

BIOSYNTHESIS OF SUCROSE

BY

Anju V Narayanan

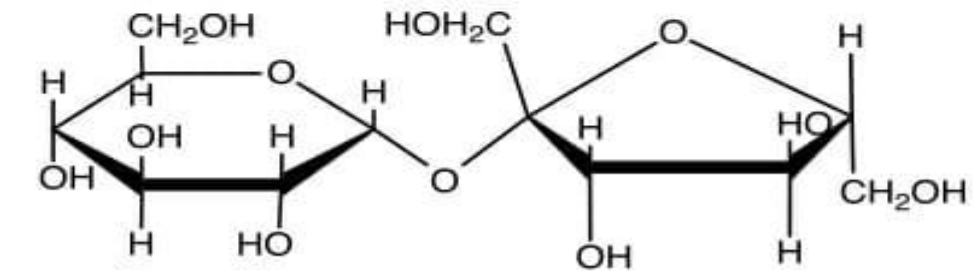
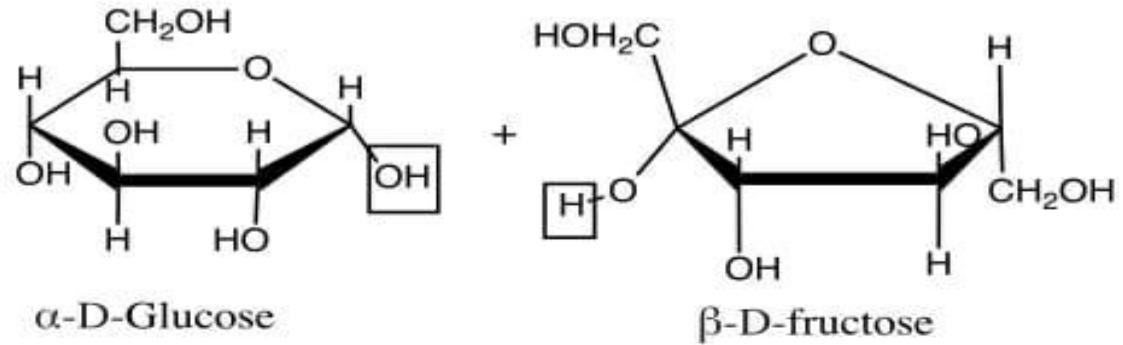
SUCROSE

- Sucrose is common sugar
- It is a disaccharide, a molecule composed of two monosaccharides: glucose and fructose
- Sucrose is formed by plants, algae and cyanobacteria but not by other organisms
- It is found naturally in many food plants along with the monosaccharide fructose
- In many fruits, such as pineapple and apricot, sucrose is the main sugar
- In others, such as grapes and pears, fructose is the main sugar
- Plants use sucrose as a storage molecule
- For quick energy, cells may store the sugar for later use

SUCROSE STRUCTURE

- Sucrose is formed by the condensation polymerization of one molecule of glucose and one molecule of fructose through glycosidic linkage
- The linkage is formed between the carbon of the aldehyde group of the glucose and the carbon of the ketone group of the fructose
- Glucose exists predominantly as a mixture of α and β "pyranose" isomers, but only the α form links to fructose
- Fructose itself exists as a mixture of α and β "furanose" isomers, but only the β isomer links to glucose

SUCROSE STRUCTURE



α -D-glucopyranosyl-(1 \rightarrow 2)- β -D fructofuranose
(Sucrose)

Continue.....

- The biosynthesis of sucrose occurs in the cytosol
- The biosynthesis of sucrose proceeds via the precursors **UDP-glucose** and **fructose 6-phosphate**, catalyzed by the enzyme **sucrose 6-phosphate synthase** and the conversion of **sucrose 6-phosphate** to **sucrose** catalyzed by the enzyme **sucrose 6-phosphate phosphatase**
- The energy for the reaction is gained by the cleavage of **uridine diphosphate (UDP)**

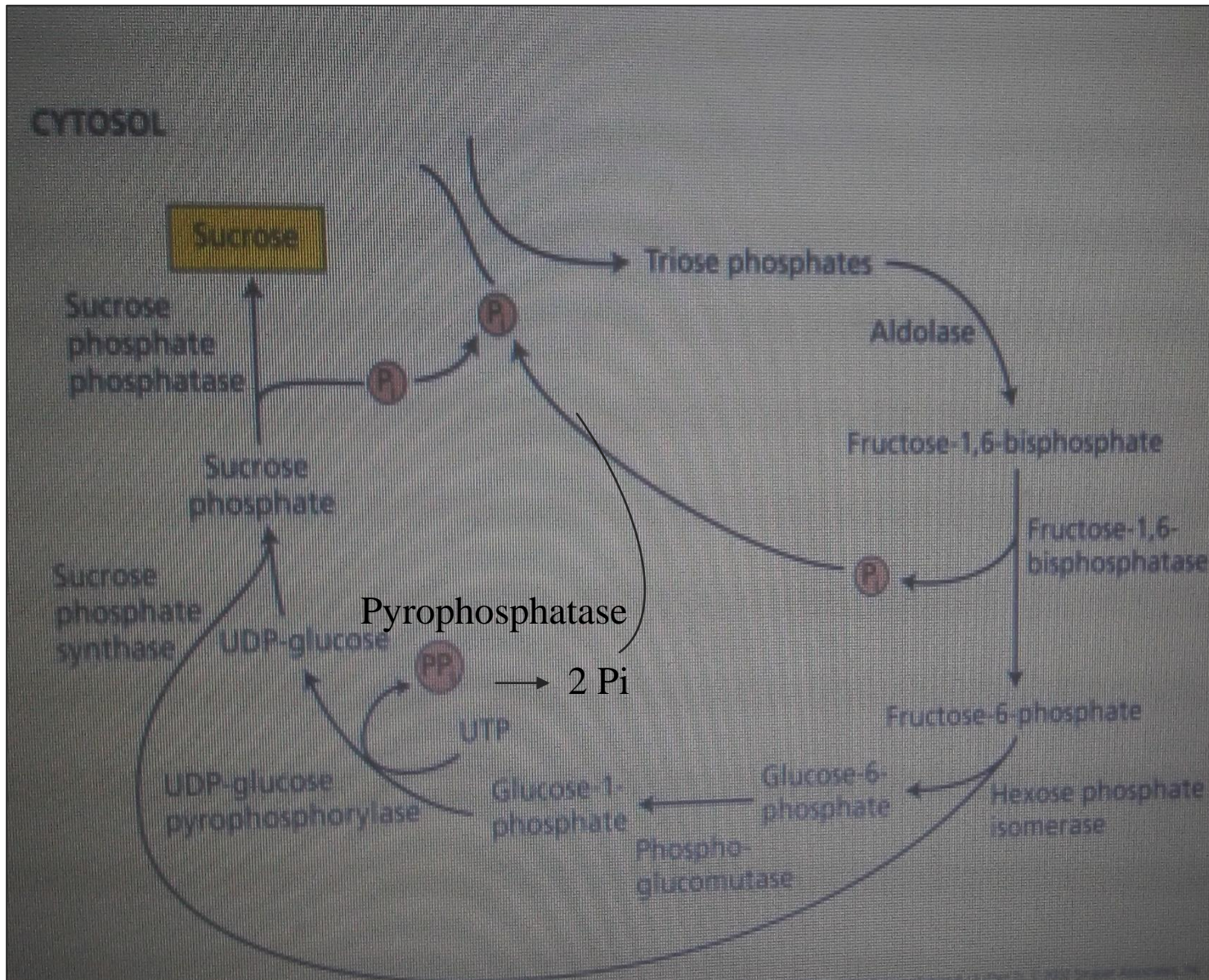
BIOSYNTHESIS OF SUCROSE

- Photosynthesis carried out by plants, algae and cyanobacteria is the major source of fixed carbon for all life on earth
- In plant photosynthesis, carbon dioxide is fixed in the chloroplasts via the Calvin cycle to yield triose phosphates (triose-P)
- Triose-P can be transported to the cytosol by a triose-P/phosphate translocator
- In the cytosol, two triose-P molecules(Glyceraldehyde 3- phosphate and dihydroxy acetone phosphate) produce one fructose 1,6-bisphosphate (F1,6BP) molecule in a reaction catalyzed by aldolase
- F1,6BP is then further metabolized to yield other hexose phosphates, such as fructose 6-phosphate (F6P) and glucose 6-phosphate (G6P)

Continue.....

- Glucose 6-phosphate transforms to glucose 1-phosphate with the help of enzyme, phosphoglucomutase
- Glucose 1-phosphate can be used to form UDP-glucose (UDP-G)
- Enzyme involved in this reaction is UDP-glucose pyrophosphorylase
- The pyrophosphate produced in the reaction is removed by pyrophosphatase (2 Pi)
- UDP-G is combined with F6P to form sucrose 6-phosphate (sucrose-P) in a reaction catalyzed by sucrose 6-phosphate synthase
- Sucrose 6-phosphate is dephosphorylated by sucrose 6-phosphate phosphatase to form sucrose

BIOSYNTHESIS OF SUCROSE



THANK YOU