

BACHELOR WITH BIOTECHNOLOGY AS MAJOR

6th SEMESTER

BTG622J2 BIOTECHNOLOGY _ PLANT BIOTECHNOLOGY

CREDITS: THEORY – 4, PRACTICAL – 2

- **Course Learning Objective:** aim of this course is to impart knowledge about plant tissue culture, plant-propagation and transgenic plant technology.
- **Course outcome:** A student will be able to;
 - decipher the basic requirements of plant cell/tissue culture.
 - carry different types of cultures for plant propagation.
 - transform plant cells by different methods.
 - be trained about the different applications of plant biotechnology.

UNIT – 1 (15 HOURS)

Introduction - plant tissue culture, basic lab requirements, totipotency vs plasticity. Plant tissue culture: media composition and role of its essential components with specific reference to Murashige and Skoog Medium. Plant growth regulators and differentiation. Steps in tissue culture: surface sterilization, explants collection and its sterilization, inoculation, callus induction, subculture, regeneration and hardening of plants.

UNIT – 2 (15 HOURS)

Meristem culture and its uses in production of virus free plants. Clonal propagation. Micro propagation of plants – medicinal and endangered plants. Somatic embryogenesis and its importance. Artificial seeds: production, applications and limitations. Anther/ovule culture, production of androgenic haploids. Somaclonal variations, sources of somaclonal variants, applications of somaclonal variations for crop improvement.

UNIT – 3 (15 HOURS)

Protoplast – Isolation (mechanical and enzymatic methods), culturing and regeneration of protoplasts, protoplast fusion (mechanical fusion, chemo fusion, electro fusion) and selection of somatic hybrids and cybrids. Plant transformation: Agrobacterium-mediated transformation, Ti-plasmid and mechanism of gene transfer, co-integrate and binary vectors. Direct gene transfer methods: biolistics, electroporation, polyethylene glycol (PEG)-mediated transformation, silicon carbide fibre method, microinjection with advantages and limitations of each method.

UNIT – 4 (15 HOURS)

Applications of plant transformation and genetic engineering for quality improvement, disease and herbicide resistant plants. Enhancement of shelf life of fruits and vegetables.

Molecular mechanism of GM crops with specific reference to Golden Rice and Bt cotton.

Molecular pharming: plant production of vaccines, antibodies and therapeutic proteins. Issues related to GM crops.

PRACTICALS (2 CREDITS: 30 hours)

1. Preparation of plant tissue culture media.
2. Surface sterilization protocols of different types of explants.
3. Explant inoculation in culture media.
4. Callus formation and induction of shoot/roots with plant hormones.
5. A demonstration on hardening and field transfer of TC plants.
6. Visit to a plant tissue culture lab/plant biotechnology lab.

BOOKS RECOMMENDED

1. Razdan, M. K., Introduction to Plant Tissue Culture, Oxford & Ibh Publishing.
2. Chawla, H. S., Introduction to Plant Biotechnology, Oxford & Ibh Publishing.
3. Smith R., Plant Tissue Culture, Academic Press.
4. Slater, A., Scott, N. W., & Fowler, M. R., Plant Biotechnology: an Introduction to Genetic Engineering. Oxford: Oxford University Press.
5. Gregory Phillips Oluf Gamborg, Plant Cell, Tissue And Organ Culture: Fundamental Methods, Springer.