

A training session report on  
**Advance Techniques in Plant Stress Biology**

Under STUTI program funded by DST



In association with  
**Indian Institute of Technology, Gandhinagar**  
(Project Management Unit)



Coordinated by  
**Prof. Bhaben Tanti**  
**Dr. Niraj Agarwala**

Department of Botany  
Gauhati University, Assam India  
**7<sup>th</sup> to 13<sup>th</sup> November 2022**

## Acknowledgement

We convey gratitude for the encouragement and support received from multiple sources during the execution of this training since its beginning. First and foremost, we want to express our sincere appreciation to the IIT Gandhinagar (PMU) and Department of Science and Technology (DST) for entrusting us with this project. The workshop was coordinated by **Dr. Niraj Agarwala and Prof. Bhaben Tanti**. The workshop was conducted on the ‘*Advance Techniques in Plant Stress Biology*’ on the instrument funded by the FIST program (Sanction No.: SR/FST/LSI-2018/148). The organizing team acknowledges the contributions of the training committee, in the implementation and execution of the program to achieve the objectives of the project, particularly, **Prof. Manoj Prasad** (NIPGR, New Delhi), **Prof. Sanjib Kumar Panda** (HoD, Department of Biochemistry, Central University of Rajasthan), Dr. Nirala Ramchiary (School of Life Sciences, JNU, New Delhi), **Prof. Suvendra Kumar Ray** (Department of MBBT, Tezpur University), **Dr. Suman Kumar Samanta** (IASST, Guwahati), **Dr. Arundhati Devi** (IASST, Guwahati), **Prof. Alak Kumar Buragohain** (Chairperson-Academics, Royal Global University, Guwahati), **Dr. Hemen Deka** (Assistant Professor, Gauhati University), Dr. Preetom Regon (Gauhati University), **Dr. Umakanta Chowra** (Guwahati College) and **Mr. Amit Kumar Pradhan** (Pragjyotish College).

We also acknowledge all the project staff and Gauhati University organizing committee contributions without which the sessions could not have been possible.

Prof. Bhaben Tanti  
Dr. Niraj Agarwala  
Coordinators

## ***Summary***

The goal of this training session was to provide a general overview on the practical aspects of pre-clinical drug screening and characterization of pharmaceuticals along with the hands on practical knowledge using sophisticated instrumentation techniques among research scholars, faculty, young scientists and industry professionals through a week-long training workshop. The workshop was conducted at Department of Botany, Gauhati University from 7<sup>th</sup> to 13<sup>th</sup> November 2022, which comprised of lectures and hands on training sessions. This initiative is funded by Department of Science & Technology under the program STUTI (Synergistic Training Program Utilizing the Scientific and Technological Infrastructure). This workshop is aimed to provide insight into the basic ideas and various techniques of studying plant stress biology. The participants were introduced to the basic concepts of different stress biology in plants, particularly on how to conduct biochemical assays using HPLC, heavy metals analysis using Atomic Absorption Spectrophotometer, enzymatic assays using a spectrophotometer, and gene expression assay using qPCR. The focus of this workshop was to have “*a balance between theory and practical training on the equipment. ‘Emphasis is on hands-on use of equipment for demonstration/characterization by each participant and analysis of participants samples’.*”

## Introduction

Department of Botany, Gauhati University, Guwahati, Assam has conducted a 7-day long workshop on ‘Advance Techniques in Plant Stress Biology’ sponsored by DST-STUTI, Govt. of India, in its campus for participants from various backgrounds such as Post Graduate, Research scholars, and Professors were invited (**Annex-1**). The following workshop's activities took place from 7<sup>th</sup> to 13<sup>th</sup> November 2022 (**Annex-2 & 3**). This report provides a quick overview of both the lecture and technical sessions

- Lecture Sessions

**Prof. Manoj Prasad** (NIPGR, New Delhi) explained gave an comprehensive idea on unraveling novel defense mechanisms in plants, particularly under virus infection. In detail, he had discussed autophagy and miRNA and R genes“ role in providing resistance against geminivirus infection. **Dr. Suman Kumar Samanta** (IASST, Guwahati) discussed principles about HPLC in detail, he had also included important points like instrument setup and detection methods, sample preparation, method development, and sample analysis. **Dr. Arundhati Devi** (IASST, Guwahati) gave a detailed lecture on Heavy Metal Analysis with Atomic Absorption Spectrophotometry (AAS) as well as the working principles and applications of AAS were thoroughly discussed. **Prof. Sanjib Kumar Panda** (Department of Biochemistry, Central University of Rajasthan) discussed key elements of plant functional genomics and its application in developing stress-resilient crops. **Dr. Nirala Ramchiary** (School of Life Sciences, Jawaharlal Nehru University) gave a lecture on differential gene expression analysis in plants with reference to case studies of Capsium. **Prof. Suvendra Kumar Ray** (Department of MBBT, Tezpur University) discussed the concepts of plant genetics in an elaborative manner. Lastly, **Prof. Alak Kumar Buragohain** (ChairpersonAcademics, Royal Global University, Guwahati) has delivered a keynote address on the topic “advances in plant stress biology” and how understanding of stress biology can be useful in developing stress-tolerant crops.

- Technical Session

On the **first** day, **Prof. Bhaben Tanti** and **Dr. Preetom Regon** (Gauhati University) began the training session by giving a general overview of seed sterilization, germination, and induction of stress as well as demonstrated each step sequentially to the participants. **Dr. Suman Kumar Samanta** (IASST, Guwahati) provided a thorough overview of the use of HPLC, including sample preparation, sample injection, and analysis of the results. In addition, all participants were provided with the basic idea on working with Agilent HPLC software. On the third day, **Dr. Hemen Deka** (Gauhati University) and Glory Borah demonstrated to the students the detection of heavy metals from soil samples using Atomic Absorption Spectrophotometer. In the **fourth** day's session, participants were briefed about how to isolate RNA from plant samples following the synthesis of cDNA. This session was conducted by **Dr. Niraj Agarwala** (Gauhati University), **Dr. Preetom Regon** (Gauhati University). On the same day later, the use of qPCR and analysis of the data obtained from qPCR was discussed with the participants. The fifth-day session included the measurement of plant stress using a Pulse Amplitude Modulation Fluorometer and this was carried out by **Ms. Sabnoor Yeasrin Jyoti** (PDUAM, Amjonga). The sixth-day training session included the determination of total polyphenol, ROS, and ROS scavenging enzymes. This session was carried out by **Dr. Umakanta Chowra** (Guwahati College) and **Mr. Amit Kumar Pradhan** (Pragjyotish College). The seventh day was a concluding session in which **Prof. Alak Kumar Buragohain** delivered a keynote speech on "Advances in plant stress biology" and followed by a valedictory session.

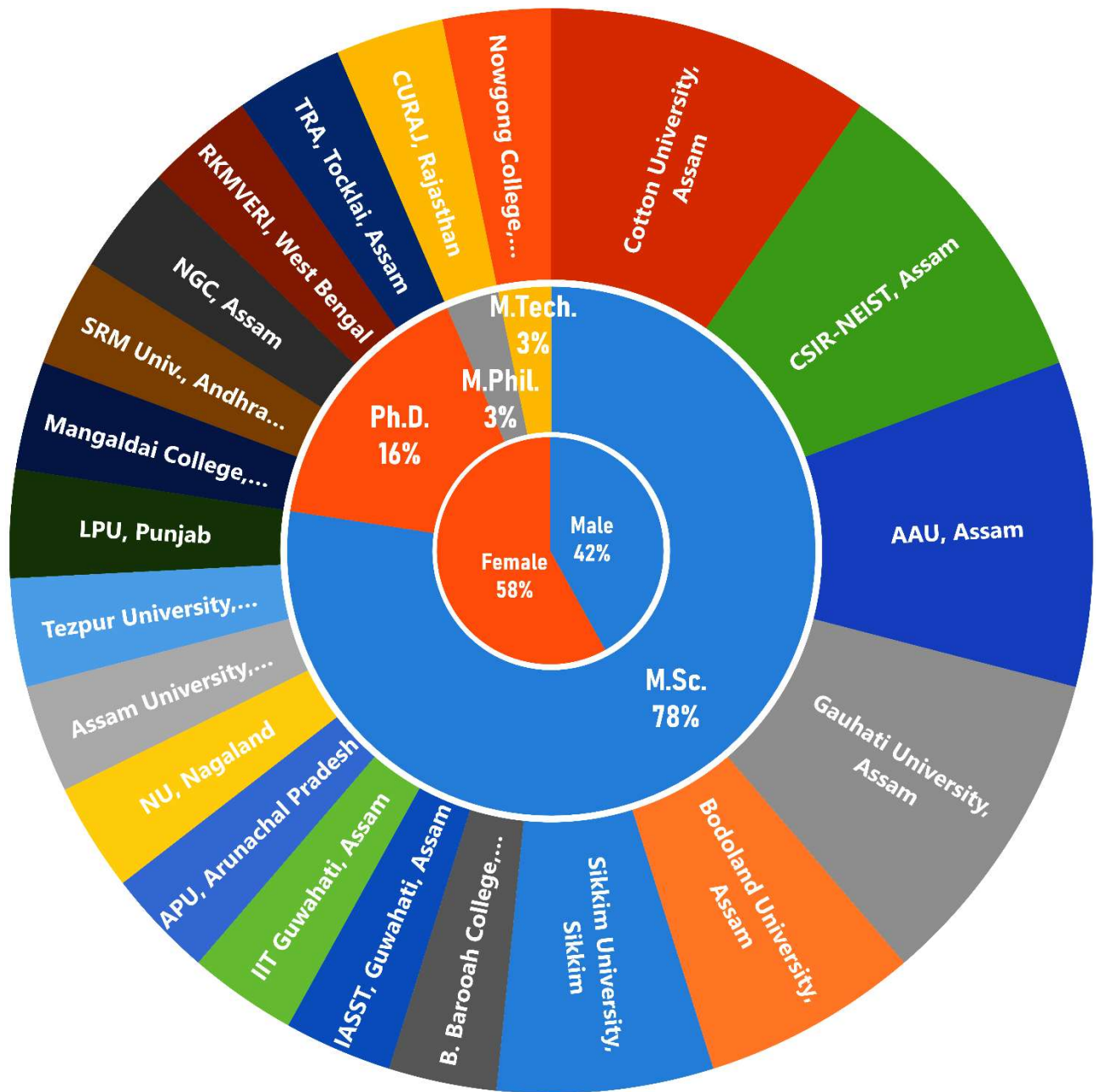
- *Types of samples tested*

During the technical session, all of the participants expressed an interest in learning from the workshop and tested different samples. For understanding, stress induction, different stressed samples were used. Trans-cinnamic acid was assessed using HPLC technique. Heavy metals Co, Cr, Ni, and Fe contaminated soil and stressed plant samples were used for heavy metal analysis using AAS. Drought-stressed plant samples were used for qPCR analysis of the reference gene (Actin) and gene of interest (Late embryogenesis abundant protein (LEA) and TLDC. Different stressed plant samples like Fe stressed, drought stressed, salinity stressed etc. were used for biochemical analysis like determination of total polyphenol, ROS and ROS scavenging enzymes like peroxidase, superoxide dismutase etc. As the main motto of the workshop was to understand the advanced techniques used in plant stress biology, for all the hands-on sessions plant samples were preferred

## *Outcomes of the Workshop*

The STUTI workshop attracted participants from 21 different institutes (**Figure 1**). A total of 31 participants enrolled and attended the Advance Techniques in Plant Stress Biology training sessions. The goal of this training event was to provide a general overview on the practical aspects of preclinical drug screening and characterization of pharmaceuticals along with the hands-on practical knowledge using sophisticated instrumentation techniques. To bring together participants from many disciplines and raise awareness of the institute's advanced facilities. Throughout the workshop, participants actively involved in the session and developed expertise's, asked major questions regarding theoretical and practical aspects of drug screening. This hands-on training program collaborations from many small institutions and national level institutes. Finally, the feedback from the participants was considered in the evaluation of the workshop. The majority of the participants were pleased with the training session and suggested that more workshops should be held in the future. Few participants suggested organizing such a workshop/training session on more regarding full instrumental technique workshop and regulatory needs.





**Figure 1.** Participants registered workshop from different institutes



# Annexure 1: Brochure for the program

## Speakers



Dr. Manoj Prasad is currently working as Staff Scientist VII & J. C. Bose National Fellow at National Institute of Plant Genome Research, New Delhi. His research area is genomics of foxtail millet and tomato.



Dr. Sanjib Kumar Panda is a Professor and Head, Department of Biochemistry, Central University of Rajasthan. His research is focused on understanding mechanisms of plant abiotic stress signal transduction.



Dr. Lingaraj Sahoo is a Professor at Indian Institute of Technology, Guwahati. His research interest is to develop biotic stress tolerance in crop plants.



Dr. Nirala Ranchariy is an Assistant Professor at School of Life Sciences, Jawaharlal Nehru University, New Delhi. His group focuses their effort to study genetics and genomics of Capsicum.



Dr. Suran K Samanta is working as Scientist – C at IASST, Guwahati. His research interests focus on molecular characterization of natural compounds from plants.

## Registration & Contact Details

Interested participants must register and only selected candidates would be invited for the workshop. For selected candidates registration fees, local travel, boarding and lodging will be covered by DST. Interested participants should register using the following link: <https://forms.gle/pFjXaNQfLchUfWE9>  
Registration Deadline: September, 30, 2022. Shortlisted candidates will be intimated by email, latest by October, 10, 2022.

### Eligibility criteria:

- Minimum qualification: Post-Graduate (Science) or B.Tech. (Technology)
- Professors/Scientists/ Post-Doctoral Fellows/Ph.D. Fellows/Industry persons who are actively involved in R&D
- Not more than 3 participants from an institute

### For more information

Convenor: Dr. Bhaben Tanti, Professor & Head, Department of Botany, Gauhati University.  
Coordinator: Dr. Niraj Agarwala, Assistant Professor, Department of Botany, Gauhati University.  
Contact No.: 8486027249  
Access: <https://events.iitg.ac.in/stuti/>  
E-mail: [dststutigu22@gmail.com](mailto:dststutigu22@gmail.com)  
Address: Dept. of Botany, Gauhati University, Guwahati, 781014, Assam, India.  
Acknowledgements:

Department of Science and Technology (DST) Funded Training Workshop under STUTI (Synergistic Training Program Utilizing the Scientific and Technological Infrastructure)

7 Days Workshop on  
"Advance Techniques in  
Plant Stress Biology"  
November 07-13, 2022  
Dept. of Botany, Gauhati University



## Contents of the workshop

- Day 1 –
- Inauguration and Welcome note
  - Expert Lecture 1: Introduction to Plant Stress Biology
  - Hands on session: Plant stress induction
- Day 2 –
- Expert Lecture 2: Fundamentals of HPLC technique and application in biology
  - Hands on session on quantitative analysis of plant metabolites using HPLC
- Day 3–
- Expert Lecture 3: Biochemistry of plants
  - Hands on session on estimation of biochemical constituents and enzyme activity
- Day 4 –
- Hands on session on estimation of biochemical constituents and enzyme activity
  - Expert lecture 4: Atomic absorption spectrophotometer (AAS): Introduction
- Day 5 –
- Hands on session on estimation of heavy metal using AAS
  - Expert lecture 5: Differential gene expression in plants
- Day 6–
- Hands on session on isolation of RNA and cDNA synthesis
  - Hands on session on gene expression analysis using qPCR
- Day 7 –
- Interactive session
  - Closing remarks

## Overview of STUTI and Objectives of Workshop:

DST welcomes the participants for the workshop on Advance Techniques in Plant Stress Biology organised under STUTI. The STUTI program envisions hands-on-training of state-of-the-art equipment and also to ensure transparent access to S&T facilities. DST has identified IIT Gandhinagar as a Project Management Unit (PMU) to conduct and co-ordinate this workshop.

The workshop is aimed to provide training on advance equipment, e.g. HPLC, AAS, q-PCR, multimode plate reader required to study stress biology of plant. The participants will be introduced to principles of instruments, hands-on experience, sample preparation and analysis, data processing. The participants will have an opportunity to interact with subject experts, and they can also analyse their own samples (with prior approval).

## Schedule

<b>Day 1, 07/11/2022</b> 09:00 Registration 10:00 Inaugural Session 10:45: Tea break 11:15 Expert Talk 1 12:30 Lunch 13:30 Session I (Hands on) 15:45: Tea Break 16:00 Session II (Hands on)	<b>Day 3, 09/11/2022</b> 09:00 Expert Talk 3 10:30 Tea break 11:30 Session I (Hands on) 1:00 Lunch 14:00 Session II (Hands on) 15:45 Tea Break 16:00 Session III (Hands on)	<b>Day 5, 11/11/2022</b> 09:00 Session I (Hands on) 10:30 Tea break 11:30 Session II (Hands on) 1:00 Lunch 14:00 Session III (Hands on) 15:45 Tea Break 16:00 Expert Talk 5 <b>Day 6, 12/11/2022</b> 09:00 Session I (Hands on) 10:30 Tea break 11:30 Session II (Hands on) 1:00 Lunch 14:00 Session III (Hands on) 15:45 Tea Break 16:00 Session IV (Hands on)
<b>Day 2, 08/11/2022</b> 09:00 Expert Talk 2 10:30 Tea break 11:30 Session I (Hands on) 1:00 Lunch 14:00 Session II (Hands on) 15:45 Tea Break 16:00 Session III (Hands on)	<b>Day 4, 10/11/2022</b> 09:00 Session I (Hands on) 10:30 Tea break 11:30 Session II (Hands on) 1:00 Lunch 14:00 Session III (Hands on) 15:45 Tea Break 16:00 Expert Talk 4	<b>Day 7, 13/11/2022</b> 10:00 Interactive session and discussion 11:30 Tea Break 11:45 Closing remarks

Visit to Dr. H. K. Baruah Regional Botanical Resource Centre, Biodiversity Centre and NYBG accredited herbarium of Gauhati University on day 4

## Annexure 2: List of registered participants for the workshop

Sr. No.	Candidate Name	Gender	Educational Qualification	Email address	University/Institute
1	Anit Baidya	Male	M.Sc. (Life sciences)	anitbaidya.98@gmail.com	Sikkim University, Gangtok, Sikkim
2	Upama Kalita	Female	M.Sc. (Botany)	kashyapupam@gmail.com	
3	Bhargov Mudhukailya	Male	M.Sc. (Botany)	mudhukailya@gmail.com	Nowgong College (Autonomous), Assam
4	Bikash Kumar Kundu	Male	M.Sc. (Botany)	bikashkundu40@gmail.com	Gauhati University, Assam
5	Rajesh Dev Sarkar	Male	M.Sc. (Botany)	rajeshdevsarkar@gmail.com	
6	Sofia Banu	Female	Ph.D. (Biotechnology)	sofiab@gauhati.ac.in	
7	Divya Gupta	Female	M.Tech. (Biotechnology)	gupta.divya.biotech20@gmail.com	Central University of Rajasthan, Rajasthan
8	Gurpreet Kaur Bhamra	Female	M.Sc. (Agriculture)	gurpreetkaurbhamra50@gmail.com	Assam Agricultural University, Assam
9	Mehjebin Rahman	Female	M.Sc. (Plant Pathology)	mehjebinr@gmail.com	
10	Reshma Ahmed	Female	Ph.D. (Agricultural Biotechnology)	reshahmed5555@gmail.com	
11	Jadumoni Saikia	Male	M.Sc. (Life sciences)	saikiajadumoni35@gmail.com	CSIR-North East Institute of Science & Technology (NEIST), Assam
12	Pallabika Dihingia	Female	M.Sc. (Botany)	dihingiapallabika@gmail.com	
13	Prasanna Sarmah	Male	M.Sc. (Biotechnology and Bioinformatics)	prasannasarmah747@gmail.com	
14	Jigyasa Somani	Female	M.Sc. (Biotechnology)	somanin92@gmail.com	Tocklai Tea Research Institute, Assam
15	Shuvam Datta	Male	M.Sc. (Genetics and Plant Breeding)	shuvam.datta.datta@gmail.com	Ramakrishna Mission Vivekananda Educational and Research Institute, West Bengal
16	Jyotirmay Kalita	Male	Ph.D. (Botany)	kalitajyotirmay911@gmail.com	North Gauhati College, Assam
17	Khushal Mehta	Male	M.Sc. (Microbiology)	khushalmehta777@gmail.com	SRM University-AP, Andhra Pradesh
18	Kuntala Sarma Bordoloi	Female	M.Sc. (Botany)	mithukuntala@gmail.com	Mangaldai College, Assam
19	Kanak Bhati	Female	Ph.D. (Agriculture)	bhati_kanak@yahoo.com	Lovely Professional University, Punjab
20	Lukapriya Dutta	Female	M.Sc. (Botany)	lukapriyadutta@gmail.com	Tezpur University, Assam
21	Madhusmita Deka	Female	M.Sc. (Botany)	humadsmitta@gmail.com	Bodoland University, Assam
22	Suparna Biswas	Female	M.Sc. (Botany)	suparnabiswas886@gmail.com	
23	Mriganka Das	Male	M.Sc. (Life sciences and Bioinformatics)	dmriganka905@gmail.com	Assam University, Assam
24	Pallavi Sharma	Female	M.Sc. (Botany)	sharmaspallavi66@gmail.com	Nagaland University, Nagaland
25	Pradosh Mahadani	Male	Ph.D. (Biotechnology)	pmahadani@gmail.com	Apex Professional University, Arunachal Pradesh
26	Shyamapada Ghosh	Male	M.Sc. (Botany)	shyamapadaghosh15@gmail.com	Indian Institute of Technology (IIT) Guwahati, Assam
27	Shabiha Nudrat Hazarika	Female	M.Sc. (Microbiology)	shabiha.nudrat@gmail.com	Institute of Advanced Study in Science and Technology, Assam
28	Karabi Barman	Female	M.Sc. (Botany)	karabibarman251@gmail.com	Cotton University, Assam
29	Sikha Borah	Female	M.Sc. (Botany)	sikhaborah199@gmail.com	
30	Zesmin Khan	Female	M.Sc. (Botany)	zesminkhan2675@gmail.com	
31	Utpal Chowdhury	Male	M.Phil (Botany)	chowdhury_u@rediffmail.com	B. Barooah College, Guwahati, Assam

### **Annexure 3: Schedule date and activities during the workshop**

#### **Day 1, 7/11/22**

09:00 Registration  
10:00 Inaugural session  
10:45 Tea break  
11:15 Expert talk 1  
12:30 Lunch  
13.:30 Session 1 (Hands-on)  
15:45 Tea break  
16:00 Session 2 (Hands-on)

#### **Day 2, 8/11/22**

09:00 Expert talk 2  
10:30 Tea break  
11.30 Session 1 (Hands-on)  
13:00 Lunch  
14:00 Session 2 (Hands-on)  
15:45 Tea break  
16:00 Session 3 (Hands-on)

#### **Day 3, 9/11/22**

09:00 Expert talk 3  
10:30 Tea break  
11:30 Session 1 (Hands-On)  
13:00 Lunch  
14:00 Session 2 (Hands-on)  
15:45 Tea break  
16:00 Session 3 (Hands-on)

#### **Day 4, 10/11/22**

09:00 Session 1 (Hands-on)  
10:30 Tea break  
11:30 Session 2 (Hands-on)  
13:00 Lunch  
14:00 Session 3 (Hands-on)  
15:45 Tea break  
16:00 Expert talk 4

#### **Day 5, 11/11/22**

09:00 Session 1 (Hands-on)  
10:30 Tea break  
11:30 Session 2 (Hands-on)  
13:00 Lunch  
14:00 Session 3 (Hands-on)  
15:45 Tea break  
16:00 Expert talk 5

#### **Day 6, 12/11/22**

09:00 Session 1 (Hands-on)  
10:30 Tea break  
11:30 Session 2 (Hands-on)  
13:00 Lunch  
14:00 Session 3 (Hands-on)  
15:45 Tea break  
16:00 Session 4 (Hands-on)

#### **Day 7, 13/11/22**

10:00 Interactive session and discussion  
11:30 Tea break  
11:45 Closing marks

## Annexure 4: Feedback summary

Sr. No	Content	% Rating
1	Overall grading of the program with reference to relevance of course, module/ content etc.	98% Rated on or above 8 points
2	Overall grading of the facilities provided by the institute, i.e., Hostel, Mess, Classrooms, Transport/infrastructure etc.	99% Rated on or above 8 points
3	Overall grading of the faculty members conducting the training	97% Rated on or above 8 points
4	How do you rate the overall training methodology	98% Rated on or above 8 points
5	How far the field visit is relevant and related to your research study	99% Rated on or above 8 points
6	Usefulness of this training in your current role	98% Rated on or above 8 points
7	Usefulness of this training in future work/job you may handle	98% Rated on or above 8 points
8	How far have you benefitted from interaction with the fellow participants of the training	97% Rated on or above 8 points
9	How far the course material supplied relevant and related to the training curriculum	95% Rated on or above 8 points
10	Overall grading of the process of training	96% Rated on or above 8 points
11	Your recommendation to your peers/ colleagues for the training Program	98% Rated on or above 8 points