Lecture Outline (Theory)

Department of Biochemistry, III B.Sc.(Hons.) Sericulture

SBCM6 313 (1+1): Essentials of Plant Biochemistry

Introduction to Biochemistry: The plant cell and its subcellular organelles-nucleus, endoplasmic reticulum, Golgi apparatus, vacuoles, mitochondria, chloroplasts, microbodies, oleosomes, cytoskeleton, cell wall and their functions.

Biomolecular components of plant cells:

Carbohydrates- Definition and classification. Monosaccharaides; stereochemistry, nomenclature, cyclic forms. Mutarotation, reactions of monosaccharaides. Di- and oligosaccharides. Plant polysaccharides, structure and role.

Amino acids and proteins: Importance of proteins in living systems. Diverse roles of proteins. Amino acids, the subunits of proteins. Classification, structures and chemical reactions. Protein amino acids. The peptide bond. Biological role of peptides. Protein classification. Structure of proteins; primary, secondary, tertiary and quaternary structures. Properties of proteins. Denaturation of proteins.

Lipids: Classification, fatty acids-their classification and structures. Chemical properties, Triglycerols, waxes, phospholipids, sphingolipids, terpenes and sterols. Their structures and functions.**Enzymes:** Classification and nomenclature. Factors that influence enzyme activity. Immobilization and industrial applications.**Nucleic acids:** RNA and DNA. The constituents of nucleic acids, structures of purines and pyramidines. Nucleosides, nucleotides. DNA-its structure. Types of RNA, their characteristics and role. Cloverleaf structure of tRNA.

Metabolism of biomolecules: An overview of metabolism, catabolism and anabolism-their general characteristics.

Carbohydrate metabolism:

Glycolysis: Pathway of glucose in the cytosolic glycolytic sequence. Energetics of glycolysis.

TCA cycle: Mitochondrial reaction cycle. Oxidation of Pyruvate via TCA cycle. Energetics of TCA cycle.**Electron transport and oxidative phosphorylation:** The components of the electron transport chain. ATP synthesis coupled to electron transport.

The pentose phosphate pathway: Reactions. Role of pentose phosphate pathway.

Lipid metabolism: β-Oxidation of fatty acids and its energetics.

Amino acid metabolism: Removal of amino group of amino acids by deamination and transamination. Decarboxylation of amino acids.

Secondary metabolites: Phenolics: Different classes of phenolics and their functions.

Polyphenols: The tannins-classification of tannins. Phenolics and tannins as antinutritional factors. Roles of phenolics and tannins in disease/pest resistance of plants.

Alkaloids: Definition and occurrence of some common alkaloids of plants. Role of alkaloids as defence compounds. **Terpenoids:** Nomenclature, classification and occurrence. Functions of terpenoids. Carotenoids-their distribution and functions in higher plants.