

PLANT PHYSIOLOGY Lecture 4 - Biological molecules

- I. Types of biological molecules**
 - A. Inorganic - cofactors, catalysts, equilibria, etc., many participate as part of or with organic molecules**
 - B. Organic - carbohydrates, lipids, proteins, nucleic acids, porphyrins, and secondary plant products**
- II Classification, structure, and function of major biological molecules**
 - A. Carbohydrates**
 - 1. Sugars and related compounds - ENERGY**
 - a) Glucose & fructose**
 - 1) Hexoses of central importance in cell metabolism**
 - b) Sucrose - a disaccharide composed of glucose and fructose - major translocated carbohydrate in plants**
 - c) Polysaccharides**
 - 1) Starch - branched polymer of glucose**
 - a) Amylose - linear polymer [$\alpha(1\rightarrow4)$]**
 - b) Amylopectin - branched polymer [$\alpha(1\rightarrow6)$]**
 - c) Easily hydrolyzed to glucose**
 - d) Major storage carbohydrate**
 - 2) Cellulose - linear polymer of glucose**
 - a) Glucose units connected differently [$\beta(1\rightarrow4)$]**
 - b) Difficult to hydrolyze**
 - c) Structural carbohydrate (along with hemicellulose, {xylose, arabinose}, lignin {coniferyl, coumaryl, synapyl alcohols}, and pectin {galactose})**
 - B. Lipids**
 - 1. Glycerol and related compounds - FAT STORAGE, COATING, & MEMBRANES**
 - a) Triglycerides (fat) - linoleic and linolenic acid**
 - b) Coating (wax, cutin) - ester (RCOOR) of above with 20 - 28 carbons**
 - c) Membranes (phospholipids) - fatty acid replaced by phosphate (hydrophilic & hydrophobic) membrane fluidity**
 - C. Proteins**
 - 1. Enzymes - CATALYZE REACTIONS; METABOLISM**
 - a) Amino acids - from translation of RNA**
 - a) Peptide bonds**
 - D. Nucleic acids - GENETIC INFORMATION**
 - 1. DNA: Adenine, guanine (purines), thymine, & cytosine (pyrimidines)**
 - 2. RNA: Adenine, guanine (purines), uracil, & cytosine (pyrimidines)**
 - E. Phorphyryns**
 - 1. Chlorophyll - PHOTOSYNTHESIS**
 - a) absorb photons**
 - b) transfer electron to acceptor - then protolysis to replace it**
 - F. Secondary products**
 - 1. Phenolics [free phenolics, flavonoids (including anthocyanins), tannins] - PIGMENTATION, RESISTANCE**
 - 2. Steroids & terpenoids - SCENTS, RESISTANCE, (used by man for RUBBER)**
 - 3. Alkaloids - RESISTANCE (used by man for DRUGS such as COCAINE, MORPHINE, etc.)**