OLIGOSACCHARIDES

Products of condensation of two-ten monosaccharides, connected by glycosidic bond.

Glycosidic bodn is fromed:

- by hemi-acetal hydroxyl (at anomeric carbon of monosaccharide)
- and whichever hydroxyl of further monosaccharide (if formating disaccharides),
- hydroxyl longer or shorter saccharide chain (if formating oligo- or polysaccharides)

Glycosidic bond is cleaved:

- easily by hydrolysis (in acids)
- enzymatically (significant enzymatic specifity)

DISACCHARIDES

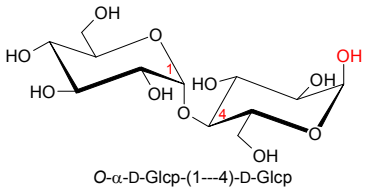
The way of formation of glycosidic bond enable to divide disaccharides into two groups:

- Reducing
- Non-reducing

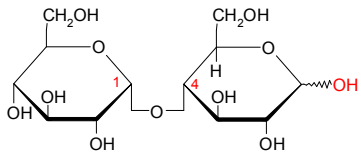
DISACCHARIDES

Reducing

The glycosidic bond enters hemi-acetyl hydroxyl of one sugar only. The other hemi-acetyl-hydroxyl is free, disaccharide possesses reducing power, can mutarotate and can formate glycosides. These disaccharides are known as „maltose type"



O-α-D-Glcp-(1---4)-D-Glcp



4-*O*-α-D-glukosyl-D-glucose

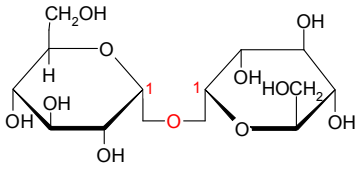
DISACCHARIDES

Non-reducing

The glycosidic bond enter hemi-acetyl hydroxyl groups of both reacting monosaccharides. These sachcharides do not mutarotate, do not make osazones. Trehalose is found in fungi and other non-photosynthetising organisms.

„Blood sugar of insects"

„Trehalose type"



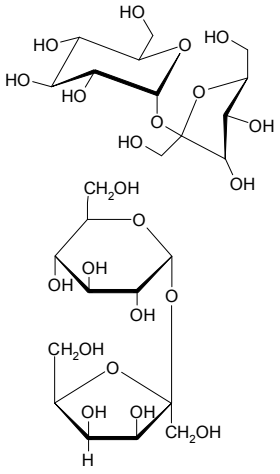
O-α-D-Glcp-(1---1)-α-D-Glcp

DISACCHARIDES

The only non-reducing disaccharide of industrial importance is sucrose (saccharose).
World production more than 150 millions tons, ¾ from sugar cane
SACCHAROSUM ČL 2009

Saccharum officinarum L. – sugar cane (Poaceae)

- perennial C_4-plant (product of CO_2 fixation is malate or aspartate)
- stem (haulm) is solid with *internodia* terminated with panicle of flowers
- Juice of crushed stems – removal of proteins, filtration, and concentration, crystallization of raw „brown" sugar. The brown sugar is further refined.
- Asia, South America and Caribbean islands are main producers, cca 100 millions tons/year



O-α-D-Glcp-(1---2)-β-D-Fruf

SACCHAROSE

Beta vulgaris L. – sugar beet (Chenopodiaceae)

- biennial plant cultivated as annual, from the beginning of 19th century used as raw material of production of sucrose.
- contains 16 – 17 % of sucrose, cca 77 % of water
- Tubers are sliced to sugar beet „cossettes", extracted with hot water, the obtained juice is purified. Concentration, crystallization (the residue is molasses). Rafination.
- 1000 kg of sugar beet → 130 kg sucrose

Acer saccharophorum (A. saccharum) C. Koch – sugar maple (Aceraceae)

- three of eastern part of North American continent
- saccharose excreted from leaves and from rupture of bark (three courted by bees)

Phoenix dactylifera L. – date palm (Palmae)

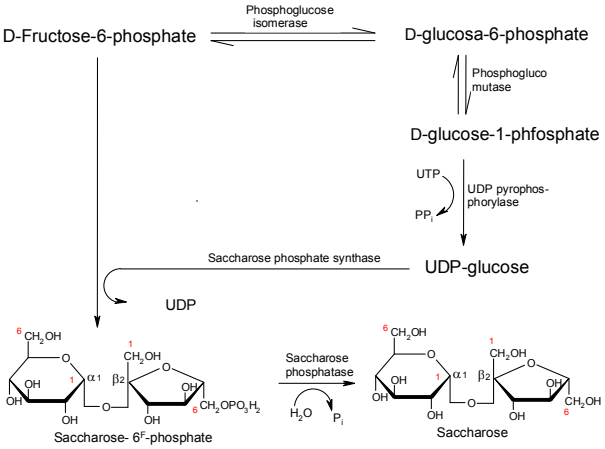
- Fruits are rich on sucrose

http://www.food-info.net/images/sugarcane2.jpg

http://www.recipetips.com/images/glossary/b/beets_sugar.jpg

http://wahyuinqatar.files.wordpress.com/2009/06/16062009692.jpg

Saccharose biosynthesis



DISACCHARIDES

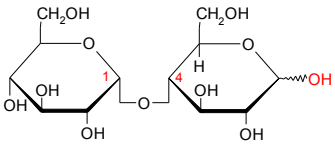
as degradation products of oligomers and polymers

Maltose

Degradation product of starch

Malt sugar

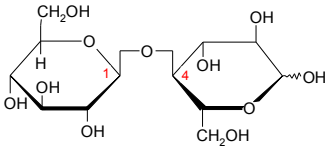
Reducing disaccharide



4-*O*-α-D-glucopyranosyl-D-glucose

Celobiose

Degradation product of cellulose



4-*O*-β-D-glucopyranosyl-D-glucose

DISACCHARIDES

reducing disaccharides as part of glycosides, especially flavonoids

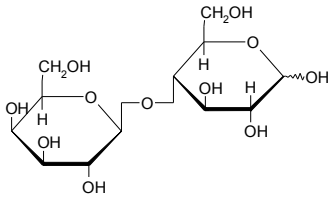
- RUTINOSE O-α-L-Rhap-(1→2)-D-Glcp
- NEOHESPERIDOSE O-α-L-Rhap-(1→6)-D-Glcp
- MALTOSE O-α-D-Glcp-(1→4)-D-Glcp

- CELLOBIOSE O-β-D-Glcp-(1→4)-D-Glcp
- SOPHOROSE O-β-D-Glcp-(1→2)-D-Glcp
- LAMINARIBIOSE O-β-D-Glcp-(1→3)-D-Glcp
- GENTIOBIOSE O-β-D-Glcp-(1→6)-D-Glcp
- LACTOSE O-β-D-Galp-(1→4)-D-Glcp
- SCILLABIOSE O-β-D-Galp-(1→3)-α-L-Rhap
- SAMBUBIOSE O-β-D-Xylp-(1→2)-D-Glcp
- PRIMEVEROSE O-β-D-Xylp-(1→6)-D-Glcp

DISACCHARIDES

Lactose

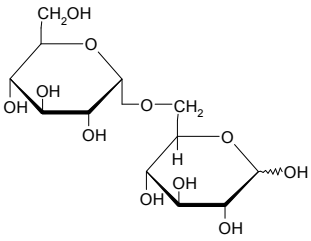
The most important sugar in mammalian mother milk (6 %). Mother milk contains also cca 0,3 % of oligosaccharides.



O-β-D-Galp-(1→4)-D-Glcp

Isomaltose

Product of starch hydrolysis in place of branching of linear chain



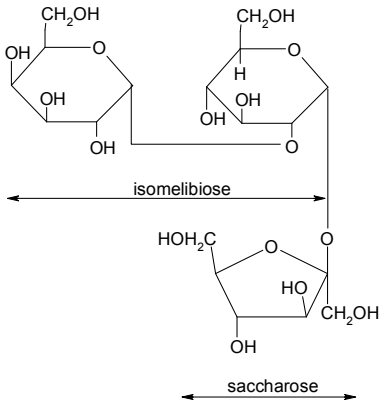
O-α-D-Glcp-(1-6)-D-Glcp

HIGHER OLIGOSACCHARIDES

TRISACCHARIDES

UMBELLIFEROSE

α-D-Galp-(1→2)-α-D-Glcp-(1→2)-β-D-Fruf



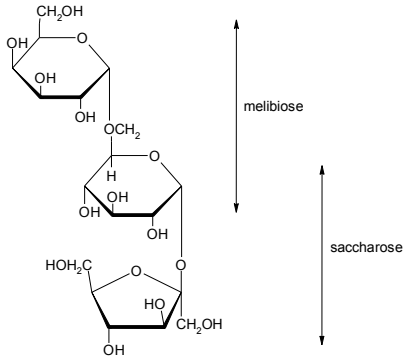
HIGHER OLIGOSACCHARIDES
TRISACCHARIDES

RAFINOSE

α-D-Galp-(1→6)-α-Glcp-(1→2)-
-β-D-Fruf

Part of molasses

Present is seeds of Fabaceae
plants → flatulence



RAMIFIED OLIGOSACCHARIDE

GYPSOSIDE A, *O*-glycoside (C-3), ester of (C-28) triterpenoid aglycon gypsogenine
Gypsophila paniculata L. – baby´s breath (Caryophyllaceae)