

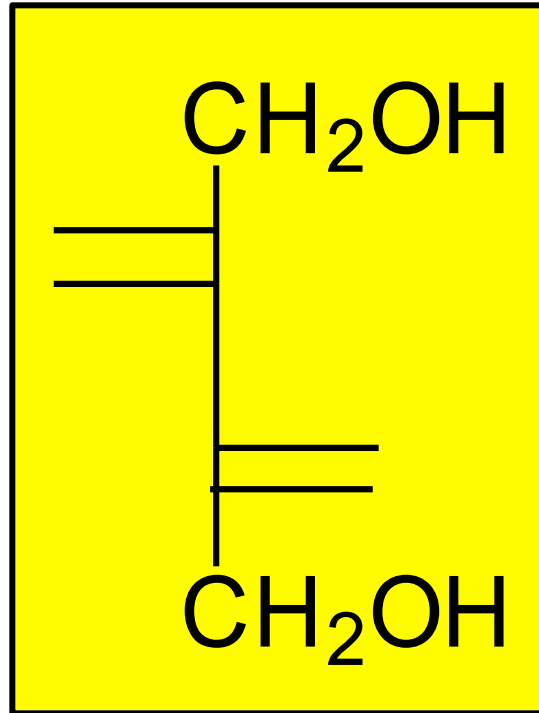
MANNITOLUM (TF) Mannitol

- ▶ Obtained by reduction of mannose
- ▶ Odourless, white, crystalline powder, sweet taste.
- ▶ Oleaceae and Scrophulariaceae family plants contain. Especially *Fraxinus ornus* (dişbudak) ...
- ▶ Manna (Kudret Helvası) main component
- ▶ Manna+ boiled EtOH extracted and then crystallized to obtain Mannitol
- ▶ Prepared by catalytic (Ni) or electrolytic reduction of Gl. and Mannose, SORBITOL+ MANNITOL mixture obtained
- ▶ Filtered, subjected to ion exchange chromatography and crystallized as mannitol

- ▶ **Soluble in water and boilen ethyl alcohol**
- ▶ **Mannitol is used for kidney function tests**
- ▶ **%25solution is given and the concentration is measured in blood and urine. It undergoes glomerular filtration and practically no tubular resorbtion**
- ▶ **%2.5 solution is used for surgery in urology**
- ▶ **Identification of some microorganisms in bacteriology**
- ▶ **Laxative in children**

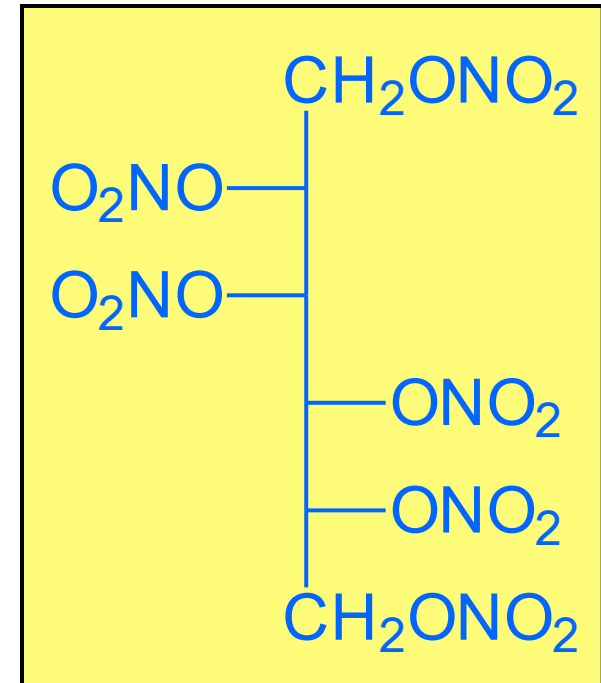
- ▶ **Sweetener for diabetic patients**
- ▶ **%5-25 solutions diuretic (50-100 g/ day)**
- ▶ **“MANNİTOLİ INJECTIO” is recorded in Turkish Pharmacopoeia as regulator of blood PH**
- ▶ **%20 MANNITOL 1g/KG dosage is used in brain eudema**

MANNITOLUM (TF) MANNITOL



Mannitol hexanitrate

- ▶ Mannitol + H_2SO_4 + HNO_3 is used for preparation
- ▶ Vasodilator
- ▶ Used against angina

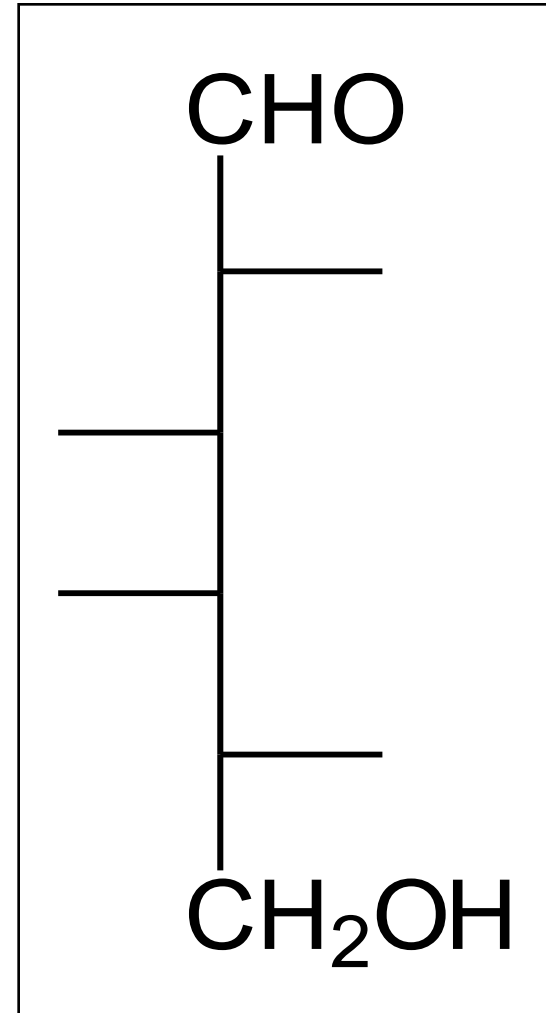
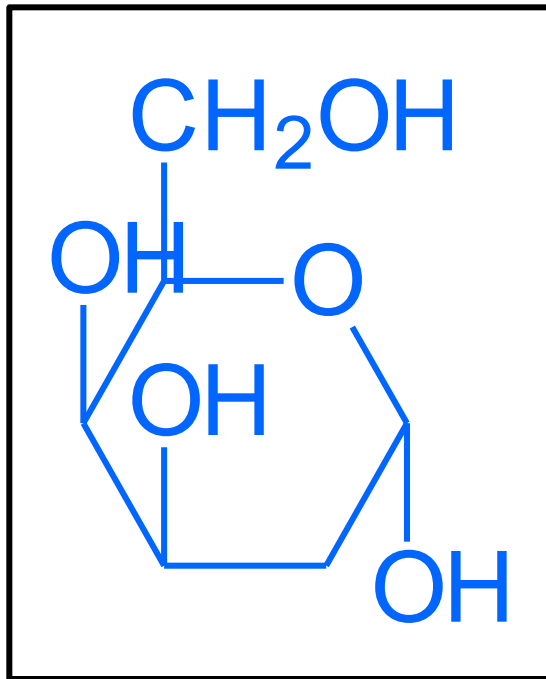


Galactose

- ▶ It is not found in nature as free form
- ▶ Hemisellulose, gum and musilages contain
- ▶ Lactose and polysaccharides also contain
- ▶ Sweet taste is lower than glucose.
- ▶ Specific rotation is $+80^{\circ}$
- ▶ Lactose + $2\text{H}_2\text{SO}_4$ hydrolisation resulted in.....Galactose

- ▶ **Clinically used for liver function tests**
- ▶ **Healthy liver converted galactose to glicogen, however if the functions of liver are lost galactose can be detected in urine**

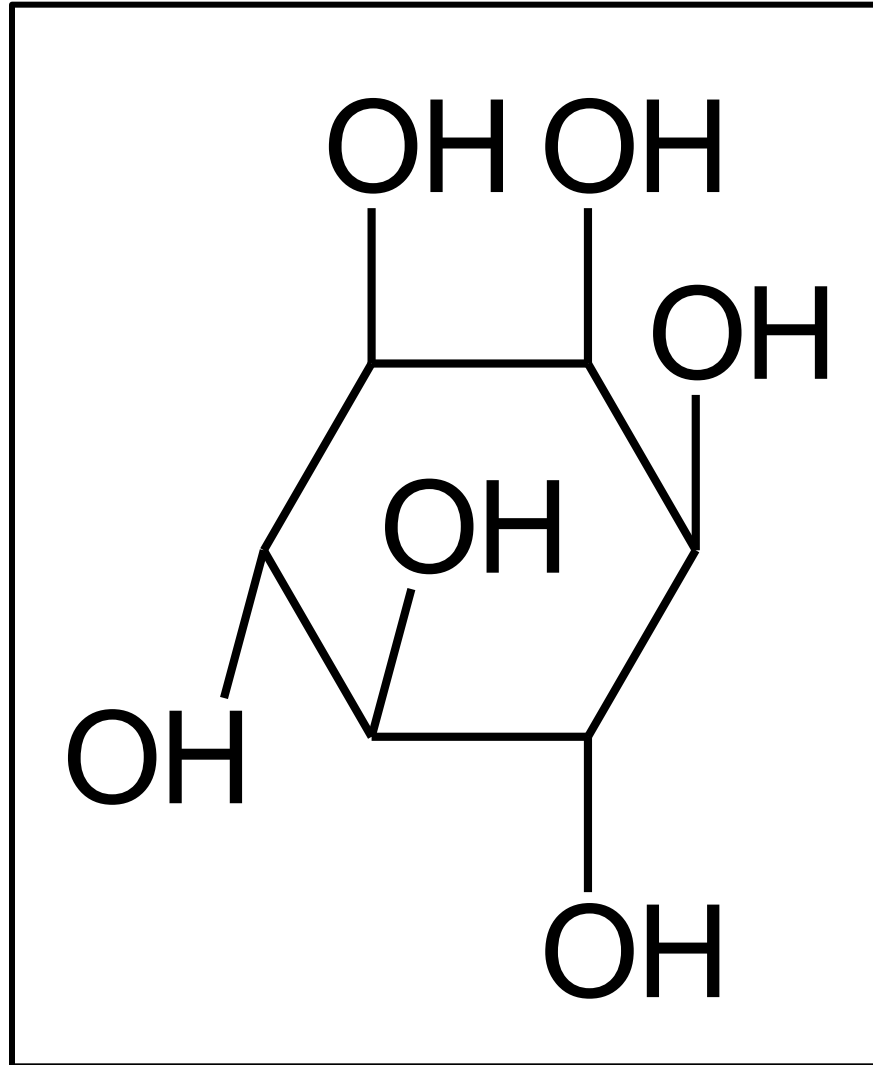
Galactose



Mesoinositol

- ▶ **Hexitol in cyclic structure**
- ▶ **8 cis-trans isomer, 1 optical isomer**
- ▶ **Mesoinositol in plants does not have optical isomer**
- ▶ **Mesoinositol+ H_3PO_4 phytic acid(Mesoinositol hexaphosphate)**
- ▶ **Phytin, a calcium magnesium salt of phytic acid that occurs in plants as the main phosphorus storage reserve especially in seeds or tubers and is used as a source of inositol .**
- ▶ **Used as anabolic**

Mesoinositol



- ▶ **Common in animal tissue.**
- ▶ **Indications such as; lose of weight, alopecia are occurred in the absence of mesoinositol**
- ▶ **Mesoinositol play an important role in fat metabolism. Protect liver against fatty liver syndrome**
- ▶ **Used as a tonic against arteriosclerosis**
- ▶ **Mesoinositol hexanicotinate.... Used against environmental, cerebral and diabetic circulatory problems**

Manna (TK)

- ▶ Source of mannitol
- ▶ Different types of manna are occurs
- ▶ Brianson manna, occurs naturally
- ▶ Effect of insects (Eucalyptus and Tamarix)
- ▶ Wounding of plants (Fraxinus)
- ▶ Lecanora esculenta lichen known as manna
- ▶ ***Lecanora esculenta* and known as MANNA OF JEW (İbrani Mannası)**
- ▶
- ▶ Insects prepared a product with compounds from plants (Trehala manna)
- ▶ ***Fraxinus ornus* L. (Oleaceae) wounding of body resulted in manna occurrence**
- ▶ 20m high, 5-9 leaflets, white flowers





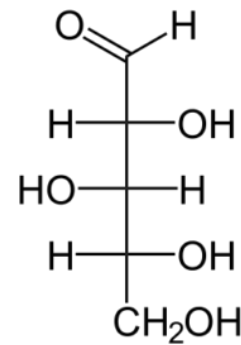
- ▶ **West and Northwest Anatolia**
- ▶ Manna is not obtained in Anatolia
- ▶ **Sicilia is the main country for manna**
- ▶ Outer sides of the Manna is straw yellow, inside is white colour, honey like smells and sweet taste
- ▶ %30-80 of mannitol, gl., fr., resin
- ▶ In children 5-30 g/day dosage laxative
- ▶ ***F. excelsior*** L., 40 m. high, 7-13 leaflets
- ▶ It grows at mountains in North Anatolia
- ▶ %2 infusion of leaves are used as diuretic, galactagogue and laxative
- ▶ **Cortex of the plant is used as antipyretic, constipating and tonic**

- ▶ Mannitol, Sorbitol, Gl., Trehalose (gl+gl), melitose (fr+gl+gal), melesitose (gl+fr+gl)
- ▶ MANNA DEPURATA a product obtained from wounds and hardening on the body
- ▶ %40-60 D-mannitol,
- ▶ mannatriose (gl+gal+gal) ve
- ▶ mannatetrose (mannotriose+fr)
- ▶ Musilage ve fraxinoside (Coumarin)
- ▶ Laxative and purgative



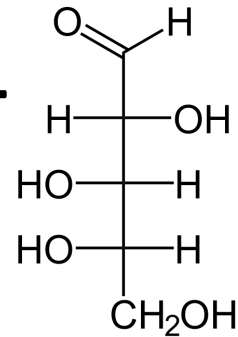
- ▶ **Gezengevi** (Ş. urfa, Mardin, Siirt, Bitlis, Diyarbakır) occurs in *Quercus libani* leaves
- ▶ Yellow-brown, sticky, sweet taste
- ▶ %40 sucrose,
- ▶ %12 fructose,
- ▶ %5 glucose, melesitose
- ▶ Does not contain MANNITOL

Pentoses



D-Xylose

- ▶ 5 oxygen and 5 C atoms
- ▶ D-xylose and L-arabinose
- ▶ D-Glucose.....D-glucuronic acid.....D-xylose
- ▶ D-galactose.....D-galacturonic acid....L-arabinose



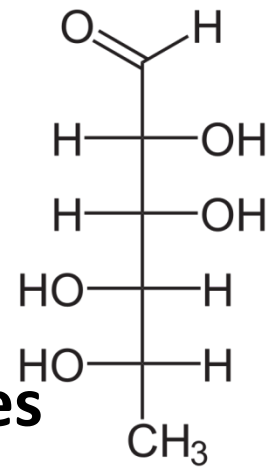
L-Arabinose

▶ D-xylose and L-arabinose

- ▶ Common constituents of complex polysaccharides, hemicelluloses (xyloglucans, xylans, glucuronoxylans, arabinoxylans, glucuronoarabinoxylans), peptic polysaccharides, mucilages and gums

▶ **L-Rhamnose:**

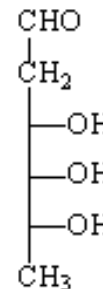
- ▶ Aldopentose,
- ▶ Methylpentose (5 O, 6 C atoms)
- ▶ 6-deoxyhexose
- ▶ A constituent of heterogenous polysaccharides and glycosides
- ▶ Used in bacteriology for identification of some microorganisms



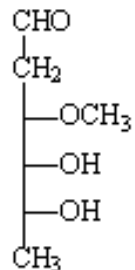
L-Rhamnose

▶ **2-desoxyoses:**

- ▶ These sugars are often methylated at 2th and 6th positions, they contain methyl substituent instead of hydroxyl group.
- ▶ Specific to cardiac glycosides
- ▶ D-digitoxose,
- ▶ L-oleandrose, D-cymarose



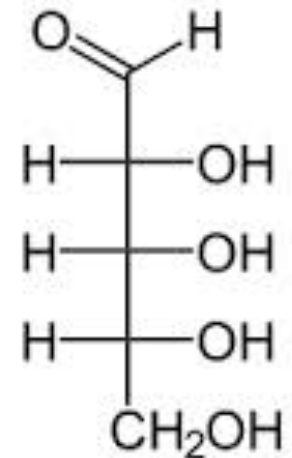
D-digitoxose



D-cymarose

▶ D-ribose:

- ▶ Pentose as a constituent of nucleotide.
- ▶ Identification of some microorganisms in bacteriology.



Tetroses

► Erythrose and erythritol tetranitrate is important in Pharmacy

Erythritol Tetranitrate:

Erythrose.....red....Erythritol +H₂SO₄+HNO₃...

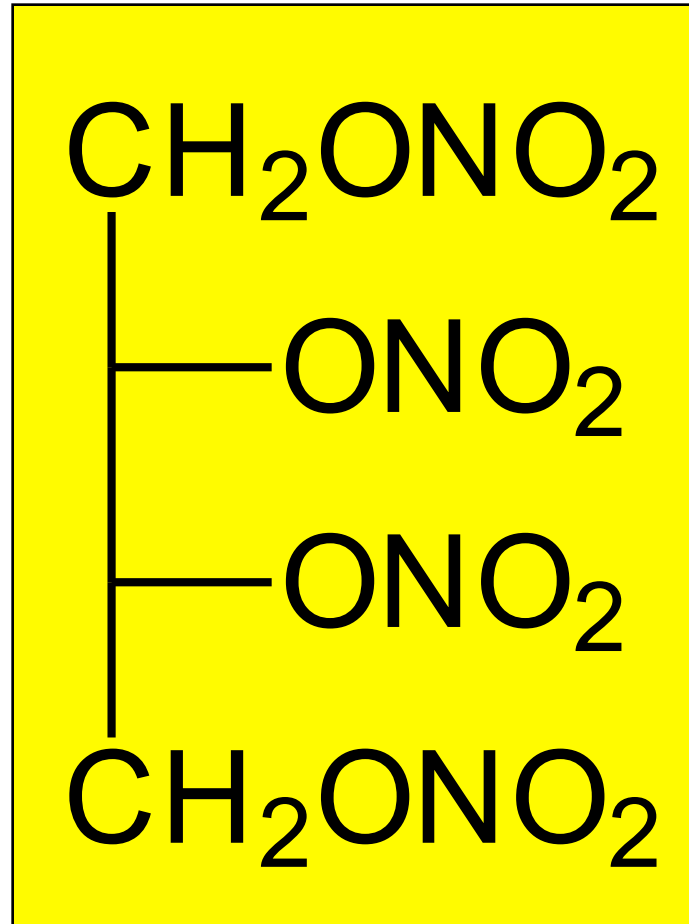
Erythritol Tetranitrate

-Vasodilator, used in angina

-Effective more longer time than other nitrate derivatives

-In industry for resin and plastic preparation

Erythritol tetranitrate



Trioses

- ▶ 3 C and 3 O atoms
 - ▶ **GLYCEROLUM (TF) GLİSEROL**
- ▶ Propane- 1,2,3-triol
- ▶ Does not found in free form in nature,
- ▶ It is a constituent of lipids
- ▶ At least contain %97 propanetriol
- ▶ “Glycerolum Concentratum” is also recorded in some pharmacopoeia contain %98 propanetriol

Production of glycerol

- ▶ **1) Soap industry, saponified of lipids**
- ▶ **Lipid + KOH saponification....Glycerol soap solution + salt (saturated solution).....
Upper phase soap**
- ▶ **Lower phase.....Glycerol+salt**
- ▶ **Lower phase concentratedsalt collapsed...Filtered and concentratedglycerol is obtained, boiled with acid and washed, decolorized and then cleaned after concentrated**

2. Fermentation

- ▶ Producing ethylalcohol sulphide ions are added and glycerol occurs as the main component. Glycerol is obtained by extracted with alcohol/ CCl_4
- ▶ Yield %15

▶ **Identification:**

▶ **Glycerol+KHSO₄ R heating**

Acrolein + 2H₂O (acrolein has specific odour)

▶ **Usage:**

▶ **Solvent in pharmaceutical technology**

▶ **Suppository for its purgative activity**

▶ **Solvent and humectant in ear drops**

▶ **Emollient against for skin and mucose irritation**

▶ **Demulcent activity against pharynx irritation on mucous mebranes**

GLYCERYLIS TRINITRATIS, TRINITRIN, TRINITROGLISERIN

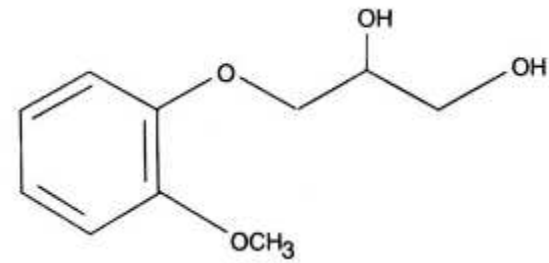
Nitroglyceryn, trinitrine

- ▶ Concentrated HNO_3 + Concentrated H_2SO_4 ...+ in cold together with glycerol

TRINITRINE is obtained

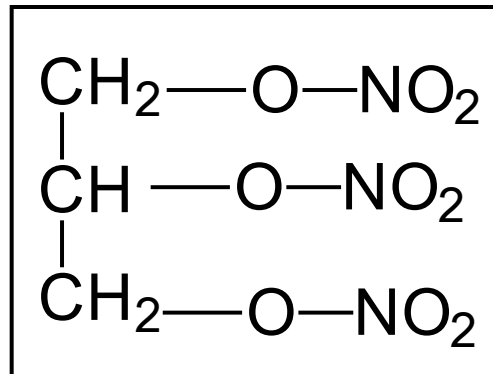
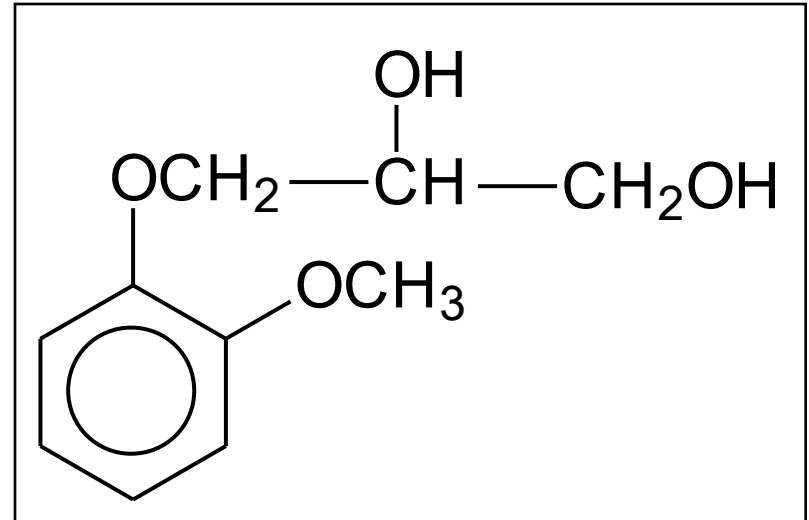
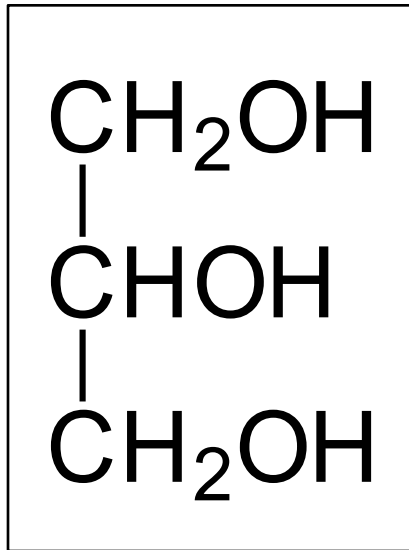
- ▶ Explosive, colourless/ pale yellow colour and volatile
- ▶ In cold it is durable however in hot can be hydrolysed easily
- ▶ “Glycerylis Trinitratis Compressi” as sublingual tablets used for coronary vasodilator
- ▶ Dosage 0.3-1.0 mg
- ▶ Mixed with lactose
- ▶ Prophylactic and treating activity in angina
- ▶ Dizziness, tachycardia, headache, are side effects

Glyceryl Guaiacolat



- ▶ **Guaiacol glyceryl ether**
 - ▶ Usage; Temporary relief of cough associated with respiratory tract infections and related conditions, such as sinusitis, pharyngitis, bronchitis, and asthma, when these conditions are complicated by tenacious mucus or mucus plugs and congestion; effective for productive as well as nonproductive cough, particularly, dry, nonproductive cough that tends to injure mucous membranes of the air passages; helps loosen phlegm and thin bronchial secretions in patients with stable chronic bronchitis.
- ▶ **GLYCERYL TRIACETATE, TRIACETIN**
- ▶ **Glycerol + CH₃COOH....ester**
- ▶ **Solvent in Pharmaceutical technology**
- ▶ **Colourless, hot taste, heavy than water and greasy**
- ▶ **Mixed with water, alcohol, ether and CHCl₃**

Glycerol, Glyceril guaiacolate Trinitroglycerin

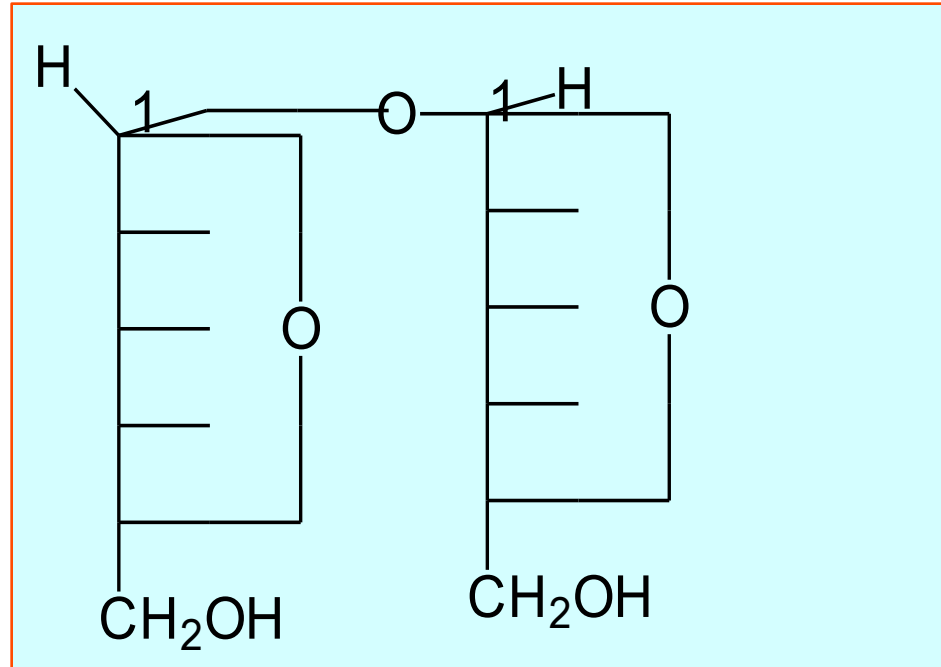


Oligosaccharides

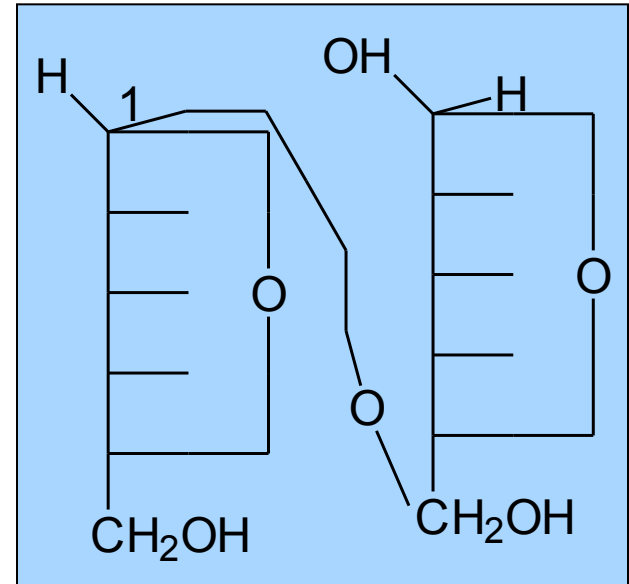
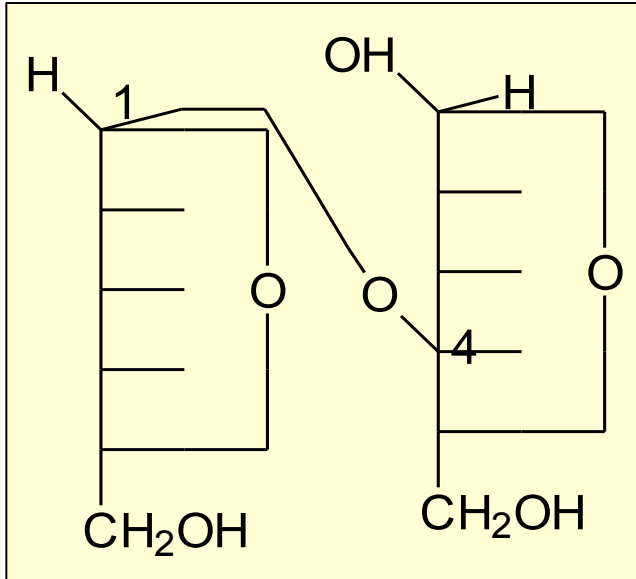
- ▶ **Hydrolysable by acids or enzymes to yield from 2-10 molecules of monosaccharides**
- ▶ **They are subdivided on the basis of the number of sugar molecules into di-, tri-, or tetrasaccharides...**
- ▶ **Polysaccharides contain more than 10 monosaccharides**
- ▶ **Homogenous oligosaccharides/polysaccharides contain same monosaccharides**
- ▶ **Heterogenous oligosaccharides/polysaccharides**
- ▶ **contain different monosaccharides**

- ▶ **Monosaccharide units are linked through glycosidic linkages**
- ▶ **Different positions can be placed such as; 1-1, 1-4, 1-6, 1-2**
- ▶ **1-4 and 1-6 glycosidic linkage, reducing sugars**
- ▶ **Maltose (1-4) (gl-gl) (Homogenous disaccharide)**
- ▶ **Gentiobiose (1-6) (gl-gl) (Homogenous disaccharide)**
- ▶ **Primeverose (6-1) (gl-xyl) (Heterogenous disaccharide)**
- ▶ **Lactose (1-4) (gl-gal) (Heterogenous disaccharide)**
- ▶ **1-2 linkage such as sucrose non-reducing sugars**
- ▶ **Sucrose (1-2) (gl-fruc) (Heterogenous disaccharide)**

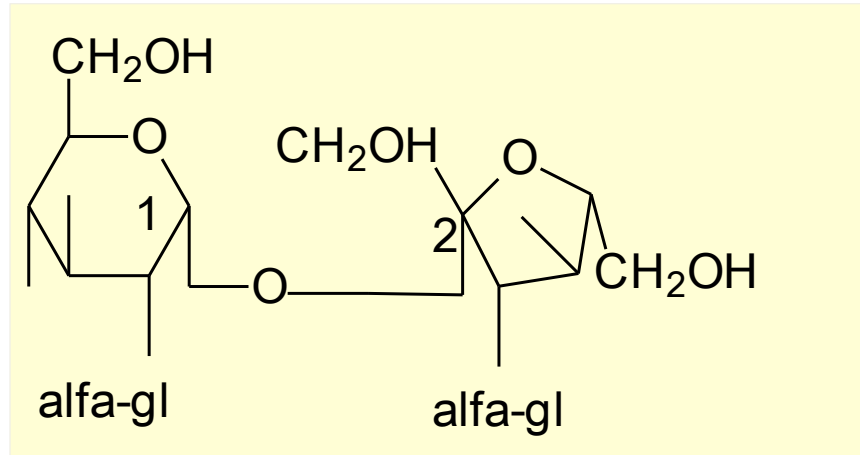
Non-reducing sugar



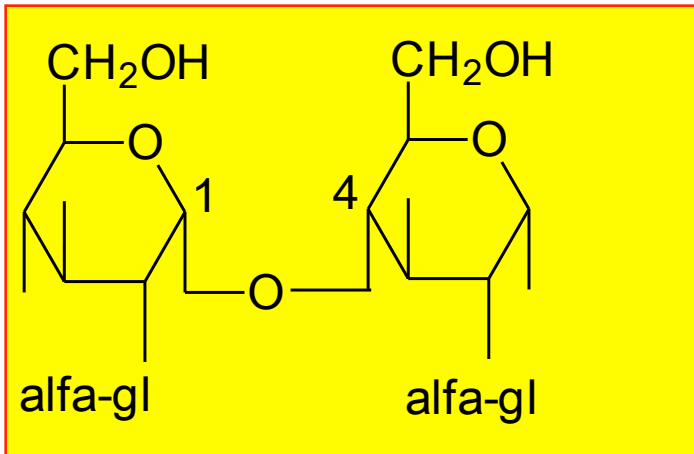
Reducing sugars



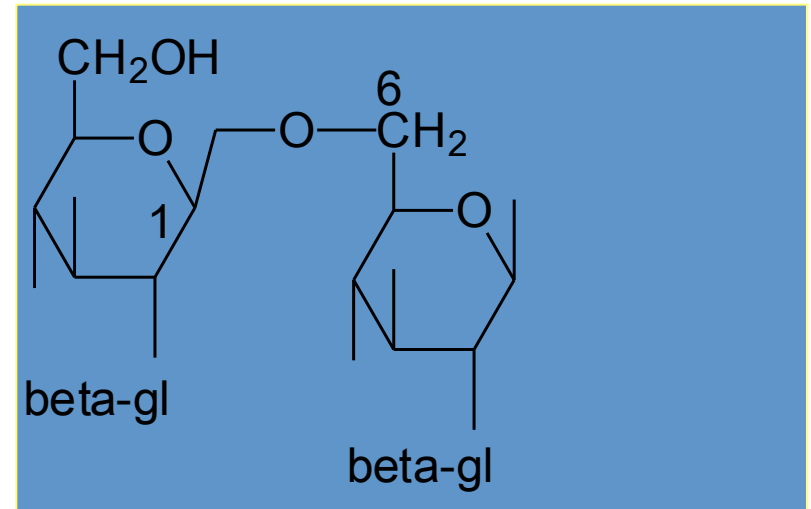
Disaccharides



Sucrose



Maltose

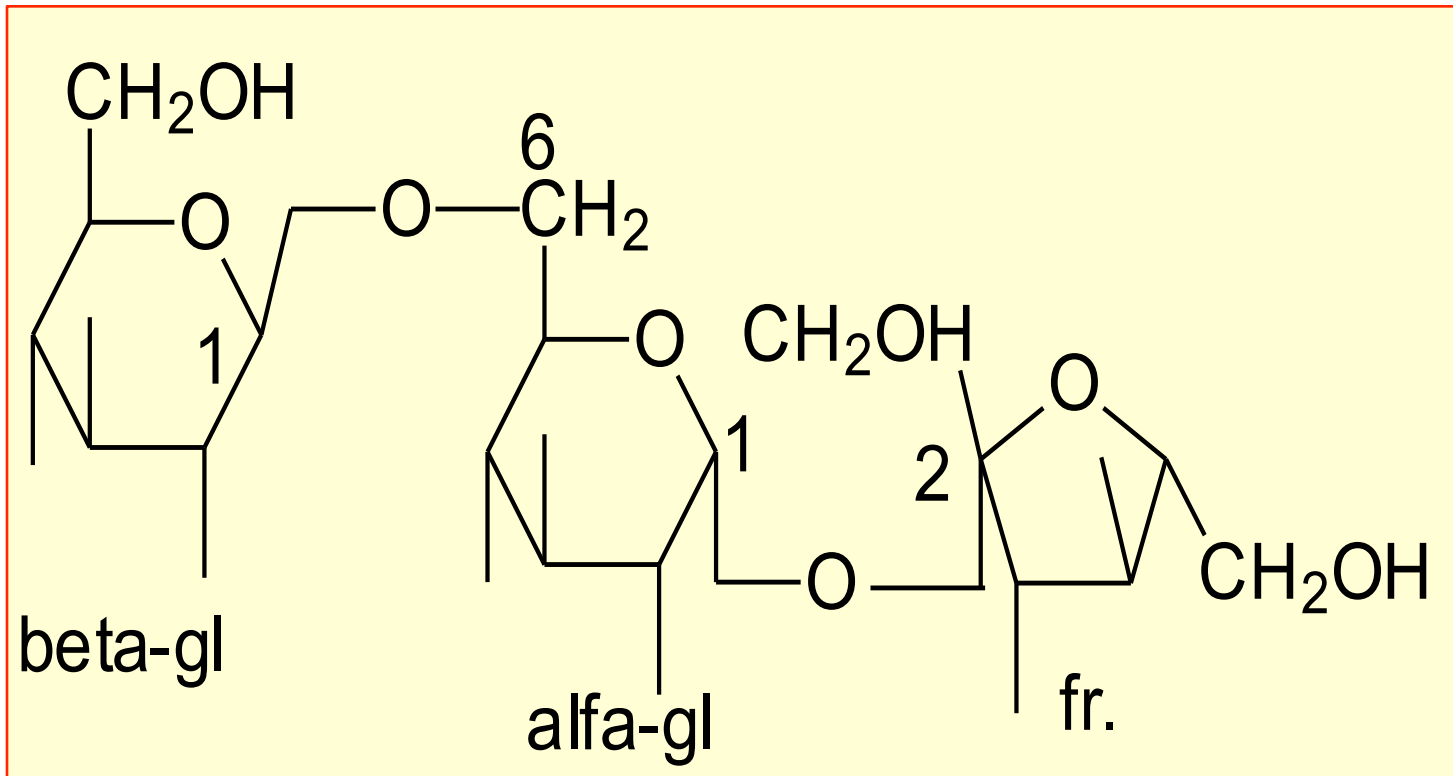


Gentiobiose

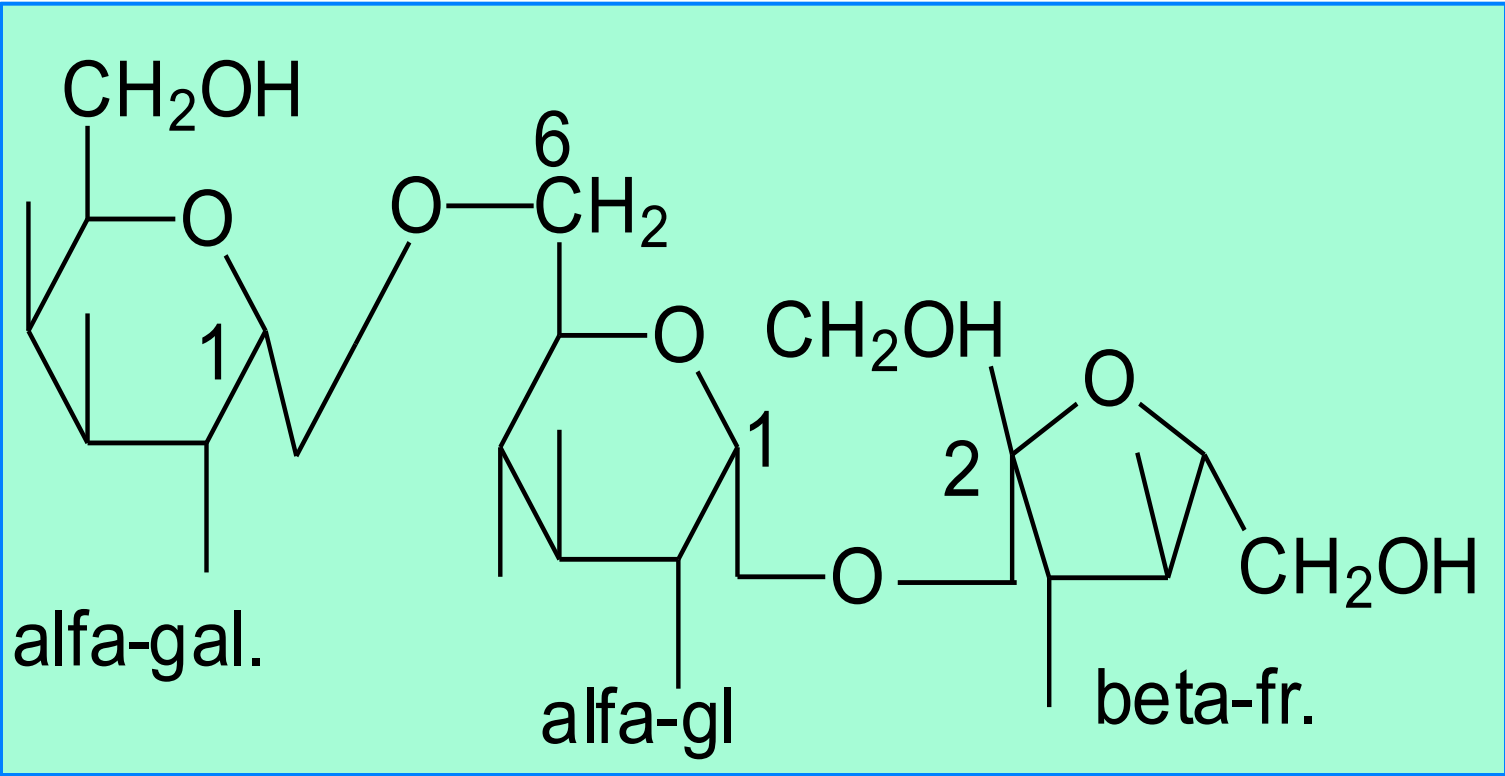
Trisaccharides

- ▶ **Gentianose (gl-gl-fr) (R. Gentianae)**
- ▶ **Raffinose (gal-gl-fr) (*Gossypium seed*)**
- ▶ **Melezitose (gl-fr-gl) (Manna)**

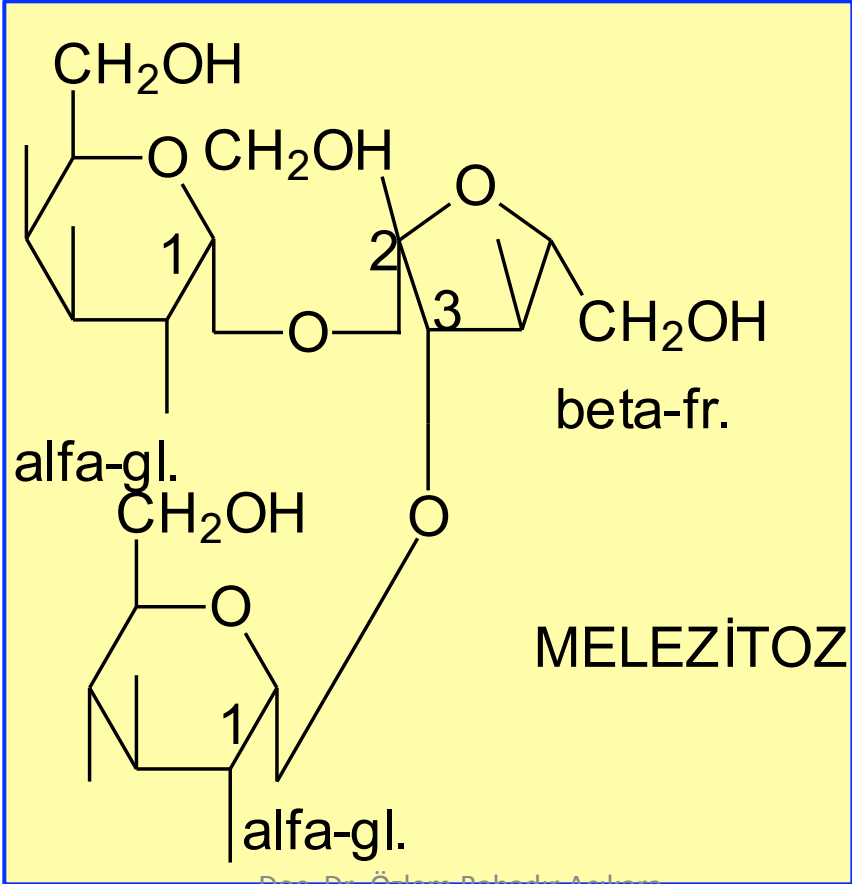
Gentianose



Raffinose



Melesitose



SACCHARUM (TF), SAKARUZ (ŞEKER), SUCROSUM, SUCROSE

- ▶ **α -D- glucopyranose+ β -D- fructofuranose α 1-2** glycosidic bond
- ▶ Most widely occurring disaccharide
- ▶ Nonreducing sugar and hydrolysed by invertase enzyme to glucose and fructose
- ▶ Obtained in Industry;
- ▶ 1) ***Saccharum officinarum*** (Sugar cane, şeker kamışı (Graminae) (Cuba, Puerto rico, The Philippines, India, Indonesia)
- ▶ 2) ***Beta vulgaris*** (**Şugar beet**, Şeker pancarı) (Chenopodiaceae) (Germany, Austria, Russia, Franse and USA)

Production of Sucrose from sugar cane

▶ **Plant is crushed**

▶ Subjected to iron cylinder to yield juice

▶ **Sugar cane juice + limewater boiled (to prevent inversion of the sucrose and coagulation of the proteins)**

▶ Foam occurs on the upper of the solution

▶ **CO₂ passed into the solution to precipitate the excess lime**

▶ Filtered...decolored using SO₂

▶ Concentrated under vacuum...Sucrose obtained in crystallin

▶ Residue is known as molasse (**MELAS**) is used to obtain ethyl alcohol and as forage

Production from sugar beet

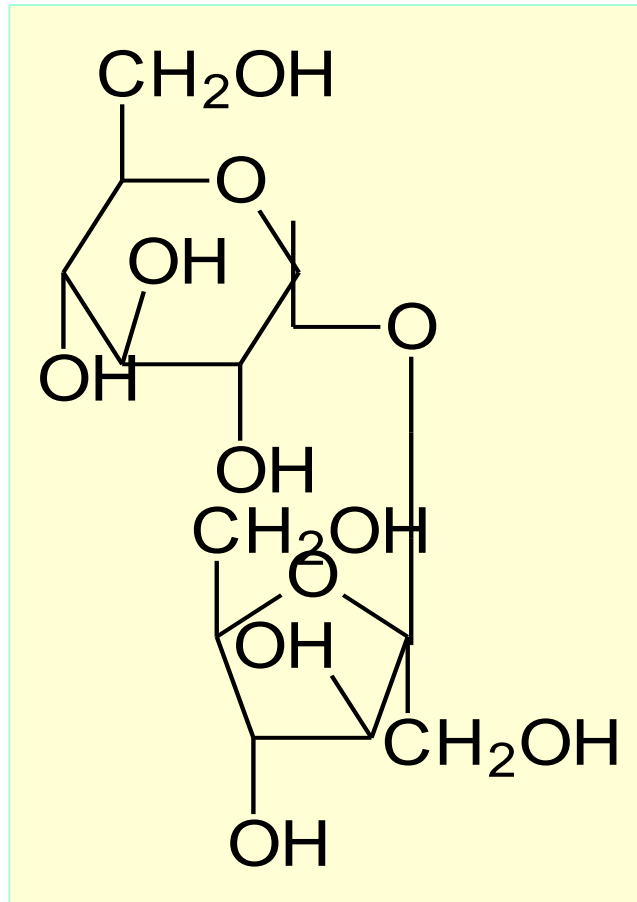
- ▶ **Nodule shaped radix are washed**
- ▶ **Cut into slices**
- ▶ **Mixed with hot water (Diffusion of the water into the slices should be proved)**
- ▶ **Crude sugar juice obtained and cleaned**
- ▶ **Mollase obtained from sugar beet contain “BETAINE” lipotropic agent used in treatment**
- ▶ **Both plants resulted in %15-20 sucrose yield**

Invert sugar

- ▶ **Hydrolysed products of sucrose**
- ▶ **Equal molecule of glucose and fructose**
- ▶ **Sucrose rotate the plane of the polarized light to the right after hydrolization rotate to the left,**

- ▶ **Water solution of sucrose+ Dil.NaOH+CuSO₄ ...Blue colourdoes not changed when boiled (Fehling Test)** Hot water solution+Diluted HCl and then NaOH addition ...orange collapse occurs.
- ▶ This reaction sign sucrose does not contain invert sugar
- ▶ **Sucrose is used in pharmaceutical preparations, syrup preparations and tablet manufacture (to mask poor taste)**
- ▶ As a nutrient and demulcent
- ▶ **Bacteriostatic and protective**
- ▶ **Prevent oxidation of some products**

SACCHARUM (TF), SAKAROZ (ŞEKER), SUCROSUM, SUCROSE

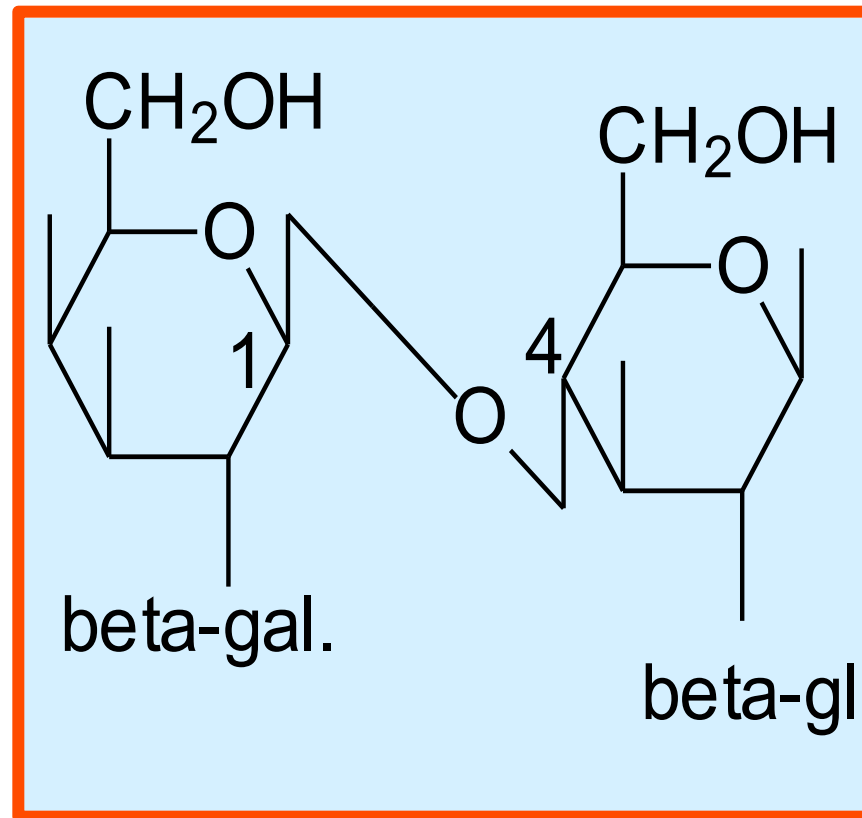


SACCHARUM LACTIS (TF), LAKTOZ, Lactose

- ▶ **It is the principal sugar of mammalian milk,**
- ▶ **Not present in higher plants**
- ▶ **β - galactopyranose + β -D-glucopyranose.... (1-4) disaccharide**
- ▶ **Hydrolysed by β - galactosidases**
- ▶ **Crystalline, odourless, light sweet taste**
- ▶ **Obtained from remain water part of production of the cheese from milk, in crystalline form**
- ▶ **Crystals are separated**
- ▶ **Decolouring with activated carbon**
- ▶ **Crystalline again**

- ▶ **Two form occur; α and β lactose**
- ▶ **β lactose can be soluble easily in water than other form**
- ▶ **Used in pharmacy**
- ▶ **%10 lactose solution is diuretic**
- ▶ **Higher concentrations are laxative**
- ▶ **Lactase enzyme deficiency leads to the lactose intolerance**
- ▶ **As nutrient in infants food since it is less sweet than sucrose and more easily digested**
- ▶ **Also used as inert diluent for other drugs**

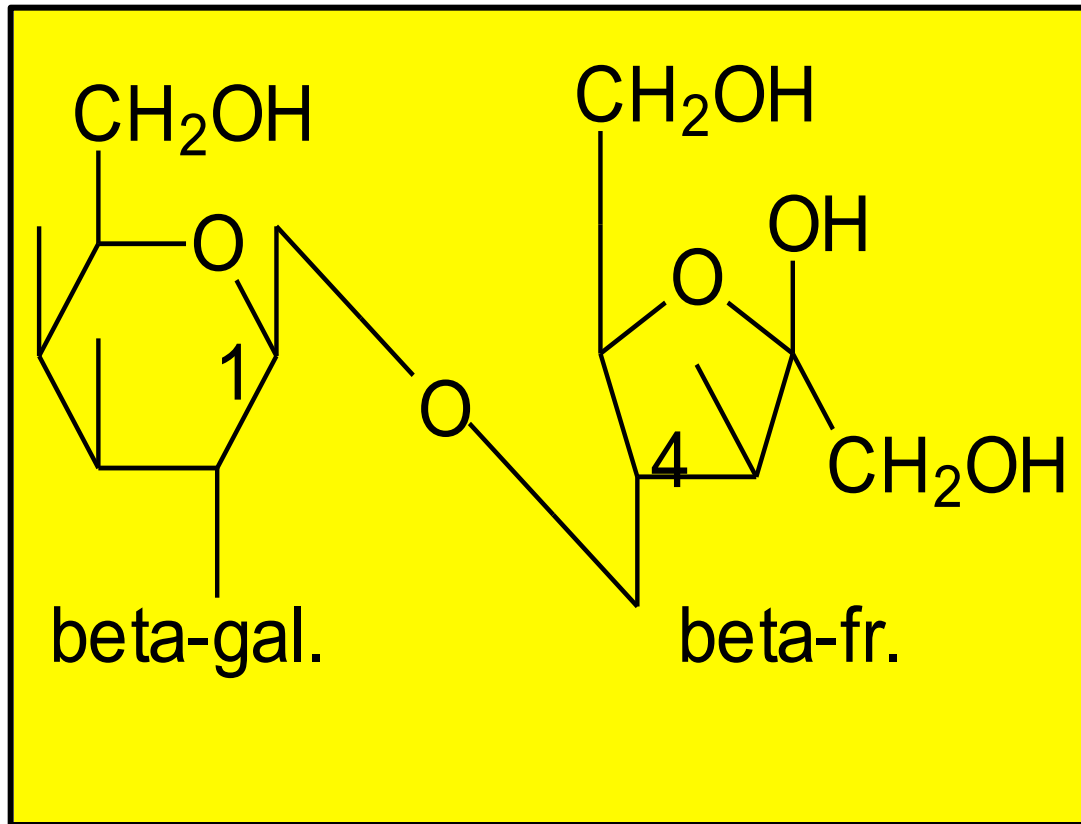
SACCHARUM LACTIS (TF), LAKTOZ, Lactose



Lactulose

- ▶ **1 mol gal. and 1 mol fr. 1-4 glycosidic bond**
- ▶ **Laxative**
- ▶ **Does not absorbed from gastrointestinal tract**
- ▶ **Semi-synthetic disaccharide**
- ▶ **Prevent NH_3 producing microorganisms**
- ▶ **Treatment of hepatic encephalopathy**

Lactulose



Polysaccharides (Homogenous) Homosaccharides

- ▶ Widely found in plant kingdom
- ▶ **Arabinose.....Arabans (gums and mucilages)**
- ▶ Xylose.....Xylans (Angiospermae, lignified tissue)
- ▶ **Mannose.....Mannan (Gymnospermae lignified tissue and in some algae as supplement material)**
- ▶ Fructose.....Fructosans (Supplement material such as inulin)
- ▶ **Galactose.....Galactans (Pectic substances and gelose(agar))**
- ▶ Glucose.....Glucans (starch, cellulose, dextran, dextrin, glycogen)

Heterogenous polysaccharides

▶ Heteropolysaccharides

- ▶ Different monosaccharides
- ▶ Uronic acid derivatives
- ▶ Acidic polysaccharides
- ▶ Neutral polysaccharides
- ▶ Gums, mucilages, pectins and hemicellulose

Polysaccharides

- ▶ **Dissolve in water partially,**
- ▶ **Ethyl alcohol or Ca, Mg, Ba salts produce precipitate**
- ▶ **They are swelling and their swelling index is recorded in Pharmacopoeia**
- ▶ The swelling index is the volume in millilitres occupied by 1 gram of a drug, after it has swollen in an aqueous liquid for 4 h.