

Gas Chromatographic Techniques in Aromatic Plants Research

DBT Skill Vigyan Refresher Course for Faculties

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REPORT

Submitted by

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Organised by

Central Instrumentation Facility

Jawaharlal Nehru Tropical Botanic Garden and Research Institute
(KSCSTE-JNTBGRI)

Palode, Thiruvananthapuram



In association with

The Department of Biotechnology, Govt. of India
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Introduction

The plant kingdom represents an extraordinary reservoir of molecules, synthesized from the fascinating laboratory of plants, and Phytochemistry deals with the diversity of such compounds. Out of the diverse plant resources, aromatic plants and the aroma chemicals are widely being utilized in various sectors such as perfumery, cosmetics, medicines, preservatives, nutraceuticals and food additives. The diversity of aroma chemicals also has significant role in plant taxonomy, chemical ecology, atmospheric chemistry and agriculture sectors. Though our country is endowed with a variety of aromatic plants, most of the plants, especially the endemic species, are yet to be investigated for their aroma constituents or potential utility. In this background, KSCSTE-JNTBGRI, with the support of DBT, Govt. of India and KBC, KSCSTE, Govt of Kerala, has organized Refresher Courses for scientists/college level teachers on the diversity of aromatic plants, their chemical profiling through various phytochemical techniques, especially GC-MS. The sessions included field visits, lab visits, theory classes, practical sessions, hands on training on GC-MS and other instruments such as Flash chromatograph, HPTLC, HPLC and LC-MS. Out of the 20 selected participants, 19 participants from Kerala, Tamil Nadu, Andhra Pradesh and Karnataka attended the programme. The participants were provided with course material, transportation and accommodation.

Dr. Rameshkumar K B

Course coordinator

Principal Scientist and Sc i/c, CIF-JNTBGRI

Day 1 (16.01.2024)

After registration process, the inaugural session was started with a prayer by Ms. Revathy and Ms. Alfina. Dr. Sarika A R, Senior Scientist, KSCSTE, Thiruvananthapuram and the State Nodal Officer, DBT Skill Vigyan Kerala extended a warm welcome to the participants. Dr. Rameshkumar K B, Principal Scientist, KSCSTE-JNTBGRI, and Course Coordinator made a short power point presentation on the programme. Dr. S Pradeep Kumar, Director, JNTBGRI, TVPM and the Chairman of CIF- JNTBGRI delivered the Presidential Address. The Director elaborated the scientific activities of JNTBGRI and the efforts taken to disseminate the knowledge to the scientific, academic and common community. The programme was inaugurated by Prof. (Dr.) GM Nair, Director, CLIF, Uty of Kerala. He motivated the participants with his eloquent speech, highlighting the importance of skills over knowledge. The inaugural session concluded with Vote of Thanks by Dr. Jothish, HoD, Plant Genetic Resources Division, JNTBGRI.

Day 1 - Inaugural Session





After tea break, Technical sessions started with presentations on diversity of aromatic plants. The first session was handled by Dr. Mathew Dan, former HoD, Plant Genetic Resources Division, KSCSTE-JNTBGRI, on the topic 'Diversity and significance of aromatic plants'. Dr. Vinodkumar TG, Senior Scientist, Ethnopharmacology Division, KSCSTE-JNTBGRI, made a presentation on 'Aromatic plants in Ayurveda', while Dr. Vinayak, CCRS, Chennai, talked on 'Aromatic plants in Sidha'. Dr. Sasikumar B, IISR (Retd) Kozhikode made an elaborative presentation on the 'Diversity of spice plants'.

In the afternoon the participants were taken to the JNTBGRI Medicinal and Aromatic Garden and the diversity of aromatic plants were detailed by Dr. Jothish P S and Dr. Jabbar.

Day 1 Technical Session



Day 1 Field Visit



Day 2 (17.01.2024)

The second day Theory/Expert Lecture were on 'Introduction to Phytochemistry' by Dr. Sabulal B, HoD, Phytochemistry and Phytopharmacology Division, KSCSTE-JNTBGRI. He elaborated on the diversity of phytochemicals and phytochemical techniques such as extraction techniques, separation techniques and characterization techniques. Dr. Ramesh Babu, Spices Board, Kochi presented in detail about 'Analytical techniques in aromatic plants research'.



Afternoon practical sessions involved lab experiments on extraction and separation techniques in phytochemistry such as Soxhlet extraction, hydrodistillation, TLC, HPTLC, Column Chromatography, Flash Chromatography and HPLC. The sessions were handled by Dr. Aniljohn J, and Ms. Sumitha B, Phytochemistry and Phytopharmacology Division KSCSTE- JNTBGRI.

Day 2 Practical Sessions



Day 3 (18.01.2024)

From third day onwards, Gas Chromatography-Mass Spectrometry (GC-MS) techniques were exposed to the participants. Mr. Rahul Dwivedi, Shimadzu, Mumbai and Mr. Vishnu, Toshvin Analytical, Chennai handled the theory sessions and practical sessions. The first day practical sessions were on GC-MS: Basic hardware, GC-MS: Basic software, GC MS: Method development, GC-MS: Sample run, essential oil and GC-MS: Post run analysis. Ms. Aparna, JPF CIF-JNTBGRI demonstrated the experiments, and the participants had hands on exposure in doing GC-MS experiments. In the evening the participants visited the Palmetam of JNTBGRI, and Dr. Jomon explained the palm collections and associated research activities at JNTBGRI.



Day 4 (19.01.2024)

GC-MS: Fixed oil analyses through FAME, GC-MS: RRI determination, GC-MS: Non-polar and polar columns were explained on fourth day by Mr. Rahul Dwivedi, Shimadzu, Mumbai and Mr. Vishnu, Toshvin Analytical, Chennai along with Ms. Aparna JPF CIF JNTBGRI. In the evening the participants visited the Bamboosetam of JNTBGRI, and Dr. Gopan explained the bamboo collections and associated research activities at JNTBGRI.



Day 5 (20.02.2024)

GC-MS: Enantiomeric analysis through chiral column, GC-MS: Maintenance and trouble shooting and GC-MS: Mass spectra interpretation were explained on fifth day by Mr. Rahul Dwivedi, Shimadzu, Mumbai and Mr. Vishnu, Toshvin Analytical, Chennai along with Ms. Aparna JPF CIF JNTBGRI. In the evening the participants visited the Field Gene Bank of JNTBGRI.



Day 6 (22.01.2024)

On sixth day, Dr. Rameshkumar K B, KSCSTE- JNTBGRI made a presentation on 'Recent advances in aromatic plants research- Chemical ecology', and the practical session on GC-MS: Head space analysis was handled by Mr. Vishnu, Toshvin Analytical, Chennai along with Ms. Aparna JPF CIF JNTBGRI.





Day 7 (23.01.2024)

On 7th day, Dr. Rameshkumar K B, KSCSTE- JNTBGRI took a class on 'Recent advances in aromatic plants research- Chemotaxonomy', and Mr. Mahesh, Research Officer, Catalyst Clinical Research, TVPM made a presentation on 'An introduction to Biostatistics', followed by Practical Session on SPSS dendrogram, PCA etc by Mr. Mahesh, Catalyst Clinical Research, TVPM.



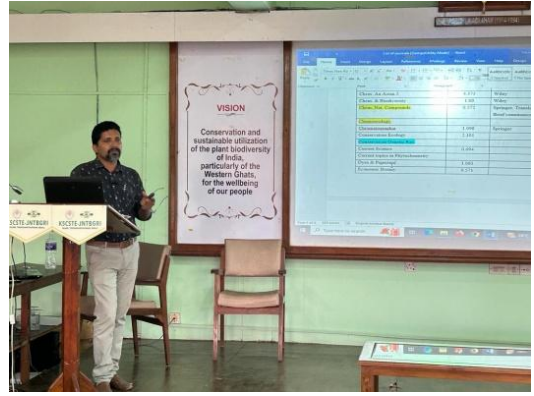
Day 8 (24.01.2024)

On day 8th the instrument LC-MS was introduced to the participants. Dr. Sulaiman C.T., CMPR, Arya Vaidya Sala, Kottakkal made a presentation on 'An introduction to LC-MS analytical technique'. Practical sessions were handed by Mr. Subhag, SpincoTech Pvt Ltd, Chennai . LC-MS: Basic hardware and software, LC-MS: Method development, LC-MS: Sample preparation and run, LC-MS: Post run analysis and Data interpretation were demonstrated.



Day 9 (25.01.2024)

On day 9th, Dr. Suja S R, HoD, Ethnopharmacology Division, KSCSTE- JNTBGRI took class on 'Recent advances in aromatic plants research-Bioactivities'. The practical sessions were on Antimicrobial evaluation of aromatic plants, by Dr. Vipin Dan, KSCSTE- JNTBGRI, and Tissue culture of aromatic plants by Dr. Radhika, KSCSTE- JNTBGRI. The participants also visited JNTBGRI Herbarium and Dr. Rajkumar demonstrated herbarium sheet preparation.



Day 10 (27.01.2024)

The diversity of plants, especially of aromatic plants, in the tropical forest were explored by the course participants by visiting Ponmudi forests. They have also visited the clove plantation and Tea processing unit at Ponmudi. Dr. M. Abdul Jabbar, KSCSTE- JNTBGRI, accompanied the participants and explained the floristic diversity of Ponmudi hills.





Day 11 (29.01.2024)

On day 11th, Dr. Rameshkumar K B, KSCSTE- JNTBGRI took a class on 'Herbal Technology Start-ups in aromatic plants sector'. The participants also visited the Animal House facility of JNTBGRI, where Dr. Suja explained the animal handling and various *in vivo* experiments using the animals. The participants also visited the Phytochemistry lab and Dr. Rajani kurup demonstrated the working of the instrument HPTLC and HPLC. After lab visit the participants visited the JNTBGRI library and familiarised with the journals and books.



Day 12 (30.01.2024)

Day 12th, the application side of aromatic plants were explored by making value added products such as soaps, candles, incense sticks, perfumes etc. Dr. Saji Alex, Womens College, Thiruvananthapuram took a class on soaps and also led a practical session on soap making using the essential oils and herbal extracts prepared during the course.

Day 12 Soap Making



Mr. Shajudeen M, MD, Scents and Secrets, Thiruvananthapuram took a class on Perfumes, followed by the Practical sessions on perfume creation. Each participant has created their own personalised perfumes making use of essential oils from aromatic plants. The preparation of incense stick, sanitizer etc. were demonstrated by Dr. S. Binu, KSCSTE- JNTBGRI.

Day 12 Perfume Making



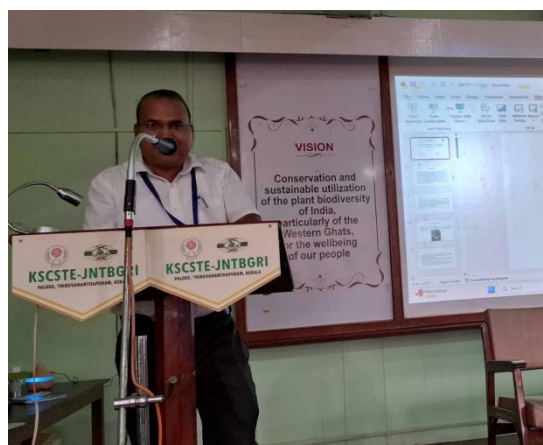
Day 13 (31.01.2024)

The location of aromatic essential oils in plant cells were detailed by Dr. Navas M, SMPB, Thrissur. He took a lecture on 'Pharmacognostical techniques in aromatic plants research' and also a Practical session on histochemistry and pharmacognosy of aromatic plants, where each participants experimented with pharmacognocny of aromatic plants. Dr. Sabu K K, Biotechnology Division, KSCSTE- JNTBGRI took a lecture on 'Recent advances in aromatic plants research- Molecular biology' and demonstrated molecular biology techniques such as DNA isolation, RTPCR analysis *etc* in the molecular biology laboratory.



Day 14 (01.02.2024)

On the final day, the selected participants Dr. Dr. Shrishail, Assistant Professor, Kuvempu University, Shimoga, Karnataka and Ms. Resmi A Assistant Professor, S N College, Punalur presented the results of their practical work on aromatic plants analyses as a case study. They have presented the volatile chemical analyses of *Canarium strictum* seeds. Also each of the participants presented their feed back of the programme on stage, and also submitted the feedback form duly filled.



Day 14- Valedictory Session

In the Valedictory session held afternoon, Dr. G. Rajkumar, HoD, Plant Systematics and Evolutionary Sciences Division extended warm welcome to the participants. Dr. Rameshkumar, Course Coordinator presented a brief report of the programme, while Mr. S. Syamkumar, Registrar, JNTBGRI delivered the special address. The valedictory address and certificate distribution were done by Dr. A. G. Pandurangan, Former Director, KSCSTE, JNTBGRI. He elaborated on the plant wealth and how it can be sustainably utilised by the support of such instrumentation techniques. Dr. S. R. Suja, HoD, Ethnomed. & Ethnopharmacology Division proposed the vote of thanks, and the programme concluded with National Anthem.

