

Plant Tissue Culture Facility

A Plant Tissue Culture Laboratory is a controlled, sterile facility where plant cells, tissues, and organs are grown on defined nutrient media, independent of soil and season. Within an institute, it serves as both a teaching space and a research platform, giving students hands-on training in aseptic technique, media preparation, callus induction, and micropropagation while helping faculty and scholars carry out advanced investigations. Equipped with laminar airflow cabinets, autoclaves, growth chambers, and culture racks with regulated light, temperature, and humidity, the lab supports work such as genetic transformation, somaclonal variation studies, secondary metabolite production, production of disease-free planting material, and conservation of rare and endangered species. By linking classroom concepts to practical experimentation, it prepares learners for careers in agricultural biotechnology, horticulture, pharmaceutical botany, and plant science research.

Instruments in this facility

- Laminar Air Flow
- Growth Chambers: Plant Tissue Culture (PTC) Culture Racks
- Equitron SLEFA automatic Autoclave
- Orbital Shaker
- pH meter

PLANT TISSUE CULTURE FACILITY

Laminar Air Flow

A horizontal laminar air flow hood is a clean workstation in which HEPA-filtered air moves in a smooth, steady stream across the work surface, from the back panel toward

the operator. This creates a particle-free zone that protects cultures, explants, media, and reagents from airborne contamination. It is a core piece of equipment in plant tissue culture, microbiology, and cell culture laboratories, where students and researchers use it for aseptic inoculation, subculturing, and sterile preparation.



Key Specifications

Parameter	Specifications
Category	Horizontal laminar flow clean air workstation
Air Filtration	HEPA filter, 99.99% efficiency at 0.3 μm
Cleanliness Class	ISO Class 5 (Class 100)
Airflow Pattern	Horizontal, uniform flow through a perforated rear discharge panel
Air Velocity	Approx. 0.45 m/s $\pm$ 20%
Pre-Filter	Replaceable pre-filter for extended HEPA life
Work Surface	Stainless steel, seamless, easy to disinfect
Body Construction	Powder-coated mild steel with a stainless-steel work area
Illumination	Fluorescent/LED tube light
Sterilisation	Germicidal UV lamp
Side Panels	Transparent acrylic/glass panels for visibility
Utility Provision	Gas line fitted for Bunsen burner
Controls	Switches for blower, light, and UV, with airflow regulation
Power Supply	220 V, 50 Hz AC
Size Options	2 ft to 6 ft widths (model dependent)

Signature Features

- **Sterile Work Zone:** Continuous filtered airflow keeps the workspace free of dust and microbes.
- **Uniform Horizontal Flow:** The perforated rear panel spreads air evenly across the work area.
- **HEPA Filtration:** Removes fine particles and airborne contaminants effectively.
- **UV Decontamination:** The UV lamp sterilises the surface and interior before and after use.
- **Bright, Clear Working Area:** Built-in lighting and transparent side panels improve visibility.
- **Easy to Clean:** The smooth stainless-steel surface withstands 70% ethanol and other disinfectants.
- **Burner-Ready Design:** Provision for a gas-fed Bunsen burner supports flame sterilisation of instruments.
- **Low Maintenance:** Filters are simple to inspect, monitor, and replace.

Research Applications

- **Plant Tissue Culture:** Explant inoculation, callus induction, subculturing, and micropropagation.
- **Microbiology:** Sterile streaking, plating, and culture transfer.
- **Cell Culture:** Handling of cell lines and media under aseptic conditions.
- **Media and Reagent Preparation:** Sterile dispensing and transfer.
- **Pharmaceutical and Diagnostic Work:** Contamination-free sample preparation.
- **Teaching:** Training students in aseptic technique.

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Growth Chambers: Plant Tissue Culture (PTC) Culture Racks

The PTC Incubation Area is a controlled-environment culture room equipped with multi-tier culture racks. It is designed for the growth, maintenance, and multiplication of plant cultures under aseptic, in vitro conditions. Regulated temperature, programmable light cycles, and uniform illumination across every shelf keep cultures growing consistently. This supports micropropagation, callus induction, organogenesis, somatic embryogenesis, and regeneration studies for both routine and advanced plant biotechnology research.





Key Specifications

Parameter	Specifications
Facility Type	Plant Tissue Culture Incubation / Growth Room
Rack Configuration	Multi-tier culture racks (4–5 shelves per rack)
Rack Material	Powder-coated mild steel / stainless steel / anodized aluminium frame
Shelf Type	Perforated or mesh shelves for uniform air circulation
Temperature Range	22 – 28 °C (typically maintained at 25 ± 2 °C)
Temperature Control	Air-conditioning with digital thermostat controller
Photoperiod	Programmable, e.g. 16 h light / 8 h dark
Light Source	Cool white / full-spectrum LED tube lights on each shelf
Light Intensity	~2,000 – 4,000 lux (~30 – 60 $\mu\text{mol m}^{-2} \text{s}^{-1}$) at culture level
Relative Humidity	50 – 70 %RH
Timer / Control Unit	Digital programmable timer for automated light cycling
Culture Vessel Compatibility	Test tubes, culture bottles, Petri dishes, jars, flasks
Air Quality	Clean, dust-minimized environment with regular surface disinfection
Monitoring	Temperature and humidity data logger / thermo-hygrometer

Signature Features

- **Uniform Multi-Tier Illumination:** Each rack shelf has its own dedicated LED lighting, giving uniform light intensity at the culture level and consistent growth across all tiers.
- **Precise Temperature Control:** The air-conditioned incubation area maintains a stable temperature, which supports reproducible morphogenesis and reduces stress on delicate cultures.
- **Programmable Photoperiod:** Automated timers let researchers set day/night cycles suited to different plant species and culture stages, such as callus induction, shoot multiplication, and rooting.
- **Space-Efficient Rack Design:** Vertical multi-shelf racks hold a large number of culture vessels in a compact footprint, which suits high-throughput micropropagation.
- **Contamination-Conscious Environment:** Easy-to-clean rack surfaces, controlled airflow, and a restricted-access room reduce the risk of fungal and bacterial contamination.

Research Applications

- **Micropropagation:** Rapid clonal multiplication of elite plant species from shoot tips, nodal segments, and axillary buds under controlled conditions. It yields disease-free, genetically uniform plantlets on a large scale for commercial and conservation purposes.
- **Callus Induction and Culture:** Controlled incubation supports the initiation and maintenance of undifferentiated callus from leaf, stem, root, and other explants. Callus serves as the starting material for regeneration, suspension cultures, and secondary metabolite studies.
- **Somatic Embryogenesis and Organogenesis:** The area supports differentiation pathways in which cultures develop into somatic embryos, shoots, or roots. This is central to plant regeneration protocols and genetic improvement programs.
- **Genetic Transformation Studies:** Co-cultivation, selection, and regeneration of transformed tissues following *Agrobacterium*-mediated or other gene transfer methods take place under regulated, reproducible conditions.
- **Secondary Metabolite Production:** Cell and organ cultures can be grown under defined light and temperature regimes to produce pharmaceutically and industrially important compounds such as alkaloids, flavonoids, and terpenoids.
- **Germplasm Conservation and Hardening:** The area supports in vitro conservation of rare, endangered, and elite germplasm through slow-growth maintenance. It also serves as the pre-acclimatization stage before plantlets move to greenhouse hardening.

PLANT TISSUE CULTURE FACILITY · AUTOCLAVE

Equitron SLEFA automatic Autoclave

The Equitron 7431 SLEFA Autoclave (53 L) is a well-engineered, fully automated sterilization solution that comprehensively addresses the demands of an animal cell culture research laboratory. Its programmable microprocessor control, multi-layer safety interlocks, CE and ASME certification, and practical 53-litre chamber capacity combine to make it a reliable and regulatory-ready instrument for media sterilization, glassware processing, biohazardous waste decontamination, and instrument sterilization. Its fully automatic operation supports both the operational efficiency and the rigorous reproducibility that modern cell biology and biomedical research require.



Key Technical Specifications

Parameter	Specifications
Chamber Capacity	53 Litres
Working Chamber Dimensions	350 mm × 550 mm
Loading Type	Top Loading
Carrier Dimensions	300 × 500 mm (with separator)
Standard Sterilization Temperature	121°C
Maximum Operating Temperature	134°C
Maximum Operating Pressure	30 psi (~1.035 bar)
Control System	Microprocessor / LCD-based; user-programmable time and temperature
Lid Locking Mechanism	Single ergonomic lever; single-hand operation
Over-Temperature Protection	Independent alarm and automatic cut-off
Low Water Protection	Automatic low water level cut-off
Pressure Safety Valve	Spring-loaded; activates on over-pressure, Pressure interlock on door
Chamber Construction	Stainless steel; designed and tested per ASME guidelines
External Construction	Epoxy-coated steel (standard); SS 304 external panels available (suffix -SS)
Cycle Automation	Fully automatic: air purging → sterilization hold → pressure exhaust

Signature Features

▪ Reproducibility and Batch Consistency

The microprocessor-based controller executes each sterilization cycle — air purging, sterilization hold, and terminal pressure exhaust — identically and automatically, without operator intervention. This reproducibility is essential in GLP-compliant cell culture operations where batch-to-batch consistency in media and reagent sterility is both a scientific and regulatory requirement.

▪ Multi-Layer Safety Architecture

The 7431 SLEFA incorporates redundant safety systems critical for laboratories handling animal-derived biological materials:

- The lid safety interlock prevents cycle initiation until the lid is fully secured and prevents lid opening while the chamber is pressurized, protecting operators from steam-related injury.
- An independent over-temperature alarm with automatic cut-off guards against thermal damage to culture materials or equipment.
- The spring-loaded pressure safety valve provides passive overpressure protection independent of the electronic control system.
- The low water cut-off prevents element damage and chamber overheating during unattended operation.
- **Operational Efficiency**

The 53-litre chamber capacity enables high-volume batch sterilization in a single run, minimizing turnaround time and supporting continuous cell culture workflows. The ergonomic single-lever mechanism allows rapid, one-handed lid operation. Full automation frees research staff from attendance duties during the sterilization cycle, enabling concurrent laboratory activities.

- **Flexibility Across Sterilization Modes**

The 7431 SLEFA supports standard gravity-displacement sterilization at 121°C for routine media and glassware processing, and an optional high-speed operating mode at 134°C for applications requiring more aggressive or rapid sterilization. This eliminates the need for multiple instruments across diverse sterilization requirements in a single laboratory.

Key Research Applications

- **Sterilization of Culture Media and Reagents**

Animal cell culture depends on chemically defined or complex media such as DMEM, RPMI-1640, and MEM, along with supplements including phosphate-buffered saline (PBS), distilled water, and salt solutions. While heat-sensitive components of media like serum require filter sterilization, but base media preparations and aqueous solutions require moist-heat sterilization at 121°C. The 7431 SLEFA achieves and maintains this temperature through its programmable hold cycle, ensuring complete destruction of bacteria, fungi, viruses, and mycoplasma — persistent threats to mammalian cell cultures.

- **Sterilization of Glassware, Surgical Instruments and Plasticware**

Active cell culture laboratories generate large volumes of glassware and autoclavable plasticware including Erlenmeyer flasks, beakers, measuring cylinders, glass pipettes, centrifuge tubes, pipette tip boxes, reagent bottles scalpels, scissors, forceps, and spatulas. The 7431 SLEFA's 53-litre chamber accommodates substantial batch loads, enabling efficient high-throughput decontamination to support continuous cell culture workflows.

- **Decontamination of Biohazardous Waste**

In accordance with biosafety regulations governing animal-derived biological materials, all laboratory waste — including spent media, contaminated plasticware, sharps containers, and animal tissue remnants — must be rendered biologically safe before disposal. The automatic cycle of the 7431 SLEFA ensures consistent, validated inactivation of all biological agents, supporting compliance with Institutional Biosafety Committee (IBSC) requirements and national biosafety frameworks such as those issued by India's DBT/RCGM or equivalent international bodies.

- **Preparation of Microbiological Substrates**

Cell culture research frequently intersects with microbiology, especially when developing feeder-cell layers, preparing bacteria-conditioned media, or conducting co-culture experiments. The 7431 SLEFA is suitable for sterilizing agar plates, broth media, and culture substrates used in microbiome-related assays and co-culture systems, broadening its application beyond core mammalian cell culture.

- **Sterilization of Process Water**

High-purity autoclaved water is required for reconstituting lyophilized media components, preparing buffer solutions, and rinsing laboratory glassware. The autoclave neutralizes residual microbial contamination and pyrogens in water supplies, reducing the risk of introducing endotoxins into sensitive animal cell culture systems