## EXTENDED LECTURE OUTLINE

**PBT 6 314 Fundamentals of Plant Biotechnology (2+0)**

**1. Concepts of Biotechnology:** Introduction to Biotechnology and definitions of Biotechnology. General applications of Biotechnology and applications Agricultural Biotechnology in crop improvement, pharmaceuticals, food and Industrial applications.

**2. History of plant tissue culture and genetic engineering in crop improvement.**

**3. Introduction to Genetic Engineering** :,

Definitions of Genetic engineering, steps of gene cloning

Definition of Restriction enzymes, types of restriction enzyme (Type I, Type II and Type III restriction Endonucleases).

Molecular tools used in genetic engineering- DNA polymerase, Ligase, phosphotase,kinase, linkers,adopters, and reverse transcriptase.

4. **Definition and properties of vectors:**

Types of Vectors: Cloning and Expression Vectors and shuttle vectors.

Commonly used vectors- Plasmids, phage, Cosmid, YACs, BACs, Ti plasmids.

genomic library and cDNA library for isolation of gene,

Transformation in bacteria: cacl2 and electroporation.

Selection by replica plating technique

Transformation methods plants-Direct and indirect

5. **Role of Transgenic plants in crop improvement**.

Transgenic plants for pest / Insect resistance-Example: Bt Cotton

Transgenic plants for disease resistance-Example: Virus, Bacteria and Fungal disease resistance plants. Transgenic plants for delayed ripening in tomato-Example: Flavr Savr. Transgenic for nutritional improvement.

6. **DNA finger printing**

Molecular markers, definitions, types of markers and different DNA based markers, Viz., RFLP, AFLP, RAPD, SSR Markers. Advantages, disadvantages and applications of Molecular Markers for crop improvement.Marker assited breeding

**7. Biosafety guidelines in india for release of GMOs(Brief) :**IBSC,RDAC,RCGM ,GEAC ,DLC and SBCC.

**IPR(Brief):** Patents, Copyright, Trademark,Trade secrets and GI(Breif)

8. **Micropropagation**

Definition of micropropagation, Stages of micro propagation (0-Preparative stage-1, stage 2-Multiplication stage, stage 3-Rooting stage, stage 4-Transplantation / Hardening stage). Adavantages micropropagation , Adavantages / Applications and Disadvantages micropropagation.

Organogenesis: direct and Indirect ,

9**. Sources of Somaclonal variation** (chromosomal abnormality or changes in chromosomal number (ploidy level), culture condition, pre-excisting, epigenetic and transposable elements…applications

10. **Developmental pattern of Somatic embryogenesis** : somatic embryogenesis :direct and indirect process ; Globular Stage, Heart Stage, Torpedo, Cotyledonary / Mature Stage. • Factors affecting Somatic embryogenesis. • Applications and limitations of Somatic Embryogenesis.

11**. Somatic Hybridization**: Definition and Steps involved in somatic hybrid production (1.Collection of explants, 2.Protoplast isolation, 3. Protoplast fusion (Spontaneous fusion and Induced fusion), 4. Selection of Hybrid cells, 5. Culture of Hybrid cells, 6. Regeneration of plants from hybrid tissue. Applications and Limitations of Somatic Hybridization

12. **Plant Tissue Culture application for Crop Improvement**

**13.Cryopreservation:**

Invitro preservations techniques and and applications.

**References:**


1. Plant Biotechnology- by B.D. Singh
2. Elements of Biotechnology- by A K Gupta
3. Plant Tissue culture -by Bhojwani and Razdan
4. Plant Tissue culture- by Sunil Kumar and M. P. Singh
5. Techniques in Molecular Biology - by Channarayappa.
6. Plant Biotechnology -Adrian slater, Nigel scott and Mark flowler