

## **FROP-102.E: Plant Tissue Culture and Forest Breeding**

### **Unit 1: Introduction to Plant Tissue Culture**

Concept and definition of plant tissue culture, Historical development and milestones, Aseptic techniques, Concept of **Totipotency**, Explant, Types of culture-Callus culture, Cell suspension culture, Organ culture, meristem culture, Protoplast culture.

Composition of culture media (e.g., **MS, Whites, Nitch medium etc**), Role of plant growth regulators-Auxins, Cytokinins, Gibberellins, Carbon sources, vitamins, and additives, Environmental Factors-Light, Temperature, pH.

### **Unit 2: Micropropagation in Forestry Species**

Stages of micropropagation-Initiation, Multiplication, Rooting, Hardening Clonal propagation of forest trees, Advantages over conventional propagation.

Concept of somaclonal variation, Genetic vs epigenetic variation, Selection of desirable variants, Applications in-Disease resistance, Stress tolerance (drought, salinity)

### **Unit 3: Haploid and Doubled Haploid Production**

Androgenesis (anther and pollen culture), Gynogenesis, Production of haploids and doubled haploids, Importance in forest tree breeding-Rapid homozygosity, Trait fixation

### **Unit 4: Genetic Transformation in Forest Trees**

Methods of gene transfer-**Agrobacterium-mediated transformation**, concept of genetic recombination, Direct gene transfer (biolistics), Transgenic Forest trees-Pest resistance, Herbicide tolerance, Wood quality improvement

### **Unit 5: Cryopreservation and Germplasm Conservation**

Concept of Cryopreservation -Techniques-Slow freezing, Vitrification, Conservation of elite genotypes and rare species, Role in forest genetic resource management.

### **Suggested Readings**

1. Dubey, R. C. (2008). A Textbook of Biotechnology. S. Chand & Co. Ltd., New Delhi.
2. Gupta, P. K. (1994). Elements of Biotechnology. Rastogi and Co., Meerut.
3. Hammaond, J., McGarvey, P. and Yusibov, V. (2000). Plant Biotechnology. Springer Verlag, Berlin.
4. Satyanarayana, V. (2005). Biotechnology. Books and Allied (P) Ltd., Kolkata
5. Bhojwani, S. S. and Razdan, M. K. (1983). Plant Tissue Culture: Theory and Practice. Elsevier Science Publishers, Netherlands
6. Reinert, J. and Bajaj, Y. P. S. (1977). Plant Cell Tissue and Organ Culture: A Laboratory Manual, Narosa Publishing House, New Delhi.
7. Prasash M. and Arora. C.K... 1998. Plant tissue culture, Ammol publication Pvt. Ltd. • Ignacimuthu, S.1997. Biotechnology: An Introduction-2nd Edition, Narosa Publishing House, New Delhi