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BIOCH-311 Fundamentals of Plant Biochemistry and Biotechnology 3 (2+1)

Theory

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins. Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation; Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

Lecture Schedule:Theory

S. N.	Topic	No. of lectures
1.	Importance of Biochemistry.	1
2.	Properties of Water, pH and Buffer.	2
3.	Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides.	3
4.	Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids.	2
5.	Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.	2
6.	Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes.	2
7.	Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure.	2
8.	Metabolism of carbohydrates: Glycolysis, TCA cycle, Glyoxylate cycle, Electron transport chain.	3
9.	Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.	2
10.	Concepts and applications of plant biotechnology:	1
11.	Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications;	2
12.	Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids;	2
13.	Somaclonal variation and its use in crop improvement; cryo-preservation;	1
14.	Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods;	2
15.	Transgenics and its importance in crop improvement;	1
16.	PCR techniques and its applications;	1
17.	RFLP, RAPD, SSR;	1
18.	Marker Assisted Breeding in crop improvement;	1
19.	Biotechnology regulations	1

Lecture Schedule: Practical

S. N.	Topic	No. of lectures
1	Preparation of solution, pH & buffers	2
2	Qualitative tests of carbohydrates and amino acids.	2
3	Quantitative estimation of glucose/ proteins	2
4	Titration methods for estimation of amino acids/lipids, ,	1

5	Effect of pH, temperature and substrate concentration on enzyme action	1
6	Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides.	1
7	Sterilization techniques.	1
8	Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium	1
9	Callus induction from various explants.	1
10	Micro-propagation, hardening and acclimatization	2
11	Demonstration on isolation of DNA.	1
12	Demonstration of gel electrophoresis techniques and DNA finger printing	1

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