ANS 212: Introduction to Agricultural Biochemistry

LECTURE SERIES101

BY

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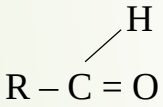
CHEMISTRY OF DIFFERENT FOOD GROUPS: **CARBOHYDRATES**

GENERAL OVERVIEW

- General characteristics of carbohydrates/sugars
- Monosaccharides
  - Aldoses and Ketoses
  - Linear and ring formation in aldoses and ketoses
- Disaccharides
  - The O-glycosidic bond
  - Examples of disaccharides
- Polysaccharides
  - Structural polysaccharides, eg. Cellulose, Chitin
  - Storage polysaccharides, eg. Starch and Glycogen
  - Glycosaminoglyccans
- Reactions of carbohydrates
- Important carbohydrates in nature

GENERAL CHARACTERISTICS OF CARBOHYDRATES/SUGARS

- They are a class of nutrients
- They are the most abundant of macronutrients
- Basic units are monosaccharides
- Polymeric in nature
- Contain functional group of aldehydes or ketones in addition to the alcohol functional group



Aldehyde functional group

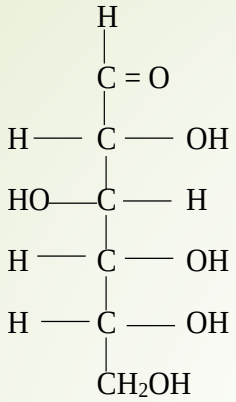
Ketone functional group

- They are poly alcohols
- They carry out reactions of alcohols and aldehydes or ketones
- They are an energy source to living organisms

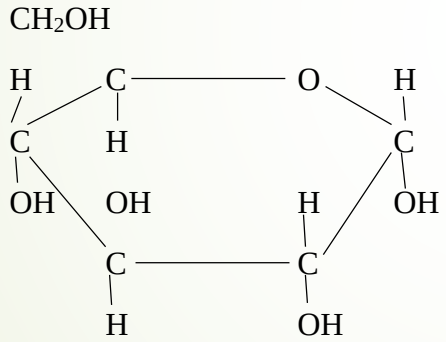
MONOSACCHARIDES

- They are the basic units of carbohydrates, simple sugars
- General formula $C_nH_{2n}O_n$ or $(CH_2O)_n$ where n=3 or more

  Eg. $C_3H_6O_3$ (glyceraldehyde or dihydroxyacetone), $C_6H_{12}O_6$(glucose or fructose)
- Classified according to no. of C-atoms (trioses, tetroses, pentoses…)
- Soluble in water
- Spatial arrangement – Isomerism
- In solution they form cyclic hemiacetals and hemiketals
- Common examples in nature: Glucose, Fructose & Ribose
- They are either Aldoses and Ketoses
- They are reducing sugars
- Serve as energy sources when oxidised



Glucose linear structure



α-Glucose

DISACCHARIDES

- Two monosaccharide units joined together
- Most are sweet in taste
- Common disaccharides in nature include maltose, sucrose and lactose
- Joined by O-glycosidic bond
- Maltose, sucrose and lactose
  - Maltose = glucose + glucose
  - Sucrose = glucose + fructose
  - Lactose = glucose + galactose
- Some are reducing sugars

POLYSACCHARIDES

- Structural polysaccharides
  - Cellulose
  - Chitin
- Storage polysaccharides
  - Starch
  - Glycogen
- Glycoseaminoglyccans