/mL of USP Mannose RS in *Mobile phase*

Sample solution A: Transfer 100 mg of Guar Gum to a glass test tube. Add 2.0 mL of water and 2.0 mL of 1 M trifluoroacetic acid to the tube, and mix on a vortex mixer for 30 s. Incubate the solution at 105° in an oil-bath heating module for 6 h. After the first 15 min of incubation, mix on a vortex mixer for 30 s. After the 30 min of incubation, mix on a vortex mixer for 30 s. [Note—This ensures that Guar Gum does not stick to the bottom of the test tube and burn.] Before HPLC analysis, mix on a vortex mixer for 30 s, and pass the solution through a 0.45-µm PES (polyethersulfone) membrane syringe filter.

Sample solution B: 5 mg/mL of Guar Gum in *Mobile phase*

Chromatographic system

(See *Chromatography ⟨621⟩, System Suitability*.)

Mode: LC

Detector: Refractive index

Column: 8.0-mm × 30-cm; 7-µm packing L22

Temperatures

Detector: 55°

Column: 80°

Flow rate: 0.75 mL/min

Injection volume: 10 µL

Detector purge time: 1 min

Run time: 17 min

System suitability

Samples: *System suitability solution* and *Standard solution*

[Note—The relative retention times for glucose, xylose, galactose, and mannose are 0.88, 0.94, 1.00, and 1.10, respectively.]

Suitability requirements

Resolution: NLT 0.9 between dextrose and xylose; NLT 1.0 between xylose and galactose; NLT 1.5 between galactose and mannose, *System suitability solution*

Tailing factor: 0.8–1.8 for the galactose and mannose peaks, *Standard solution*

Relative standard deviation: NMT 2.0% for the galactose and mannose peaks, *Standard solution*

Analysis

Samples: *Standard solution*, *Sample solution A*, and *Sample solution B*

In the chromatogram of *Sample solution B*, no galactose and mannose peaks are observed.

Calculate the percentage of galactose (C_G) or mannose (C_M) in the portion of Guar Gum taken:

$$\text{Result } (C_G \text{ or } C_M) = (r_U/r_S) \times (C_S/C_U) \times 100$$

r_U = peak response of galactose or mannose in *Sample solution A*

r_S = peak response of galactose or mannose in the *Standard solution*

C_S = concentration of USP Galactose RS or USP Mannose RS in the *Standard solution* (mg/mL)

C_U = concentration of Guar Gum in *Sample solution A* (mg/mL)

Calculate the content of galactomannans in the portion of Guar Gum taken:

$$\text{Result} = C_M + C_G$$

Calculate the ratio of constituting mannose and galactose in the portion of Guar Gum taken:

Result = C_M/C_G

Acceptance criteria

Content of galactomannan: NLT 66.0%

Ratio of constituting mannose and galactose: 1.4–2.2

IMPURITIES

Change to read:

• ▲Arsenic ⟨211⟩, *Procedures, Procedure 2*▲ (CN 1-Jun-2023) : NMT 3 µg/g

Change to read:

• ▲Lead ⟨251⟩, *Procedures, Procedure 1*▲ (CN 1-Jun-2023)

Analysis: Prepare a *Test Preparation* as directed in the chapter, and use 10 mL of *Diluted Standard Lead Solution* (10 µg of Pb) for the test.

Acceptance criteria: NMT 10 µg/g

SPECIFIC TESTS

• Articles of Botanical Origin, *Total Ash* ⟨561⟩: NMT 1.5%

• Acid-Insoluble Matter

Sample: 1.5 g

Analysis: Transfer the *Sample* to a 250-mL beaker containing 150 mL of water and 1.5 mL of sulfuric acid. Cover the beaker with a watch glass, and heat the mixture on a steam bath for 6 h, rubbing down the wall of the beaker frequently with a rubber-tipped stirring rod and replacing any water lost by evaporation. At the end of the 6 h heating period, add 500 mg, accurately weighed, of a filter aid, and pass through a tared, ashless filter. Wash the residue several times with hot water, dry the filter and its contents at 105° for 3 h, cool in a desiccator, and weigh. Determine the amount of acid-insoluble matter by subtracting the weight of the filter aid from that of the residue.

Acceptance criteria: NMT 7.0%

• Microbial Enumeration Tests ⟨61⟩ and Tests for Specified Microorganisms ⟨62⟩: The total aerobic microbial count does not exceed 10^4 cfu/g, and the total combined molds and yeasts count does not exceed 10^2 cfu/g. It meets the requirements of the tests for absence of *Salmonella* species and *Escherichia coli*. It is recommended that the enrichment broth contain a 1% cellulase solution additive to optimize the recovery of *Salmonella* from this material.

• Protein

Sample: 1.0 g

Analysis: Transfer the *Sample* to a 500-mL Kjeldahl flask, and proceed as directed in *Nitrogen Determination* ⟨461⟩, *Method I*. Determine the percentage of nitrogen. Calculate the amount of protein by multiplying the percentage of nitrogen by 6.25.

Acceptance criteria: NMT 10.0%

• Starch

Analysis: To a dispersion (1 in 10) of Guar Gum add a few drops of iodine TS.

Acceptance criteria: No blue color is produced.

• Loss on Drying ⟨731⟩

Analysis: Dry at 105° for 5 h.

Acceptance criteria: NMT 15.0%

ADDITIONAL REQUIREMENTS

• Packaging and Storage: Preserve in well-closed containers.

• USP Reference Standards ⟨11⟩

USP Dextrose RS
USP Galactose RS
USP Mannose RS
USP Xylose RS

Auxiliary Information - Please check for your question in the FAQs before contacting USP.

Topic/Question	Contact	Expert Committee
GUAR GUM	Documentary Standards Support	CE2020 Complex Excipients

Chromatographic Database Information: Chromatographic Database

Most Recently Appeared In:
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