Teaching Plan

S.Y.B.Sc. Botany [Semester - III]

Course Category – Minor Course (MN)

Course Code – BOT-242-MN

Course Title: Tissue Culture Technology

AY-2026-27

Sr. No.	Month	Topic
1	AUG-26	**CREDIT I – Basics of Plant Tissue Culture Technology 15** **1Introduction to Plant Tissue Culture** 1.1. Introduction and brief history of PTC. 1.2. Definitions and Concepts: 1.2.1. Plant tissue culture, *In vitro* culture, cellular totipotency, differentiation, dedifferentiation, and re-differentiation. 1.2.2. *In vitro* culture, *in vivo* culture, plantlet, seedling, and micropropagation. 1.2.3. Aseptic condition, sterilization, contamination, decontamination. 1.2.4. Mother/stock plant, virus-free plant, explant, callus, cell suspension, and protoplast. 1.2.5. Inoculation, incubation, sub-culturing, hardening, and acclimatization. 1.2.6. Normality, molarity, molality and percentage solutions – weight by volume (w/v) and volume-by-volume (v/v), hard water, distilled water, alkaline, acidic and neutral solutions. 1.2.7. Nutrient medium, macronutrients, micronutrients, carbon/energy source, organic supplements, plant growth regulator (PGR), gelling agent, pH, stock solution, and working solution. 1.2.8. Organogenesis – rhizogenesis, callogenesis, caulogenesis, somatic embryogenesis, haploid culture, somatic hybridization, cybridization, artificial / synthetic seeds, somaclonal variations, clonal propagation. **Laboratory Setup and Requirements in PTC** 2.1. Layout and design of plant tissue culture lab: Stock room, Washing and sterilization area, Media preparation room, Inoculation / transfer room (Aseptic chamber), Culture / Incubation room, Hardening / greenhouse area. 2.2. Basic requirements in PTC: 2.2.1. Chemicals: Detergents / disinfectants, Surfactants, Double distilled water, Inorganic macro and micronutrients, organic supplements (vitamins, amino acids, etc.), gelling agents, carbon / energy sources, other additives, plant growth regulators: Auxins, cytokinins, gibberellins - its types and role in PTC. 2.2.2. Glassware and plastic ware: for measuring, storage, and culture; standards of glassware / plastic ware used in PTC. 2.2.3. Equipment/Instruments: Glass distillation unit, Hot air oven,

		Autoclave, Laminar Air Flow, pH meter, Hot plate magnetic stirrer, Microwave oven, Culture racks, Air conditioner (A.C.), Digital rotary Incubator, Air pressure modules. 2.2.4. Miscellaneous **3.Aseptic / Sterilization Techniques** 3.1. Introduction, definition and concept. 3.2. Methods of sterilization: 3.2.1. Physical methods: dry heat sterilization (Hot air oven), steam/moist/wet heat sterilization (Autoclave), UV Irradiation (Laminar Air Flow), Ultrafilter sterilization (Membrane filters). 3.2.2. Chemical methods: Fumigation, disinfection, surface sterilization.
2	Sep-26	**4.Plant Tissue Culture Media** 4.1. Introduction, definition and concept of medium. 4.2. Role of essential nutrients in plant growth and development. 4.3. Types of culture media: MS, B5, White's and Nitsch medium. 4.4. Composition of MS nutrient culture media – macronutrients (Major stock), micronutrients (minor stock), organic supplements (vitamins and amino acids), carbon/energy source, plant growth regulators, other additives, pH, gelling agent. 4.5. Media preparation: concept of stock and working solutions preparation for media and PGRs, standard operating protocol (SOP) of media preparation; media sterilization. **CREDIT II – Applied Plant Tissue Culture Technology 15** **5Micropropagation** 5.1. Introduction, definition and concept of micropropagation.5.2. Stages of micropropagation: Stage I: Mother plant selection; Stage II: Initiation / establishment; Stage III: Multiplication; Stage IV: Rooting; Stage V: Hardening and acclimatization. 5.3. Organogenesis: definition, concept, types –caulogenesis (shoot formation) and rhizogenesis (root formation); production of virus free plants using meristem tip culture. 5.4. Commercial micropropagation of Banana and Pomegranate. 5.5. Advantages and limitations of micropropagation.

8	OCT-26	**6Applied Plant Tissue Culture Techniques** 6.1. Callus culture: definition, stages – induction, proliferation and morphogenesis (direct and indirect organogenesis); Types of callus based on a) Texture - compact and friable; b) Origin – organogenic and non-organogenic, c) Morphogenic potential – embryogenic and non-embryogenic, d) Color – white, green, brown; Growth measurement parameters – fresh and dry weight; Importance of callus culture. 6.2. Cell Suspension culture: types – batch and continuous culture; role in secondary metabolite production. 6.3. Somatic embryogenesis: definition, process, structure, stages of somatic embryos, factors affecting somatic embryogenesis; artificial / synthetic seed production. 6.4. Protoplast culture and fusion: methods of protoplast isolation – mechanical and enzymatic; viability test – FDA (fluorescein Diacetate staining) and Evans Blue staining; Protoplast fusion: PEG and electric shock; Somatic hybridization and cybridization; applications of protoplast culture. 6.5. Haploid culture: Anther and pollen culture – development of homozygous lines (double haploids); Embryo and ovule culture – embryo rescue.
8	NOV	7Cryopreservation andand Germplasm conservation 7.1. Cryopreservation: definition, techniques – slow freezing, vitrification, sub-zero non-freezing storage and preservation in dry state; steps involved in cryopreservation; applications. 7.2. Germplasm conservation: definition, *in situ* and *ex situ* conservation. **Revision and Assignment**

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