Plant Tissue Culture And Bioprocessing Research Lab

(DBT, Govt. Of INDIA Funded)

AVIT
AARUPADAI VEEDU INSTITUTE OF TECHNOLOGY

VINAYAKA MISSION'S RESEARCH FOUNDATION

Plant Tissue Culture

&

Bioprocessing Research Lab

DEPARTMENT OF BIOTECHNOLOGY

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Centre For Plant Tissue Culture And Bioprocessing (DBT, Govt. of INDIA Funded)

About the Centre

Worldwide Plant tissue culture technique is being utilized as an imperative tool to meet green economy of the country. Plantlets are grown in large number from isolated cells or tissues under sterile and controlled conditions outside the parent plant.

Plant Tissue Culture Lab provides the facility of growing large number of isolated cells or tissues under sterile and controlled conditions obtained from any part of the plantlike stem, root, leaf etc. which are encouraged to produce more cells in culture and to express their totipotency (i.e., their genetic ability to produce more plants).

Cells or tissues are grown in different types of glass vials containing a medium with mineral nutrients, vitamins and phyto-hormones. Tissue Culture techniques are being exploited in this laboratory to multiply plants which are difficult to propagate by conventional means.

The Centre was established in the month of March 2012 under Department of Biotechnology, Govt. of India under a funded project entitled “Large scale production of 4- ipomeanol an anti cancer agent”

Vision

To disseminate the knowledge and skill to students and develop entrepreneurs in plant tissue culture to meet the green demands of the day by day increasing population.

Mission

- To produce exact copies of plants with desirable traits in large scale within short period of time.
- To maintain and establish virus free, disease free stocks
- To cross distantly related species by protoplast fusion and regeneration of novel hybrid
- To rapidly develop and study on molecular basis for physiological, biochemical and reproductive mechanisms in plants for stress tolerant species
- To regenerate transgenic plants of desirable characters
- To produce identical sterile hybrid species
- To conserve rare or endangered plant species

Facilities available in the Centre

Basic facilities

- An aseptic transfer area
- A media preparation and sterilization area
- Environmentally controlled incubators or culture room
- Data collection area

Laboratory Design and Development

The tissue culture lab provides facilities for:

- Washing and storage of glassware, plastic ware
- Preparation, sterilization and storage of nutrient media
- Aseptic manipulation of plant material

- Maintenance of cultures under controlled temperature, light and humidity
- Observation of cultures, data collection and photographic facility
- Acclimatization of in vitro developed plants. The overall design must focus on maintaining aseptic conditions.

There are three separate rooms available (i) one for washing up, storage and media preparation (the media preparation room);
(ii) a second room, containing laminar-air-flow or clean air cabinets for dissection of plant tissues and sub-culturing(dissection room or sterilization room); (iii) and the third room to incubate cultures(culture room).This culture room should contain a culture observation table provided with binoculars or stereo-zoom microscope and an adequate lightsource.

Culture room

There is a room maintained at temperature 25 ±2°C, controlled by air conditioners attached to a temperature controller for maintaining cultures .Cultures are generally grown in diffuse light from cool, white, fluorescent tubes. Light scan be controlled with automatic time clocks. Generally, a 16-hour day and 8-hour nights are used. The culture room is provided with specially designed shelves to store cultures. Shelves are made of rigid material and it is kept clean and dust-free. Insulation between the shelf lights and the shelf above will ensure an even temperature around the cultures. While flasks, jars and petridishes can be placed directly on the shelf or trays of suitable sizes, culture tubes require some sort of support. Metallic polypropylene racks, each with a holding capacity of 18-24 tubes, are fitted suitable for the purpose

Dissection room or sterilization room

This area have restricted entry, in order to ensure the sterile conditions required for the transfer operations. For sterile transfer operations, the laminar-air-flow cabinets are used. Temperature control is provided in this room as the heat is produced continuously from the flames of burners in the hoods. The laminar horizontal flow sterile transfer cabinet is available in the room. A stainless steel working platform is provided which is most durable, easy to keep clean and to prevent the unwanted damage due to accidental fire. It is fitted with Ultraviolet light to maintain sterility inside the cabinet. Work can be started after 10-15 min of UV exposure and switching on the air flow, and one can work uninterrupted for long hours.

A Laminar-air-flow cabinet has small motor to blow air which first passes through a coarse filter, where it loses large particles, and subsequently through a fine filter known as 'High Efficiency Particulate Air(HEPA)".The HEPA filters remove particles larger than 0.3 μm, and the ultraclean air flows through the working area. The velocity of the ultra-clean air is about 27 ± 3 m min-1 which is adequate for preventing the contamination of the working area as long as the flow is on. The flow of the air does not in any way hamper the use of a spirit lamp or a Bunsen burner.

Equipment

- Autoclave
- Air conditioners
- Culture racks with tube lights
- Distillation unit
- Fermenter

- Hot air oven
- Microwave oven
- Microscope
- Lyophilizer
- Refrigerator
- Ph meter
- Vortex shaker

Production Process

(i) In vitro culture establishmentstage

- Test tube cultures
- Guaranteed pathogens free
- Development and phyto-sanitary condition
- Maintained in temporary culture medium

(ii) Productionstage

- Massive propagation of explants plantlets
- Propagation range depends on the species
- Propagation range may vary according to the phyto hormones in the culture medium
- Production cycle depends on species behavior
- Development of good plantlets

Advantages of Plant Tissue Culture

- Thousands of plantlets can be produced in few week time from a small amount of plant tissue
- Tissue culture is very fast technique
- Production of exact copies of plants with desirable traits

- New plants produced by tissue culture are disease free
- Tissue culture can grow plants round the year, irrespective of weather or season
- Very little space is needed for developing new plants by tissue culture
- It helps to speed up the production of new varieties into the marketplace
- Techniques helps in maintaining and establishing virus free stock
- Production of multiple plants in the absence of seeds or pollinators
- Regeneration of whole plants from plant cells that have been genetically modified

Interdisciplinary faculty team

- Dr.R.Devika,ProfessorandHead,Biotechnology
- Dr.B.Prabasheela,Asso.Professor,Biotechnology
- Dr.A.Nirmala,Asst.Professor(Gr.II),Biotechnology
- Dr.R.Balachandar, Asst.Professor(Gr.II),Biotechnology
- Ms.K.Sasi Kala, Asst.Professor(Gr.II),Biotechnology
- Mrs. M.Subathra, Asst.Professor,Biotechnology

Research Project

Dr. M. Remya, Associate Professor, Department of Biotechnology, received Rs. 26,48,490/- (Rs. Twentysix lakhs forty eight thousand four hundred and ninety only) funded by Department of Biotechnology, Govt. of India,entitled“Largescaleproductionof4-ipomeanol

an anti cancer agent" during March 2012 to 2015. (No.BT/Bio CARe/03/904/2010-11Date:24/01/2012)

Proposed Activities

- ZnO nanoparticle as a carrier: Nano fertilizer formulation for Baryard Millet.

Research Publications

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- Devika, R., Justin Koilpillai and NazarathArokiamary, 2012. In vitro micropropogation of Sphaeranthusamaranthides Burn. F.RecentRes. In SciandTech.,4(4):1–4.

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- Balachandar.2004.Plant regeneration from leaf and stem explants of *Solanum trilobatum* L.Current Science, 86/11,1478-1480.
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- Remya.M2013. In vitro regeneration of Aristolochiatagala and production of artificial seeds. Biologia Plantarum,.57 (2) : 210 –218.
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- Alkapriyadarshni , Amit kumar , Dhirajkumar, P. Arjun and B. Prabasheela. 2013. Micropropagation, RegenerationandEvaluationofantimicrobialactivity of lippianodiflora. International Journal ofAdvances inEngineeringandTechnology,6(4):1819–1828.
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- VinothS 2014.Optimization of factors influencing microinjection method for Agrobacterium - Mediated transformation of Embryonic Shoot Apical Meristem in Cotton (Gossypiumhirsutum L. cv.SVPR-2)Int.J.Curr.Biotechnol.,2(12):35-40.

FACILITIES AVAIALBLE

Figure 1: Culture rack facility

Figure 2: Laminar-air-hood with coarse filter, HEPA filter, gas cock, gas cylinder and electrical outlets

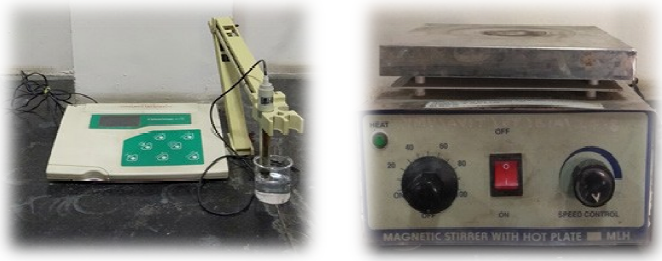

Figure 3: pH Meter and Magnetic stirrer-cum-heater

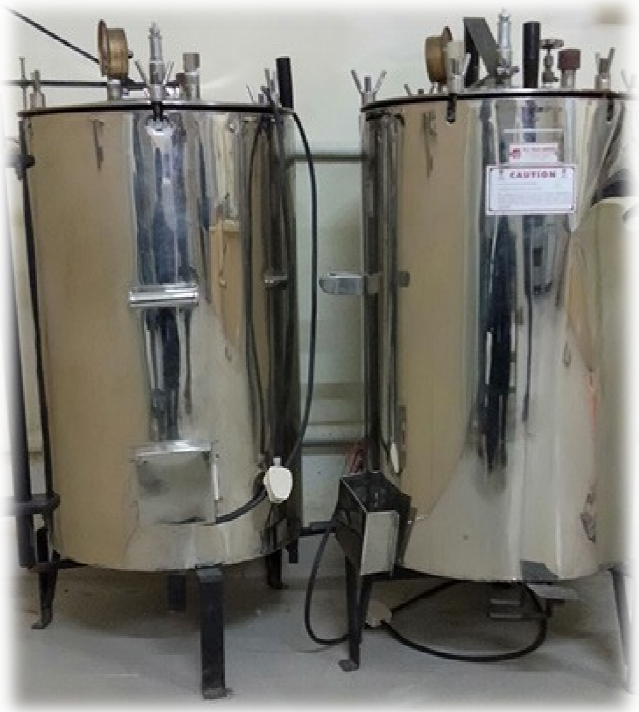

Figure 4: Autoclave with accessories

Figure 5: Binocular stereo zoom microscope (left side)
and Centrifuge (right figure)

Figure 6: Incubator shaker

Figure. 7: Lyophilizer

Figure. 8: Bioreactor

Figure 9. Microwave oven