Glucose

- Glucoses must pass the following tests:

1. Solubility, 2. neutrality, 3. test for absence of starch and dextrins, 4. limit tests for sulfites, chlorides, sulfates, barium, arsenic, cadmium, and lead.

- Glucose is prepared for parenteral administration in aqueous solution.

Other starch industry products

- Industrial products from starch include maltodextrins, glucose syrups, fructose syrups, and liquid glucose.

1. Maltodextrins have DE less than 20. and it is a mixture of polysaccharides resulting from the partial hydrolysis of starch.

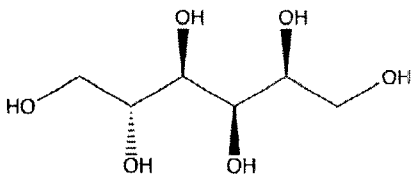
Maltodextrin Applications

- Bulking
- Body/viscosity
- Sugar crystallization (hard candies)
- Turn oil into powder
- Matrix for Drying
- Energy Source

Monosaccharide derivatives

used in Pharmacy

D-Sorbitol



- D-Sorbitol=D- glucitol,
- D-Sorbitol is identified by the melting point of its acetylated derivative and by TLC.
- D-Sorbitol must pass many tests:

1. Specific optical rotation,
2. Neutrality of its solution,
3. limit tests (chloride, sulfate, nickel, lead), water (for anhydrous sorbitol <1.5%), relative density, refractive index (for 70% sorbitol), quantitation of reducing sugars.

D-Sorbitol

- It is indicated in symptomatic treatment of dyspepsia.
- Contraindications include organic inflammatory and undiagnosed abdominal pain.

Uses of Sorbitol

-Sorbitol is used in bacterial culture media to distinguish the pathogenic *Escherichia coli* O157:H7 from most other strains of *E. coli* ,as it is usually incapable of fermenting sorbitol.
-Sorbitol, combined with kayexalate ,helps the body rid itself of excess potassium ions in a hyperkalaemic state [8].The kayexalate exchanges sodium ions for potassium ions in the bowel, while sorbitol helps to eliminate it.

Health care, food, and cosmetic uses

- Sorbitol often is used in modern cosmetics as a humectant and thickener[10].Sorbitol often is used in mouthwash and toothpaste .Some transparent gels can be made only with sorbitol, as it has a refractive index sufficiently high for transparent formulations. It is also used frequently in "sugar free" chewing gum..

Health care, food, and cosmetic uses

- Sorbitol is used as a cryoprotectant additive (mixed with sucrose and sodium polyphosphates
- It is also used as a humectant in some cigarettes[11].
- Sorbitol sometimes is used as a sweetener and humectant in cookies and other foods that are not identified as "dietary" items

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Miscellaneous uses of Sorbitol

-A mixture of sorbitol and potassium nitrate has found some success as an amateur solid rocket fuel[12].

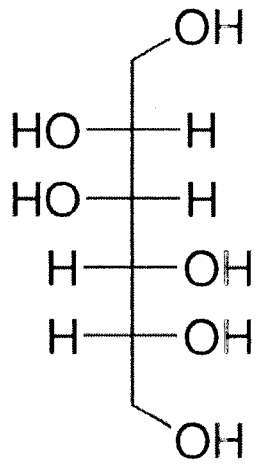
-Sorbitol is identified as a potential key chemical intermediate [13]for production of fuels from biomass resources .

Main medical Uses of D-Sorbitol

- As a sweetener, sorbitol is used as

1. a substitute for sucrose for diabetics (it is converted to D-fructose, which is subsequently metabolized to glycogen).

D-mannitol



- It is identified by its melting point and by TLC.

it must pass many tests:

1. absence of D-sorbitol (TLC) and of
2. reducing sugars,
3. limit test for metals (Ni, Pb) and for anions (e.g., chlorides and sulfates)

- It is quantitated by periodate oxidation.

D-mannitol

- Uses: Mannitol is used as

1. laxative and
2. in the treatment of gastric dilation, nausea..

- Contraindication: biliary tract obstruction.

Polysaccharides

- Homogenous polysaccharides can be distinguished, resulting from the condensation of a large number of molecules of the same sugar, from heterogeneous polysaccharides, which result from condensation of molecules of different types of sugars.

polysaccharides

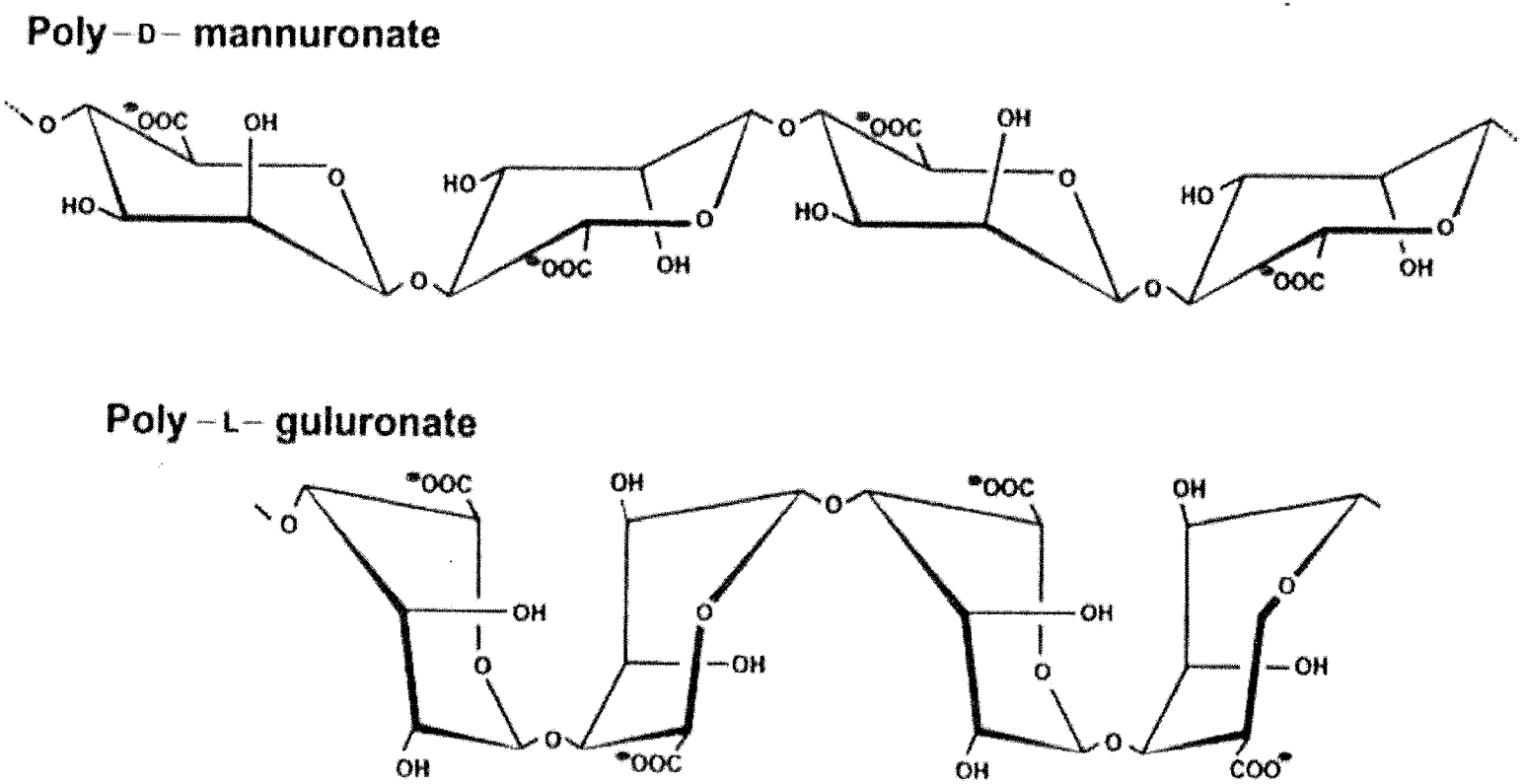


Figure 4.2 Poly-G and poly-M alginate sequences give different structures.

Different types of alginates - different properties e.g. gel strength

Polyguluronate: - gelation through addition of Ca^{2+} ions – egg-box

Polymannuronate – less strong gels, interactions with Ca^{2+} weaker, ribbon-type conformation

Alternating sequences – disordered structure, no gelation

Sources of Polysaccharide

- Microbial fermentation
- Higher plants
  - seeds,
  - tree extrudates,
  - marine plants,
- Chemical modification of other polymers

No calorific value; fiber

Polysaccharides – 6 case studies

1. **Alginates**
2. **Pectin**
3. **Xanthan**
4. **Galactomannans**
5. **Cellulose**
6. **Starch**

Isolation and structural analysis

- Isolation:
- polysaccharides dissolve in water, possibly in the presence of mineral acids (as for pectin extraction) or of various salts (carbonates in the case of algins).

Isolation and structural analysis

- The elimination of salts and of low molecular-weight molecules can be done by : 1-dialysis, 2-by using ion exchange resins, 3-by molecular gel filtration or 4-by extraction (for example, elimination of oligosaccharides and of pigments by ethanol or acetone).

Isolation and structural analysis

- Chromatographic techniques find broad application in the purification of polysaccharids: on charcoal, on native or substituted reticulated polyglucan gels, or on ion exchanges.

Isolation and structural analysis

- In all cases, purification is followed by physical and chemical determinations:

1. optical rotation,
2. molecular weight,
3. elemental composition,
4. electrophoresis, and more.

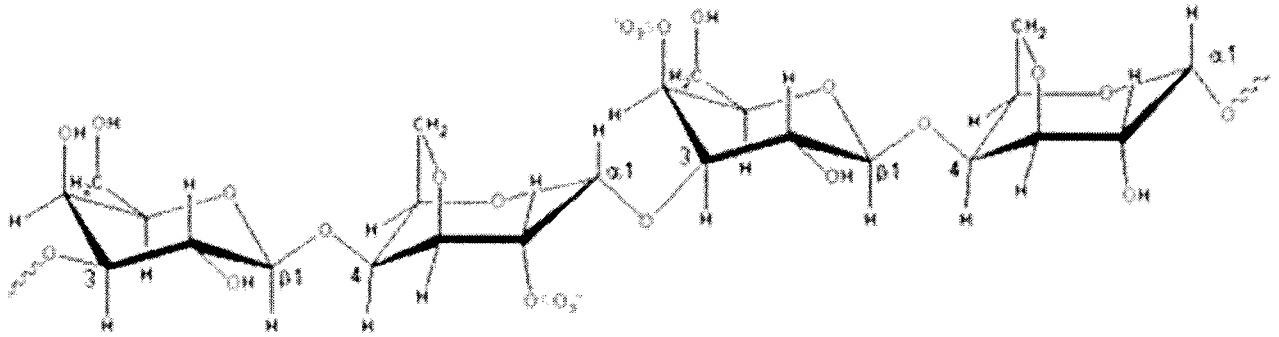
Isolation and structural analysis

- The structural analysis of polysaccharides is exceedingly complex and requires the combined use of physical (spectroscopy and spectrometry) and chemical methods (hydrolysis, partial hydrolysis, formation of derivatives, controlled degradation of the polymer and its derivatives).

Preparation of Carrageenans

- After a wash (that eliminates debris and minerals) the seaweeds are extracted by slightly alkaline warm water.
- The residual thalluses, filtered under pressure, are discarded.
- The supernatant is partially concentrated and an alcohol is added to precipitate the polysaccharide.

Carrageenans



Tests of Algal Polysaccharides

1. Characterization of galactose (by TLC) after sulfuric acid hydrolysis of the polymer.
2. Estimation of the apparent viscosity of a 15g/L solution at 75 °C;
3. Limit test for heavy metals;
4. Residual level in methanol and 2-propanol (by GC: <0.1%).
5. Quantitation of sulfates by barium perchlorate after mineralization in oxygen.

Soluble starch

- Soluble starch is prepared by treating commercial potato starch with hydrochloric acid until, after washing, it forms clear solution in hot water.
- It should show little reduction with Fehling's solution and gives a deep blue colour with iodine.
- On heating with 5% potassium hydroxide solution, it gives a canary-yellow color, no colour afforded by ordinary starch and dextrin give a brown color when similarly treated.

Tests for Acacia gum

- Acacia is almost completely soluble in an equal weight of water.
- 10% aqueous solution gives no precipitate with dilute solution of lead acetate (distinction from tragacanth and agar), gives no colour with solution of iodine (absence of starch and dextrin).

Tests for Acacia gum

- Pharmacopoeial quality of Acacia gum gives no reaction for tannin with ferric chloride.
- The mucilage (moistened acacia gum) gives a blue color when treated with solution of benzidine and a few drops of hydrogen peroxide, which indicates the presence of a peroxidase (possible distinction from tragacanth).