POLYSACCHARIDES

- Polysaccharides contain a large number of monosaccharide units joined together by glycosidic linkages. These are the most commonly encountered carbohydrates in nature. They mainly act as the food storage or structural materials.

1. Starch:

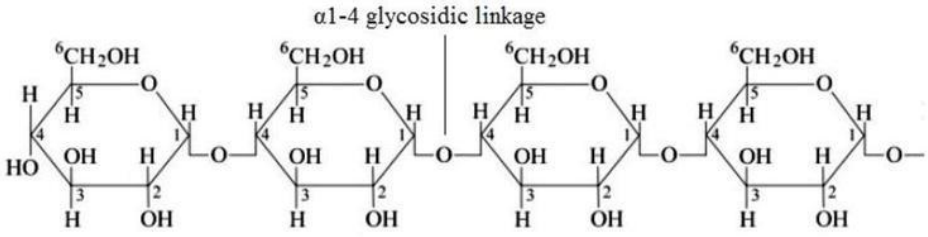
- Starch is the main storage polysaccharide of plants.
- It is the most important dietary source for human beings.
- High content of starch is found in cereals, roots, tubers and some vegetables.
- It is a polymer of a-glucose and consists of two components— Amylose and Amylopectin.

Amylose

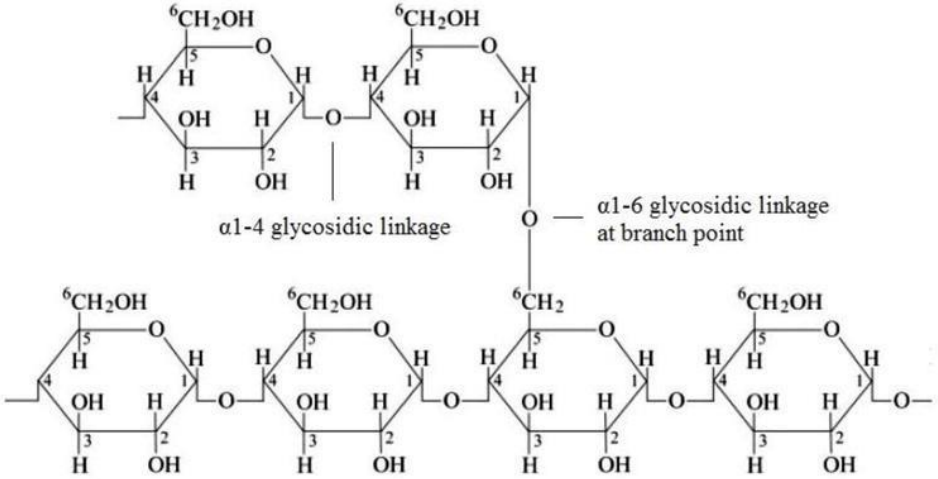
- It is water soluble component which constitutes about 15-20% of starch.
- Chemically amylose is a long unbranched chain with 200-1000 α-D-(+)-glucose units held together by C1– C4 glycosidic linkage(α1→4).

Amylopectin

- It is insoluble in water and constitutes about 80- 85% of starch.
- It is a branched chain polymer of α-D-glucose units in which chain is formed by C1–C4 glycosidic linkage(α1→4) whereas branching(occurring every 24 to 30 residues) occurs by C1–C6 glycosidic linkage(α1→6).



Amylose



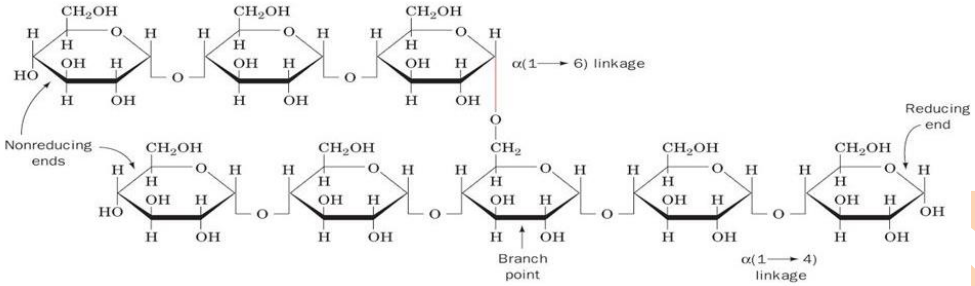
Amylopectin

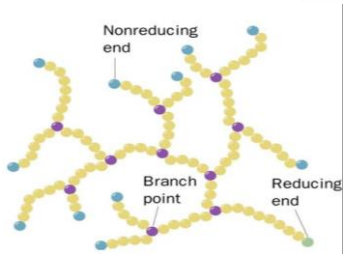
2. Glycogen

- The carbohydrates are stored in animal body as glycogen.
- It is also known as *animal starch* because its structure is similar to amylopectin and is rather more highly branched.
- It is present in liver, muscles and brain.
- When the body needs glucose, enzymes break the glycogen down to glucose.
- Glycogen is also found in yeast and fungi

Structure

- Glycogen is a branched polymer of glucose.
- Like amylopectin, glycogen is a polymer of (α1→4)-linked subunits of glucose, with (α1→6)-linked branches, but glycogen is more extensively branched (on average, every 8 to 12 residues) and more compact than starch.
- The α-glycosidic bonds give rise to a helical polymer structure.





- The protein glycogenin, which is involved in glycogen synthesis, is located at the core of each glycogen granule.
- Glycogen is an analogue of starch, which is the main form of glucose storage in most plants, but starch has fewer branches and is less compact than glycogen.
- Glycogen is especially abundant in the liver
- Because each branch in glycogen ends with a nonreducing sugar unit, a glycogen molecule has as many nonreducing ends as it has branches, but only one reducing end. When glycogen is used as an energy source, glucose units are removed one at a time from the nonreducing ends.
- Glycogen and starch ingested in the diet are hydrolyzed by α-amylases, enzymes in saliva and intestinal secretions that break (α1→4) glycosidic bonds between glucose units.

❖ **Biological role of carbohydrates**

1. Carbohydrate oxidation provides energy.
2. Carbohydrate storage, in the form of glycogen, provides a short- term energy reserve.
3. Carbohydrates supply carbon atoms for the synthesis of other biochemical substances (proteins, lipids, and nucleic acids).
4. Carbohydrates form part of the structural framework of DNA and RNA molecules.
5. Carbohydrate "markers" on cell surfaces play key roles in cell -cell recognition processes.