

UNIT I

Biotechnology – definitions – History- Importance-Scope- Achievement –organization; History of plant tissue culture and plant genetic engineering – terminology used in plant tissue culture

UNIT II

Plant cell and tissue culture – steps in general tissue culture techniques – merits and limitations – applications of plant tissue culture in crop improvement; Sterilization technique, Growth room - Nutritional requirement of in-vitro culture (Media); Totipotency and morphogenesis – growth and differentiation in cultures; Micropropagation, Anther culture, Embryo culture, Endosperm culture – procedure — applications – problems – advantages and limitations; Somaclonal variation – types – origin – applications – advantages – limitations – achievements; Somatic embryogenesis and synthetic seed production technology; *In vitro* pollination and fertilization; Protoplast culture somatic hybridization-Application in crop improvement

UNIT III

Genetic engineering – Method of cloning DNA -Restriction enzymes -Vectors for gene transfer – PCR and Gene cloning- Methods of gene transfer- Transgenic plants – applications in crop improvement – limitations

UNIT IV

DNA based markers – RFLP, AFLP, RAPD, SSR—importance and applications; DNA fingerprinting – applications; Quantitative Trait Loci (QTL) mapping – Marker Assisted Selection (MAS) and its applications in crop improvement; Elementary knowledge- Application of Biotechnology in Medicine, Environmental and Industrial sector; Prospectus and public perception of Biotechnology; DNA sequencing, importance current next generation sequencing techniques.

UNIT V

Fine structure genes – definitions of genomics, structural genomics and functional genomics – Genomic approaches in agriculture – Human Genome Project – Genome size – brief outline – Computer application in genetics, advantage and limitation.

Practical

1. Requirements of plant tissue culture laboratory
2. Sterilization Techniques and inoculation of explants
3. Preparation of plant tissue culture media
4. Anther culture techniques in crop improvement.
5. Hardening requirements of tissue culture raised plants.
6. Requirements of plant biotechnological laboratory
7. DNA isolation techniques.
8. Use of markers in characterization or tagging genes
9. Bt. Technology in agriculture & its impact
10. Outline for Preparation of plant tissue culture project
11. Outline for project for erection of hardening unit
12. Visit to plant tissue culture and biotechnology laboratories.

Reference Books

1. Bilgrami, K.S. and Pandey, A.K. 1992. *Introduction to Biotechnology*. CBS Pub., New Delhi.
2. Chahal, G.S. and Gosal, S.S. 2002. *Principles and Procedures of Plant Breeding – Biotechnological and Conventional Approaches*. Narosa Publishing House, NewDelhi.
3. Chawla, H.S. 2005. *Introduction to Plant Biotechnology*. Oxford and IBH Publishing Co., New Delhi.
4. Gupta, P.K. 1994 *Elements of Biotechnology*. Rastogi and Co., Educational Publishers, Meerut.
5. Jha, T.B. and Ghosh, B. 2005. *Plant Tissue Culture*. University Press, Hyderabad.
6. Razdan, M. K. 2002. *Introduction to Plant Tissue Culture*. Oxford and IBH Publishing Co., New Delhi.
7. Singh, B.D. 2006. *Plant Biotechnology*. Kalyani Publishers, Ludhiana.