Green Skill Development Programme (GSDP)
on
Plant Tissue Culture Techniques & its Applications

Course Completion Report

Organized from 04.11.2019 to 31.12.2019
by

ENVIS Resource Partner
on
Forest Genetic Resources and Tree Improvement
Institute of Forest Genetics and Tree Breeding
(Indian Council of Forestry Research and Education)
Coimbatore

Course Completion Report

Inaugural Session

A Green Skill Development Programme (GSDP) on **"Plant Tissue Culture Techniques and its Applications" (**level-6) was conducted for a period of 40 working days (320 hours) from 04th November to 31st December 2019 by the ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at the Institute of Forest Genetics and Tree Breeding (IFGTB), Coimbatore. The training module included theory, field visits, field exercises and assignments. Dr R. Yasodha, Scientist G and Head, Plant Bio-technology and Cytogenetics Division inaugurated the training programme. Dr Kannan C.S. Warrier, Scientist F, Coordinator ENVIS & Nodal Officer GSDP presented an overview about IFGTB and various institutes under the Indian Council of Forestry Research & Education (ICFRE). He also explained on GSDP, ENVIS India and the mandate of ENVIS RP at IFGTB.

First Week (04.11.2019 to 08.11.2019)

Dr Kannan C.S. Warrier, Scientist F and Coordinator ENVIS delivered a lecture on "Introduction to Forestry". In his lecture he covered the basics on forestry and explained the methods of selection of Candidate Plus Trees (CPTs), Plus Trees and Elite Trees. He also elaborated on the principles of tree improvement and clonal forestry. While detailing the various methods of vegetative propagation techniques in forestry, the participants were made aware of the benefits and risks of using clones in forestry.

Dr R. Yasodha, Scientist G and Head, Plant Biotechnology and Cytogenetics Division delivered a lecture on basics of tissue culture. She gave an insight to history of tissue culture; principles of tissue culture; tissue culture of forest trees and standard methods used for producing tissue

culture material. She also highlighted various schemes and financial assistances provided by Union and State Governments for establishing tissue culture labs.

A lecture on “Applications in Plant Tissue Culture” was delivered by Dr Rekha R. Warrier, Scientist F & Training in-charge. She elaborated on the importance of certification of micro-propagated plants and also explained the financial assistance provided by the Government.

In order to familiarize the equipment in the tissue culture lab, an introductory session on standard procedures to operate different equipment in the lab was taken by Ms R. Mahalakshmi, Technical Officer, Plant Biotechnology and Cytogenetics Division. She gave an overall idea about the procedures followed in the lab.

A lecture on “Good Laboratory Practices” was delivered by Ms R. Kalaiselvi, Senior Research Fellow. She explained the Do’s and Don’ts followed in the lab and standard procedures for handling the chemicals and instruments. After the lecture, the trainees were taken to the lab to familiarize with different equipment.

The trainees were taken to tissue culture lab for providing practical training. Ms K. Chitra, Technician, and her team taught the following:

- Categories of glassware
- Basic steps in cleaning equipment
- General Methods of cleaning glassware
- Common lab chemicals used for cleaning glassware
- Process of decontaminating glassware

They also gave an overall idea about the procedures and special precautions to be followed for handling the glassware in the laboratory.

Hands on training were given to the trainees and they were taught how to properly clean various glasswares in the laboratory. Trainees were given guidance and support throughout their practical session.

The importance of the use of cotton plugs in lab was explained to the trainees. How cotton plugs acts as best filters of microbes was also explained. The procedure for preparing cotton plugs were taught to trainees and they prepared them. Ms K. Chitra, Technician and Ms A. Sathya, Field Assistant gave hands on training on washing various equipments to the trainees in tissue culture lab.

Standard operating procedures to be followed in the tissue culture lab and the importance of wearing appropriate gloves, lab coat and eye protection whenever using chemical disinfectants were explained by Dr Rekha. R. Warrier, Scientist F & Training in-charge. Ms K. Chitra, Technician and Ms A. Sathya, Field Assistant gave the hands on training on decontaminating culture bottles and petri plates; sterilization using the autoclave/pressure cooker and bleaching of cultures.

The trainees were taken to autoclave room Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF explained how autoclaves use pressurized steam to destroy microorganisms. Decontamination of laboratory waste and the sterilization of laboratory glassware, media, and reagents using autoclave were also taught. Trainees were independently taught to cut the cottons & tissue papers into small pieces and how to pack the bottles for sterilization. A Lecture on the difference between conventional method and tissue culture method was given by Ms S. Arathi, JRF.

Trainees were split up into 03 groups (5 members/each group) and research articles on “Aseptic Techniques in Plant Tissue Culture Lab” were distributed to them. The trainees were instructed to go through the research articles thoroughly and present the methodologies discussed in those articles.

Tools used for tissue culture were sterilized using autoclave method under the supervision of Ms R. Mahalakshimi, Technical Officer. The basic concept of sterilizing different materials using direct contact with steam at specific temperatures and pressures were taught to the trainees. The processes of setting temperature, pressure and time etc in autoclave were taught to the trainees in the practical session. The importance of wearing appropriate protective equipment while unloading the autoclave was also discussed.

Ms R. Kalaiselvi, SRF explained the basic calculations of concentrating solutions and molarities. Exercises were given to trainees to do calculations for preparing various solutions in the required concentration. A quiz was conducted based on the topics covered during the week.

Second Week (11.11.2019 to 15.11.2019)

Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF gave hands on training on sterilization procedures. They have demonstrated how to handle equipment during sterilization and provided tips for safe handling of various instruments. Lab exercises for sterilizing various instruments like bottles, test tubes, petri plates, forceps, scalpels etc using autoclave method were given to the trainees. The trainees actively practiced in the sterilization of various instruments under the guidance and support of Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF.

Ms. R. Mahalakshmi, Technical Officer gave hands on training on the procedures of Autoclaving. Loading/unloading autoclave; storage in autoclave; fixing temperature and time etc were explained.

Ms R. Kalaiselvi, SRF gave a lecture on molarity calculations, the following topics were taught to the trainees:

- Standard calculation strategies
- Use of SI units
- Key principles for efficient laboratory calculations
- Use of moles
- Different ways of expressing concentration
- How to use the molecular weight

Trainees were taught to do simple calculations and various assignments on calculating percentage and molarity were given to them.

A lecture on media components was delivered to the trainees by Ms R. Kalaiselvi, SRF. The following topics were covered in her lecture:

- Composition of culture media
- Types of media
- How medias are classified based on consistency of nutritional component
- functional use of media

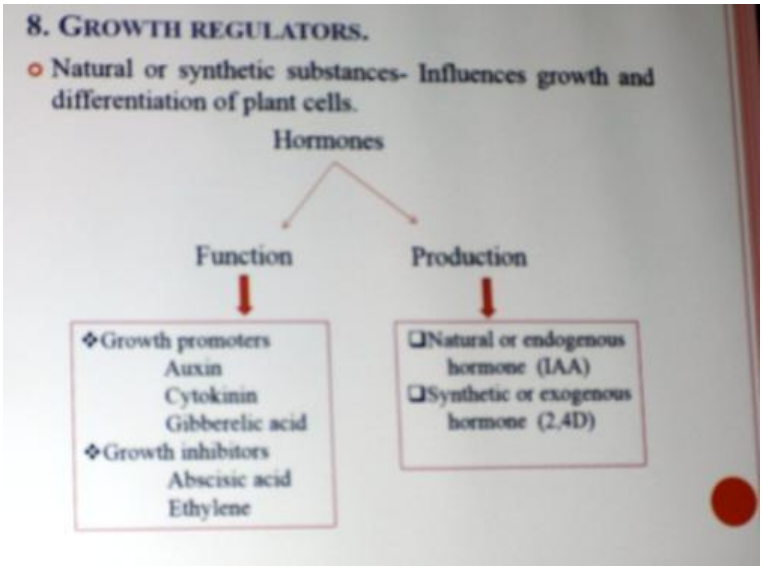
She also briefed about the usage of macronutrients, micronutrients, vitamins, amino acids/nitrogen supplements, source(s) of carbon, undefined organic supplements, growth regulators and solidifying agents. The trainees got an overall idea about the quantity and types of different components that are added into the media.

Lecture on Plant Hormone

Ms S. Arathi, JRF gave a lecture on the role of plant hormones in tissue culture. The following topics were covered in her lecture:

- Recognized groups of plant hormones
- How they hormones work together in coordinating the growth and development of cells
- The role of hormones in intercellular communication

In addition, she also explained the role of auxins, gibberellins, cytokinins, abscisic acid (ABA) and ethylene in tissue culture.



Lecture on Types of Media

Ms S. Mohana Priya, Field Assistant gave a lecture on functions of media. She highlighted the different types of media and how media provides water and nutritional needs.

Hands on Training on calculations

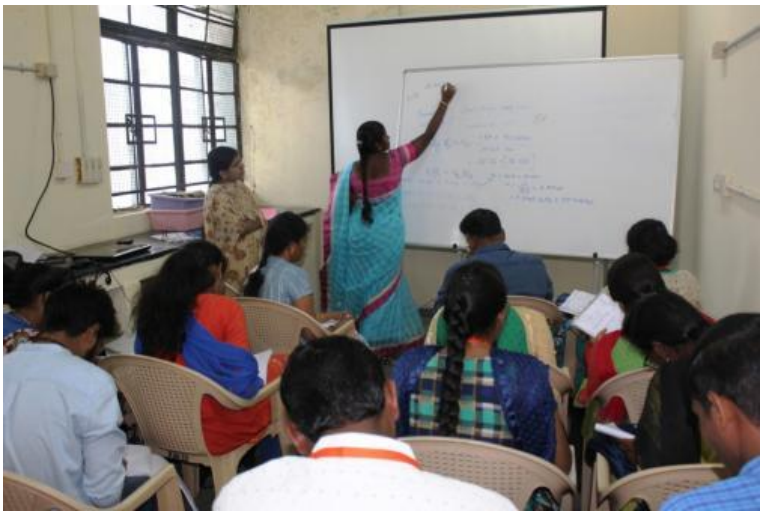
Dr Rekha R. Warrier, Scientist F & Training in-charge gave an introduction about calculating the normality of a solution and steps involved in calculating the normality. Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF gave hands on training on calculations of normality of various solutions. The trainees were taught how to find normality with molarity and calculating normality with equivalent weight.

Presentation by Trainees

The assignments on molarity and normality given for the trainees on 13.11.2019 were individually presented by the trainees under the supervision of Ms R. Mahalakshimi, Technical officer. Tips were given to the trainees to analyze problems, identify problem severity and assess the impact of alternative calculations.

Lecture on Preparation of Stock Solution

Ms R. Kalaiselvi, SRF, gave a lecture on the preparation of stock solutions using MS medium and PGR. She explained about how to improve and calculate quantities of chemicals needed for given concentrations and stock volumes. Hands on training to prepare the stock solutions were also given to the trainees.



The trainees were split into 3 groups and exercises to prepare stock solutions were given to them. Trainees actively prepared the stock solutions under the guidance of Ms S. Arathi, JRF.

Preparation of Media

The trainees were split into 03 groups and individually prepared MS media from the stock solutions under the supervision of Dr Rekha R. Warrier, Scientist F & Training in-charge. Each group prepared media and the prepared media was transferred to bottles. The trainees individually autoclaved the prepared media.

Quiz programme

A quiz programme was conducted on the topics covered during 2nd week and feedback was obtained from the trainees. 05 assignments on preparation of various solutions were given to the trainees.

Third week (18.11.2019 to 22.11.2019)

The trainees individually prepared 500 ml MS media from the stock solutions for initiation of Teak culture and autoclaved the prepared media and stored them in the new tissue culture lab under the guidance of Dr Rekha R. Warrier, Scientist F & Training in-charge and Ms R. Mahalakshimi, Technical officer. An introductory session on explant preparation was also given to the trainees.

Practical session

The general methodology for the B5 medium preparation which involves the preparation of stock solutions using high purity chemicals and demineralized water were practically taught to the trainees. Trainees were trained to store stock solutions in glass/plastic containers and how to froze and use them when required. As most of the growth regulators are not soluble in water, the trainees were taught to dissolve them in NaOH (Sodium hydroxide) or alcohol. After the training, the trainees kept the laboratory chemicals safe and secure for later use. The entire session was monitored by Ms R. Mahalakshimi, Technical officer and her team.

Preparation of Media

The trainees were split into three groups. Lab exercises to prepare stocks of macronutrients, micronutrients, iron and vitamins etc for Gamborgs B5 media were given to the trainees. The trainees prepared separate stock solutions required for the establishment of cultures, initiation of growth and maintenance and rooting. All stock solutions were stored in refrigerator for later use. The entire training session was carried out by the trainees under the guidance of Dr Rekha R. Warrier, Scientist F & Training in-charge. The process of supplementing the basal media in various concentrations and combinations were taught by Ms R. Mahalakshimi, Technical officer.

Callus Induction Procedures

The methodology for the preparation of callus induction was taught by Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF. They explained how the callus formation is induced from plant tissue samples (explants) after surface sterilization and plating onto tissue culture medium and also explained the role of callus cells in covering the plant wound.

After the lecture the trainees were taken to the tissue culture lab, Dr Rekha R. Warrier, Scientist-F & Training in-charge gave an overall idea about the methodologies to prepare callus induction and trained them to prepare callus induction medium. The trainees prepared the callus induction medium with two different concentrations of three hormones. The trainees individually autoclaved the prepared media and poured them into Petri plates. The prepared media were stored inside the Laminar Air Flow for UV sterilization.

Lecture from an Entrepreneur

Mr Srimanta Manna, an entrepreneur from West Bengal, trained by IFGTB ENVIS in the GSDP course on Quality Planting Material Producer (during FY 2018-19) shared his experience to the trainees. He highlighted how he gained additional skills by the practical training and field trips provided by IFGTB ENVIS during the GSDP course. He also explained how banking linkages sessions provided by IFGTB ENVIS during the training motivated him to approach banks for loans to start his own venture. During his speech he thanked the Ministry of Environment, Forest and Climate Change, ENVIS and, IFGTB staff for providing the guidance and support which made him to become an entrepreneur.

Visit to Vegetative Propagation Complex

The trainees were taken to vegetative propagation complex in the institute, Ms K. Chitra, Technician provided hands of training and explained the procedure and importance of spraying fungicides to teak clones. As a pre-preparatory work before collecting explants, the trainees sprayed prophylactic solutions to the teak clones.

Two research articles on “Secondary Metabolites” were distributed to the trainees. The trainees understood the topic and presented the methodologies discussed in those articles.

Mock Practical

A mock practical examination was conducted to the trainees in order to determine whether the trainees are capable to implement their theoretical knowledge in the laboratory. The trainees were split into 3 groups. Exercise to prepare MS media for subculture is given to group 1. Group 2 was assigned to prepare MS media with 0.2 mg/l benzyl adenine (BAP) and Group 3 was assigned to prepare 8 mg/l thidiazuron (TDZ). Trainees individually prepared the media assigned to them under the supervision of Dr Rekha R. Warrier, Scientist F & Training in-charge. The prepared media was autoclaved and stored.

Demonstration on Woody Plant Medium

Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF demonstrated the preparation of Woody Plant Medium (WPM). They also demonstrated the varying hormonal combinations with WPM and explained how to optimize the media for culture initiation, direct regeneration, multiple shoot induction, rooting, callus production, induction of somatic embryos and regeneration of somatic embryos into plantlets. The concept of various hormonal combinations used with the standardized multiple shoot induction medium with different basal media such as MS medium was also discussed.

Preparation of Bamboo Media

The standard method of inoculation of culture media which is used to obtain reproducibility of quantization results and the procedure for streaking plates were taught to the trainees by Ms R. Mahalakshimi, Technical Officer. An exercise to prepare and inoculate bamboo media was given to the trainees. The trainees actively prepared and inoculated the media using four quadrant methods. The prepared media were autoclaved and stored by the trainees for later use.

Quiz Programme

The trainees were split into 3 groups and an inter-group quiz programme was conducted from the topics covered during this week. The trainees themselves prepared the questions and asked the questions to other groups. The session was monitored by Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF. The trainees actively interacted with the fellow participants during the quiz.

Fourth Week (25.11.2019 to 29.11.2019)

Visit to Vegetative Propagation Complex

Trainees visited the vegetative propagation complex and Ms R. Mahalakshimi, Technical Officer demonstrated the collection of nodal explants. After the demonstration, the trainees individually collected nodal explants from different teak clones.

Surface Sterilization

The trainees processed the collected explants which involved the immersion of explants into appropriate concentration of chemical sterilants / disinfectants for a specified time resulting in the establishment of a contamination-free culture and inoculated them.

Inoculation of Seeds

Ms R. Mahalakshimi, Technical Officer demonstrated the process of inoculating seeds using inoculation media. The trainees sterilized and inoculated *Oroxylum indicum* (L.) seeds in the seed inoculation media. The inoculated bottles were incubated in the new tissue culture lab.

Sub-Culturing Media

Ms R. Kalaiselvi, SRF and Ms S. Arathi, JRF explained the process of sub-culturing involving removal of the medium and transfer of cells from a previous culture into fresh growth medium to enable further propagation of the cell line or cell strain and gave a demo on sub-culturing of teak clones. Individual exercise to sub-culture one bottle of incubated media was given to the trainees. The trainees actively sub-cultured the media and stored the same in the new tissue culture lab for later use.

Collection of Leaf Explants of *Premna integrifolia*

The trainees collected explants of *Premna integrifolia* which is commonly known as Araṇi or Agnimantha from the vegetative propagation complex, the collected leaves were washed thoroughly in running tap water and air dried individually by the trainees. Subsequently, leaves were washed twice with sterile distilled water and were surface sterilized by sequential washes to remove the epiphytic microbes. After surface sterilization, the leaves were blotted on sterile tissue paper under laminar airflow and cut into smaller segments (0.5 X 0.5 cm2) with a sterile surgical blade and plated on culture medium to isolate the foliar endophytic fungi. The efficacy of the surface sterilization was tested by imprinting the sterilized leaf segments on the surface of PDA medium.

Collection of Bamboo Explants

The trainees collected nodal explants of bamboo from the vegetative propagation complex. The collected nodal explants were washed thoroughly in running tap water and air dried individually by the trainees. Further, surface sterilization of the explants were carried out under laminar airflow by treating the explants with appropriate chemical solutions, washing, rinsing with ethanol and final washing with sterile distilled water. After treatment, the explants were then inoculated on solidified MS basal medium. The cultures were incubated under controlled temperature, light and humidity in new tissue culture lab.

The process of identifying and collecting the healthy plants from the processed explants was taught to the trainees by Dr Rekha R. Warrier, Scientist F and Training in-charge. Later, the trainees collected the healthy plants of teak clone TS 14-2 for rooting and sub-culturing from the processed nodal explants which were stored earlier. The trainees were instructed to store the healthy plants for the further use.

Fifth week (02.12.2019 to 06.12.2019)

Visit to the Plant Biotechnology Nursery

The trainees were taken to PBT nursery and Ms K. Shanthi, Chief Technical Officer explained the following:

- The general structure of the nursery
- How to establish mist chambers
- Preparation of beds in the mist chamber
- Fertigation in mist chamber

She also gave an overall idea about the maintenance of humidity and temperature and steps of coppicing. The shade house facilities were explained to the trainees and the overall process of collection of shoots was also explained.

Filling Hycopots

As a pre-preparatory work for rooting, the trainees were split into 3 groups and were provided hands on experience on preparing hycopots and fill them with vermiculate. The filled hycopots were stored in the nursery by covering them in a poly tunnel to maintain moisture and temperature.

Rooting Process

The process of transferring the selected healthy clones from lab to nursery was taught by Ms K. Shanthi, Chief Technical Officer. The stored teak clones (which were earmarked as healthy clones by the trainees on 29.11.2019) were transferred to the nursery for rooting by the trainees.

Planting Cuttings

The processed cuttings were planted into hycopots. The cuttings were kept in polytunnels until a good root system is developed and shoot growth starts. Fresh water and bavistin were sprayed and the polytunnel was tightly covered by filling the ends with sand.

Vermiculite Preparation

The manufacturing process used to produce vermiculate was demonstrated by Ms K. Shanthi, Chief Technical Officer. She explained about the raw materials used in the preparation; preparation method; ratios of mixtures; health aspects and various parameters like temperature, moisture etc for the preparation of vermiculite. The trainees were split into 03 groups and exercise to prepare vermiculate was given to each group.

Lecture on Various Nursery Techniques of Teak

Mr C. Rajesh, Field Assistant delivered a lecture on various nursery techniques of teak. He also briefed about the different types of pests that affect tissue culture of teak plants.

World Soil Day Celebration

The trainees participated in the World Soil Day 2019 awareness programme organized by ENVIS Resource Partner on Forest Genetic Resources and Tree Improvement at IFGTB. The primary objective of the observance was to highlight soil's importance on earth and to protect the environment from soil erosion for sustainable future.

Visit to Genenwin Biotech

A field visit to Genewin Bio-tech, Hosur was organized for the trainees to give an exposure on large scale production of tissue culture plants and highly equipped Research & Development wing. Mr Gowtham Palani, Managing Director, Genewin Bio-tech welcomed the trainees and explained about the unit. He also explained the difficulties and problems faced during the establishment the unit and the solutions for overcoming them. He also gave an insight that how the mother plants from different countries were selected and secured for later use. The cultures of banana and ginger at different growth levels were shown to the trainees. Practical training to operate inoculation reams and cleaning & maintenance were also provided to the trainees. Trainees actively took observations and interacted with the field staff.

The trainees experienced the standards of the various infrastructure and individual units. The mother plants of various bamboo species collected from different countries like Thailand, Indonesia, Srilanka and the method of preserving them were shown to the trainees. He also answered various questions raised by the trainees and guaranteed that Genewin Biotech would supply the plants and buyback the same.

Visit to GrowMore Biotech Ltd

In order to provide a real time exposure on large scale production of quality planting stocks, a field visit to GrowMore Biotech Ltd, Hosur, a company excelling in providing high quality plants to farmers, industries and Government departments in India and export quality planting stock to several countries was organized for the trainees on 07.12.2019. Mr G. Panner Selvam, General Manager welcomed the trainees and gave an introductory session about the organization. He also explained how they got accreditation from Australian Quarantine Inspection Service (AQIS) for exporting ex-agar plants from India to Australia in the year 2002. He also informed that GrowMore Biotech was a Technological Partner with National Mission on Bamboo Application (NMBA) of Technology, Information, Forecasting and Assessment Council (TIFAC), Department of Science and Technology, Government of India. GrowMore Biotech has been enrolled with the Ministry of Micro, Small & Medium Enterprises, Government of India as MSME unit and it is a Corporate Life Member in National Academy of Biological Sciences (NABS), Chennai and also Life member in Hosur Small & Tiny Industries Association (HOSTIA).

Lecture on Bheema Bamboo

Mr. G. Panner Selvam gave a special emphasis on the development of the “Bheema Bamboo”, a superior clone, selected from *Bambusa balcooa*, a higher biomass yielding bamboo species developed by Dr N. Barathi, GrowMore Biotech. He highlighted that this clone is thorn less, sterile, superior bamboo. Tissue cultured Bheema Bamboo is identical, homogeneous, and free from pests and diseases and grow, vigorously. It can be grown in the field for many years with no need for replanting. It yields higher biomass if managed by following the appropriate silvicultural methods.

Sixth Week (09.12.2019 to 13.12.2019)

DNA Fidelity Test

The use of CTAB (cetyltrimethylammonium bromide), a cationic detergent, facilitates the separation of polysaccharides during purification while additives, such as polyvinylpyrrolidone, can aid in removing polyphenols to purify DNA from plant tissues were taught to the trainees by Dr .Rekha R. Warrier, Scientist F & Training in-charge. She also demonstrated the usage of Arbor Easy DNA kit. Then the trainees were split into 03 groups and exercises to prepare 5X TBE buffer, wash buffer A & B were given to them. The trainees actively prepared the buffer and also carried out the isolation of DNA from the teak clones TS 20-21 using three different methods.

Polymerase Chain Reaction (PCR)

The usage of Agarose an algal polysaccharide, a thermoreversible and ion-dependent gelling agent was explained to the trainees. The procedure of using Agarose gel electrophoresis in analysis of proteins and major steps involved in Polymerase Chain Reaction (PCR) involved in DNA sequencing were taught to the trainees by Ms R. Mahalakshimi, Technical Officer.

Cast Tray Sealing

The trainees were split into 03 groups and experiments to seal the boats and cast tray using 0.8% & 1.2 % of Agarase gel were given to them. After the gel preparation, the trainees loaded the prepared DNA sample isolated it using ArborEasy DNA Kit. The experiment was monitored under UV-transilluminator at regular intervals.

Lecture on the Significance of Mountains in Conservation of FGRs

In connection with the observance of International Mountain Day 2019, a lecture on the role of mountains in conserving Forest Genetic Resources was delivered by Dr Kannan CS Warrier, Scientist F, ENVIS Coordinator and Nodal Officer GSDP. He gave an insight on the significance of mountains to the youth. One-tenth of the human population derives their support of living through mountains, he added. He also explained the importance of Western Ghats which is one of the eight hottest hotspots of biological diversity in the world along with Srilanka. Older than the Himalayas, the Western Ghats is the home to at least 325 globally threatened flora and fauna. Thirty-nine World Heritage Sites in the Western Ghats declared by the UNESCO were also detailed. The details are available in the FAO website: http://www.fao.org/international-mountain-day/imd-around-the-world/news-details/en/c/1257022/

Eco Tour to Western Ghats

An eco tour to Sadivayal Forest Area, Western Ghats Region in collaboration with Tamil Nadu Forest Department was arranged. Shri M.R. Arokiyasamy, Range Forest Officer explained the floristic diversity of the forests and the role of mountains in the well being of wildlife.

Collection of Cuttings

The trainees collected the cuttings of *Melia dubia,* from the IFGTB nursery and planted them into 40 cc coir pith filled hycopots. They also processed the cuttings of medicinal plants like *Gmelina arborea, Oroxylum indicum, Premna integrifolia* and *Aegle marmelos* and planted them in hycopots. These plants were kept inside the polytunnel.

Visit to Seed Technology Nursery

The trainees visited the Seed Technology Nursery, Mr Judin Jose, Junior Research Fellow and Ms Sayyeda, Field Assistant explained the medicinal values of the plants.

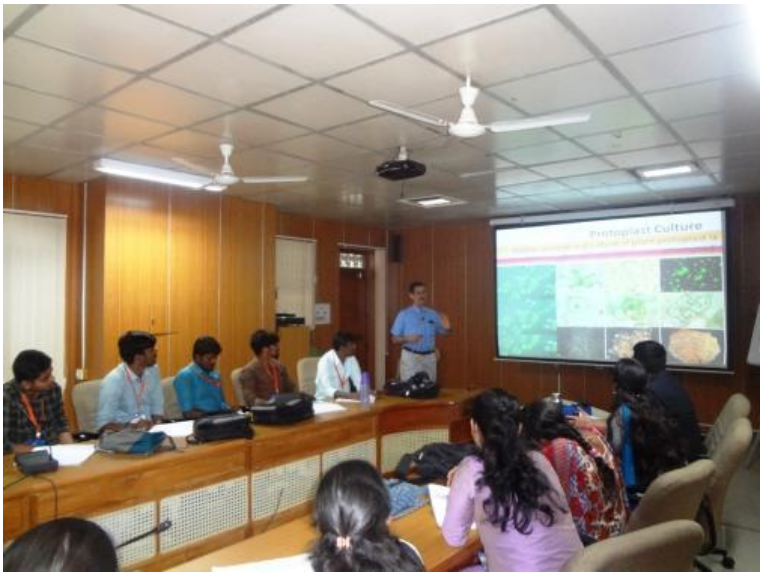
Visit to SPIC ABC

The trainees were taken to SPIC Agro Biotech Centre (ABC), Alandurai, Coimbatore to provide a real time exposure on current trends in tissue culture. Ms K. Shanthi, Technical Officer gave an overview about the unit. She also briefed that SPIC – ABC today produces and supplies high-yielding, disease-free young plants of banana, gerbera and ornamentals on a regular basis. She also highlighted that SPIC – ABC is the exclusive representative for production and marketing of gerbera plants for M/s. Schreurs, a Netherlands based pioneer company in the breeding, propagation, production and marketing of gerberas and rose. Mr N. Venkatramani, Asst Manager, explained about the tissue culture techniques followed for banana.

Seventh week (16.12.2019 to 20.12.2019)

Lecture on Issues in Tissue Culture

Dr Kannan C.S. Warrier, Scientist F, ENVIS Coordinator and Nodal Officer GSDP delivered a lecture on Issues in Tissue Culture. The prospects and problems in tissue culture were covered in his lecture. Tips to overcome the issues were also discussed.



A group photo of the GSDP team was captured

Plant Quarantine and Phytosanitary Certification

Dr J.P. Jacob, Scientist G and Head, Chemistry and Bioprospecting delivered a lecture on plant quarantine laws and phytosanitary measures to be followed for the certification. An overall idea about the laws related for clearance of plants, laws associated with plant products, export/import and other regulated articles were also discussed. Copies of certificates provided to various agencies were also shown to the trainees.

NABARD Initiatives

Dr S. Vigneswaran, Programme Officer delivered a lecture on NABARD and its functions. Initially he explained why NABARD has been established as an apex institution and deliberated about on farm schemes and off farm schemes. :

The annual report of the NABARD for the FY 2018-19 was shared to the trainees and various subsidies provided by NABARD were also discussed.

Banking Linkages: UBI, Coimbatore

A session on banking linkages was arranged to give an overall idea about the schemes offered by various banks for becoming an entrepreneur. Dr Rekha R. Warrier, Scientist F & Training in-charge explained about the importance of entrepreneurship development.

Mr Vishnudevan, Deputy Manager, Union Bank of India, Coimbatore delivered a lecture on “Role of Banks on Development of Self Sustain Personals and Groups". He gave an overall idea about the schemes offered by Union Bank of India.

Banking Linkages –SBI, Coimbatore

Ms Ramya, Deputy Manager, State Bank of India, Ganapathy, Coimbatore delivered a lecture on “Role of SBI in building an Entrepreneur". She explained that State Bank of India grants financial assistance to technically qualified, trained and experienced entrepreneurs for setting up new viable industrial projects. Loans are also extended to technocrats who are unable to meet the normal margin requirements under the liberalized schemes. She also briefed that State Bank of India offers business loan to meet the varied needs of large business houses as well as Small and Medium Enterprises (SME).

Visit to Tissue Culture Lab

The trainees were taken to the tissue culture laboratory of the Horticulture Department in the Botanical Garden, the Nilgiris. Mr. Prabhu, Horticulture Officer explained that the after being dormant for over five years, the tissue culture laboratory was back to functioning at its full capacity, with hybrid banana plants, strawberries and orchids being developed at the facility over the last few months.

Visit to Central Potato Research Station

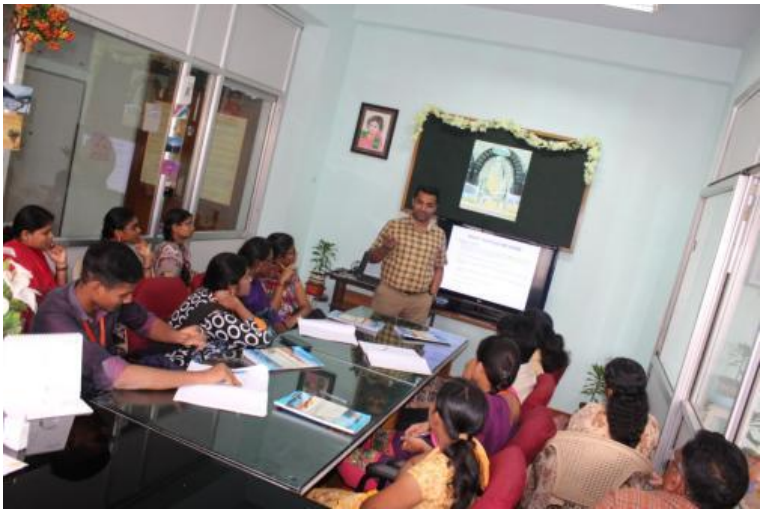
The trainees were taken to Central Potato Research Station, Ooty. Dr E.P. Venkatasalam, Head and Senior Scientist explained that the station is being doing Research for the development of agro-techniques for potato cultivation, development of varieties possessing combined resistance to late blight and cyst nematode and to develop control measures for late blight, cyst nematode, bacterial wilt and other soil and tuber borne diseases. He also explained the hardening procedures to the trainees and enlightened them on the importance of aeroponic techniques (a soilless technique for growing plants) used in potato cultivation. Later, the trainees were taken to potato field.

Visit to Rose Garden

The trainees were taken to Rose garden, one of the most famous botanical gardens maintained by the Horticulture Department of Tamil Nadu. Ms Menaka, Horticulture Officer explained about appropriate basal medium and growth regulators used for culturing rose plants. She highlighted how the stock cultures are maintained explained about various budding methods. Hands-on Training on T-budding (also known as shield budding, a technique of grafting to change varieties of plants) were also given to the trainees.

Lecture on Cleaner Production and Waste Minimization

Dr S. Vigneswaran, Programme Officer, ENVIS RP, IFGTB delivered a lecture on Cleaner Production & Waste Minimization and Laboratory Waste Management. He also gave an insight on various tips for preventing the generation of wastes. In addition, 2 short films on waste management were screened to the trainees to provide an exposure on how wastes can be converted to useful products.

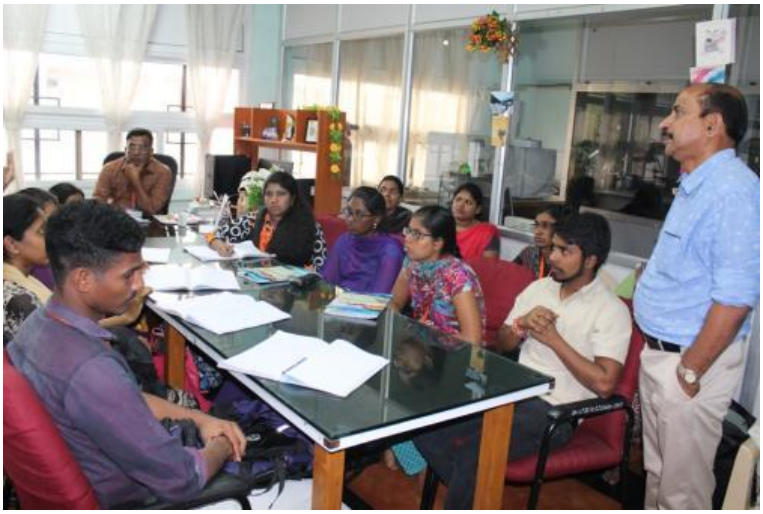


Lecture on Scope of Tissue Culture in Bamboos

Shri. Maria Domnic Savio, Scientist E delivered a lecture on the Scope of Tissue Culture in Bamboos. He also explained the process of explants collection, cultivars/genotypes/ecotypes, process of surface sterilization, culture media and process of hardening and acclimatization of bamboos.

Lecture on Medicinal Plants

Mr Benjamin from Araya Vaidya Pharmacy (AVP), Coimbatore briefed about the Centre for Indian Medical Heritage. He explained about different medicinal plants, their uses and their mode of propagation. He also showcased many medicinal plants to the trainees. Mr Gopi and Mr Sasikumar from AVP detailed on various endangered medicinal plants. They explained that the main reasons for the existing threats to these medicinal plants are loss and degradation of habitat, illegal trade, over exploitation, over grazing, human settlements, climatic disaster and due to avalanches.



Eighth week (23.12.2019 to 31.12.2019)

Visit to CPBMB, Thrissur, Kerala

The trainees were taken to Centre for Plant Biotechnology and Molecular Biology (CPBMB), Thrissur, Kerala. Dr Deepu Mathew, Assistant Professor explained about the tissue culture concepts and techniques followed in their institute. He also introduced various laboratory setups like inoculation room, growth room, cold room and dark growth room. He also explained the use of bioreactor for the production secondary metabolites and somatic embryos. The culture tubes of orchids, pepper, curry leaves, anthurium and their primary, secondary and tertiary hardening stages were shown to the trainees. The trainees were exposed to the commercial micro propagation unit of banana.

Visit to NBPGR, Kerala

The trainees were taken to the National Bureau of Plant Genetic Resources, Thrissur, Kerala. Dr Joseph
H. George, Director in-charge welcomed the trainees and gave an introductory session about the institute. Dr. M. Latha and Dr Pradeep Kumar explained about the ongoing activities of the institute and delivered a lecture on exploration, collection, conservation, utilization and management of plant genetic resources in India.

Lecture on Nursery Management

Mr P. Saktivel, an entrepreneur delivered a lecture on nursery management. The following topics were covered in his lecture:

- Nursery and its importance
- Selection of the nursery site
- Guidelines for Nursery Raising
- Types of nursery
- Preparation of the nursery bed

A clipping on the activities carried out in his clonal nursery was shown to the trainees.

Lecture on Coir Pith

Mr Poopalan, Coir board explained the importance of coir and coir pith. He also screened a video highlighting the manufacturing process of coir pith. He explained the different between the usage of coir pith as media and manure. The following were covered in his lecture:

- Starting a new unit
- Financial Assistance Schemes
- Registration of the Unit with the Coir Board
- Registration as SSI,SME
- Applying for Export License

He also gave an insight on the subsides provided by the government for setting up a new unit.

Visit to NCRB, Tiruchirapalli

The trainees were taken to National Research Centre for Banana (NCRB), Trichy to provide an exposure to the tissue culture techniques used in Banana. Dr M.S. Saraswathi, Senior Principal Scientist gave a lecture on the various tissue culture techniques followed for micro-propagation of banana. She explained that explants from elite plants and daughter suckers are being used for mass clonal propagation.

The trainees were taken to the tissue culture lab in NCRB. Shri E. Karthikeyan, Junior Research Fellow and Ms S. Uma Bharathi, Young Professional showed the culture bottles of multiple shoot production from shoot tips, cultured on MS medium supplemented with BAP. They also explained the methodologies followed during the preparation of cultures. The trainees were taken to nursery area in NCRB, Dr.D. Karthi, Scientist explained the effects of different substrates and growing environments on hardening of *in vitro* raised plantlets of banana

In addition to the practical classes, separate field exercises were given to the participants. Assessment & evaluation was done by an external examiner and an in-house officer. The participants were assessed based on the performance in theory, practical's and viva voce examination. All the fifteen participants cleared the evaluation and successfully completed the training programme.

Valedictory function

The valedictory function of the Certificate Course was held on 31.12.2019. The function began with the National Song Vande Mataram. Dr S. Vigneswaran, Programme Officer, ENVIS welcomed the gathering. Dr Rekha R. Warrier, Scientist F & Training in-charge presented an elaborate report on the GSDP.Dr S. Murugesan, Director, IFGTB in his special address highlighted the role of the state of the art tissue culture facilities of IFGTB in making available the quality planting stock of various economically important tree species especially teak. The Director presented the certificates to the 15 participants from Tamil Nadu, Kerala, Puducherry and Uttar Pradesh who successfully completed the course and wished all success in their future endeavours. Dr T Vamadevan, Shri V Thangavel and Ms. G.V. Subha Shree, the ENVIS personnel screened a short-film covering the highlights of the training from day one. In their feedback, the GSDP participants thanked ENVIS Secretariat, MoEF&CC, GoI for selecting them for the course and explained how the training module improved their skills and knowledge in the field of tissue culture. They thanked the facilities provided by the institute and IFGTB ENVIS for meticulously organizing the programme. Dr Kannan CS Warrier, Scientist F, Coordinator ENVIS and Nodal Officer GSDP provided an insight on the various Green Skill Development Programmes of MoEF&CC and urged the youth to make use of them depending on their field of interest. He thanked all the resource persons and supporting staff of IFGTB and from different other organizations. The support rendered by ENVIS India and the Ministry of Environment Forest and Climate Change was specially acknowledged.