Compositional Guideline: D-glucose, polymer with xylitol

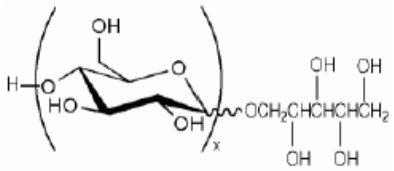
DESCRIPTION

D-glucose, polymer with xylitol is the product of chemical glycosylation between xylitol and D-glucose in the presence of a mineral acid catalyst. The reaction mixture is then neutralised and diluted to yield an inseparable mixture comprising of xylitylglucoside (CAS No: 1095751-96-4), anhydroxylitol (CAS No: 53448-53-6), xylitol (CAS No: 87-99-0), and D-glucose (CAS No: 50-99-7).

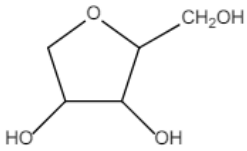
CAS number: 875800-11-6

Molecular structures:

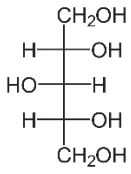
Xylitylglucoside:



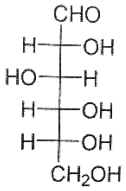
Anhydroxylitol:



Xylitol:



D-glucose:



Test	Method reference	Acceptance criteria

CHARACTERISATION		
General properties		
Appearance	Visual	Transparent to slightly opalescent yellowish liquid
pH	Ph. Eur. 2.2.3	4.5 - 7.0
Water content	Karl Fischer (Ph. Eur. 2.5.12)	15 - 17%
Boiling point	Ph. Eur. 2.2.12	314.9 ± 2.6°C
Density	USP <699>	1435 Kg/m^3 at 20°C
Water solubility	Commission Directive 92/69/EEC (1992) - Flask Method A6	674 g/L at 20°C
Identity		
LC-MS	LC-MS[1]	Detection of molecular ions peaks for all components as follows: • m/z 319 [M+23] for monoether xylitylglucoside • m/z 481 [M+23] for diether xylitylglucoside • m/z 175 [M+23] for xylitol • m/z 327 [2M+23] for xylitol dimer • m/z 157 [M+23] for 1,4-anhydroxylitol • m/z 291 [2M+23] for 1,4-anhydroxylitol dimer
GC	GC[2]	Observation of peaks at retention times: • 11 min (xylitan); • 14 min (xylitol); • 16 min (α-D-glucose); • 17 min (β-D-glucose); • 22-26 min (xylitylglucosides dimers); • 30-34 min (xylitylglucosides trimers); • 36-38 min (xylitylglucosides tetramers)

FT-IR	FT-IR[3]	Observation of characteristic peaks at 3329, 2936, 1418, 1260, 1040, and 823 cm^{-1}.
NMR	USP <761>	^{1}H-NMR: Observation of signals at 3.2-4.7 ppm. ^{13}C-NMR: Observation of signals at 68-94 ppm. DEPT-135: Observation of signals at 72.6 ppm and 60.0-62.0 ppm in DEPT-135 sub-spectra.
UV-Vis	USP <857>	Observation of a single absorption peak at 195 nm.
Assay		
Hydroxyl value on dry material	USP <401>	Limits for the assay test: 1100 - 1300 mg KOH/g
GC	GC[2]	Xylitylglycoside (35-50%); Anhydroxylitol (24-34%); Xylitol (5-15%); D-glucose (0-5%)
Impurities and incidental constituents		
Elemental impurities		
Lead	ICP-MS[4]	<2.00 ppm
Cadmium	ICP-MS[4]	<0.10 ppm
Mercury	ICP-MS[4]	<0.10 ppm
Arsenic	ICP-MS[4]	<0.50 ppm
Nickel	ICP-MS[4]	<2.00 ppm
Chromium	ICP-MS[4]	<1.00 ppm
Cobalt	ICP-MS[4]	<2.00 ppm
Antimony	ICP-MS[4]	<0.50 ppm
Microbiology		

While substance manufacturers are encouraged to include limits for objectionable microorganisms, it is the product into which those substances are formulated that is subject to a legally binding set of criteria. The Therapeutic Goods Order No. 100 *'Microbiological Standards for Medicines*' mandates that any finished product that contains the ingredient, alone or in combination with other ingredients, must comply with the microbial acceptance criteria set by Clause 11 of the Order.

Footnotes

1. **LC-MS:** LC system: Acquity UPLC I-Class; Column: Acquity BEH Amide 50 x 2.1 mm; 1.7 µm particle size; Solvent wash: Water/MeOH; Solvent purge: Water/Acetonitrile. Gradient: A: Acetonitrile/Water (80:20) + 1% NH_4OH; B: Acetonitrile/Water (30:70) + 1% NH_4OH; HR-MS system: Xevo G2-XS ToF (Waters); Mode of ionisation: ESI; m/z and calibration mode: 50 to 1200 m/z.
2. **GC:** Column: Varian fused silica CP-Wax-52CB (10 m x 0.10 mm id, DF 0.2, cat no. CP7335); Injection volume: 5.0 µL; Helium carrier gas: 4 psi at room temperature; Flame ionization detector; Detection temperature: 350°C (8°C/min); Solvent plug: 10 µL; Injector temperature: 300°C; Make-up gas: air and hydrogen; Leak: 60 mL/min.
3. **FT-IR:** Nicolet IS10 IR spectrophotometer with ATR window (mono-reflexion); wave number range of 400 to 4,000 cm^{-1}, minimum 32 scans, and 4.00 cm^{-1} resolution.
4. **ICP-MS:** Samples dilution factor 100 as follows: 0.30 g of sample + 0.30 g of internal standard solution (In and Re at 5 ppm) + 0.45 mL of concentrated HNO_3 + 0.15 mL of concentrated HCl + complete to 30 g with ultrapure water. Standard solutions of Ag, Al, As, B, Ba, Be, Bi, Ca, Cd, Co, Cr, Cs, Cu, Fe, Ga, Ge, Hf, In, K, Li, Mg, Mn, Mo, Na, Nb, Ni, Pb, Rb, Sb, Se, Sn, Sr, Ta, Ti, Tl, V, W, Zn, Zr at 5 ppb, 10 ppb, and 50 ppb.

Abbreviations

CAS: Chemical abstract services
DEPT: Distortionless Enhancement by Polarisation Transfer
FT-IR: Fourier-transform infrared spectroscopy
GC: Gas chromatography
ICP-MS: Inductively coupled plasma - Mass spectrometry
LC-MS: Liquid chromatography - Mass spectrometry
NMR: Nuclear magnetic resonance spectroscopy
Ph. Eur.: European Pharmacopoeia
USP: United States Pharmacopeia
UV-Vis: Ultraviolet-visible spectroscopy

Version	Description of change (for official use only)	Effective date
1.0	Original	