Brief Report of the Training Program

on

"Documentation, Good Agricultural Practices, Biotechnological tools And Techniques, Quality Control, Bio-prospection and Product Development of Medicinal and Aromatic Plants Native to the Indian Ocean Region"

IORA-RCSTT Coordination Centre on Medicinal Plants (ICCMP),

CSIR-Central Institute of Medicinal and Aromatic Plants, Lucknow, India

March 2023,

The training was financially supported by the Ministry of External Affairs, New Delhi (India)

सत्यमेव जयते
Ministry of External Affairs
Government of India

TABLE OF CONTENTS

1. BACKGROUND:

IORA-RCSTT Coordination Centre on Medicinal Plants (ICCMP) organized a seven days training program on "Documentation, Good Agricultural Practices, Biotechnological Tools and Techniques, Quality Control, Bio-prospection and Product Development of Medicinal and Aromatic Plants Native to the Indian Ocean Region" from 19-25 March, 2023. The training was sponsored by the Ministry of External Affairs, Govt. of India.

The training materialized in hybrid mode. A total of 14 participants from nine Member States [*Annexure- I*] participated in the training program. The training covered more than 20 lectures and an equal number of demonstrations in the areas of Herbarium documentation, Conservation and Production of authenticated herbal materials, Good agricultural practices, Breeding techniques, Quality attributes of medicinal and aromatic plants, Biotechnology and Bio-prospection and IPR issues. The trainees were also given practical exposure pertaining to protocols adopted at CSIR-CIMAP towards agronomical practices, gene banking, distillation techniques, research-based products and entrepreneurship methods being practised. The training methodology was interactive and practical based where the faculty ensured that knowledge was not only disseminated but accurately perceived and understood by the participants. And to ensure this, the trainers engaged the participants in discussions and kept the forum open for feedback, queries and suggestions.

2. TRAINING OBJECTIVES AND IMPLEMENTATION:

I. The primary aim of the training was capacity building through enhancing the knowledge base of the partners and representatives through interactive lectures,- discussions, practical sessions and visits to entrepreneurs involved in the area of Medicinal and Aromatic Plants (MAPs).

II. The program also aimed to expose the trainees to the use of high-end instrumentation and advanced tools involved in the research and development of Medicinal and Aromatic Plants.

- The entire program was focused on strengthening the technical and operational capacity of the IOR countries in the area of Medicinal and Aromatic Plants. The participants were primed for the development of protocols / standards for

quality control of the herbs and the processes involved based on the published literature of the institute and the accepted guidelines.

- End to end solutions from cultivation to the end product and processes through processing were addressed to render them with a holistic approach for future trade in MAPs. Field visits to successful farmers and small-scale industry exposure was organized as an example to give them a feel of success in this area.
- Demonstration of technologies developed by the Institution. The concept of Incubation facility for entrepreneurs who cannot invest immediately was also demonstrated. Further, the possibility of facilitation of joint technology development, commercialization of research-based translation of products among the Member States was also explored. Better understanding of trade and related issues, export-import procedures and export promotion schemes related to Medicinal and Aromatic plants and their formulations was also touched upon.
- The training included lectures, group discussions, experimental exercises, field and industry visits. The programme was structured to lead the participants from simple experimental design, through more complex methods along with advancement in technology uses. The programme was structured to lead the participants from simple experimental design, through more complex methods along with advancement in technology uses. Lectures were delivered in hybrid mode.

Annexure- I

3. PARTICIPANTS' PROFILE

Name of Participant	Address/ Country	Mode of Participation
Mércia Maria Alfinete Sulumindine Inroga	Ministry of Health-Mozambique/Phytochemistry Department Avenida Eduardo Mondlane/Salvador Allende, 3rd floor, **Maputo-Mozambique**	Physical Mode
Helena, Antonio Namurá Correia	National Directorate of Traditional and Alternative Medicine, Ministry Of Health Augusto Correia/ **Mozambique/Maputo**/ Bairro do Costa de Sol	Physical Mode
Dr. Batagalle Gedara Supul Malika Sumanasinghe	Head of Division of Pharmaceutical Botany, Bandaranaike Memorial Ayurveda Research Institute, **Sri Lanka**	Physical Mode
Dr. Depika Subramanien	Department of Biotechnology and Food Science, SB campus, Faculty of Applied Science, Durban University of Technology, **South Africa**	Physical Mode
Fereshteh Moradi (Mrs.)	Chief Coordinator, IORA Regional Centre for Science and Technology Transfer (RCSTT), **Iran**	Online Mode
Dr. Mohammad Reza Sanjabi	Director, IORA Regional Centre for Science and Technology Transfer (RCSTT), NO 27 FORSAT ST ENGHELAB AVE, **Iran**	Online Mode
Dr. Rakotosaona Rianasoambolanoro	National Center of Applied Pharmaceutical Research, Rue RP Rahajarizafy Ambodivoanjo BP 702; Antananarivo 101, **Madagascar**	Online Mode
Dr. Fadzureena binti Jamaludin	Senior Research Officer , Head of Bio resources Programme, Natural Products Division, Forest Research Institute **Malaysia**	Online Mode
Professor Laetitia DELORT	ECREIN team, Human Nutrition Unit UMR1019 INRAE-University Clermont Auvergne **FRANCE**	Online Mode
Dr. Comal Chandra Radhakeesoon	Ayurvedic Medical Officer in the Ministry of Health and Wellness, 5TH Floor Emanuele Anquetil Bldg Port Louis, **Mauritius**	Online Mode
Dr. Surakit Nathisuwan,	Department of Pharmacy, Faculty of Pharmacy, Mahidol University, **Thailand**	Online Mode
Anchalee Jintapattanakit	Department of Pharmacy, Faculty of Pharmacy, Mahidol University, **Thailand**	Online Mode
Thanika P.	Department of Pharmacy, Faculty of Pharmacy, Mahidol University, **Thailand**	Online Mode
Wachiraporn	Department of Pharmacy, Faculty of Pharmacy, Mahidol University, **Thailand**	Online Mode

RESOURCE PERSONS'

Sl. No.	Name	Designation	Specialization
1.	Dr. Saudan Singh	Chief Scientist	Crop Production and Protection
2.	Dr. Sudeep Tandon	Chief Scientist	Processing and Upscaling
3.	Dr. Anil Kumar Gupta	Chief Scientist	Plant Breeding and Genetic Resource Conservation
4.	Dr. Laiq Ur Rahman	Chief Scientist	Tissue Culture and Plant Biotechnology
5.	Dr. Rajesh Verma	Senior Principal Scientist	Crop Production & Protection
6.	Dr. Karuna Shanker	Senior Principal Scientist	Analytical Chemistry
7.	Dr. Dnyaneshwar Umrao Bawankule	Senior Principal Scientist	Drug Discovery and Development
8.	Dr. Sanjay Kumar	Senior Principal Scientist	Technology Dissemination
9.	Dr. Manoj Semwal	Senior Principal Scientist	Precision Agriculture and AI
10.	Dr. Sumit Ghosh	Senior Principal Scientist	Plant Biotechnology & IPR
11.	Dr. V. Sunderasan	Principal Scientist	Botany
12.	Dr. Ramswaroop Verma	Principal Scientist	Essential Oil Chemistry
13.	Dr. Chandan S. Chanotiya	Principal Scientist	Essential Oil Chemistry
14.	Dr. Ramesh Srivastava	Principal Scientist	Business Development
15.	Dr. Narendra Kumar	Senior Scientist	Botany and Herbarium
16.	Dr. Anirban Pal	Senior Principal Scientist	Bioprospection and Product Development
17.	Dr. Alok Kalra	Emeritus Scientist	Aroma Mission

VENUE AND DATE

IORA-RCSTT Coordination Centre on Medicinal Plants (ICCMP)
CSIR- CIMAP, P.O.-CSIR-CIMAP, Near Kukrail Picnic Spot, Lucknow-226015, India
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Email : director@cimap.res.in, iorarcstt@cimap.res.in

Inaugural Ceremony:

The Inaugural Meeting of the training program entitled "Documentation, Good Agricultural Practices, Biotechnological Tools and Techniques, Quality Control, Bio-prospection and Product Development of Medicinal and Aromatic Plants Native to the Indian Ocean Region" was held at the CSIR- Central Institute of Medicinal and Aromatic Plants on 20th March 2023.

The Convener of the training program, Dr. Anirban Pal welcomed Director IORA-RCSTT, Iran, Director, CSIR- CIMAP, Member State Participants and Faculty members. The training program schedule and its program were briefed.

Thereafter, Dr. Prabodh K. Trivedi, Director, CSIR- CIMAP addressed the gathering and highlighted the research activities and contribution of the institute in the area of Medicinal and Aromatic Plants (MAPs) in the last 60 years. Dr. Trivedi stated that more than 150 improved varieties of MAPs were released by the institute till now and farmers and industries related to the MAPs have been highly benefitted through this. Institute is also engaged in validating the literature described in various ancient books of Indian Origin. Dr. Trivedi invited researchers from Indian Ocean Region for research collaborations and joint technology development.

In the keynote session, Dr. Sanjabi, Director, IORA- RCSTT, Tehran, Iran addressed on development of new technologies, cooperation, commercialization, and transfer of technology among the IORA Member States and Dialogue Partners. He focused on the development of all kinds of applied science-related technologies, carrying out related analytical research on technology policy, marketing opportunities, and possible joint venture among the Member States and Dialogue Partners, networking among the key stakeholders.

This was followed by an address by Mrs. Fereshteh Moradi, Chief Coordinator, IORA-RCSTT, Iran and Introduction by Member State participants: Mércia Maria Alfinete Sulumindine Inroga, Helena, Antonio Namurá Correia, Dr. Batagalle Gedara Supul Malika Sumanasinghe, Dr. Depika Subramanien, Dr. Rakotosaona Rianasoambolanoro, Dr. Fadzureena binti Jamaludin, Professor Laetitia DELORT, Dr. Comal Chandra Radhakeesoon, Dr.Surakit Nathisuwan, Wachiraporn, Thanika P., Anchalee Jintapattanakit. Faculty of the training program of CSIR-CIMAP introduced themselves and their research expertise area.

Director- CSIR- CIMAP released the training manual and felicitates the participants by giving them Memento.

The Inaugural ceremony concluded with a vote of Thanks proposed by Dr. Anirban Pal.

Inaugural Session

Training Sessions

Assessment of adulteration in raw herbal trade

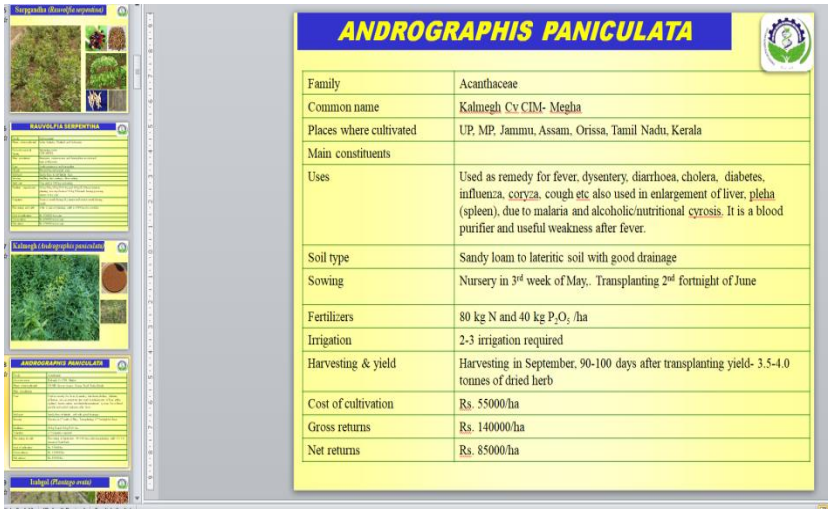
Dr. Narendra Kumar
Senior Scientist
Plant Breeding & Genetic Resource Conservation

Adulteration of medicinal herbs is known to occur since old times, hence the session started with a Lecture on integrative methods for authentication of the medicinal plants and identifying the adulteration(if any). Information on identification techniques (morphological, anatomical, chemical, and molecular) necessary for Authenticated biological reference material, was given to participants. Techniques involved in botanical and chemical standardization of medicinal plants were discussed in brief. Quality control methods for medicinal plant materials mentioned in Pharmacopoeias and other reference literatures i.e., Ayurvedic Pharmacopoeia of India (API), United States pharmacopoeia (USP), European pharmacopoeia (PhEur), Chinese Pharmacopoeia (ChP), Traditional Chinese Medicine (TCM), World Health Organization (WHO) were described. Practical knowledge on developing and validating Pharmacopoeial parameters such as Macroscopic and Microscopic identification along with powder characterization and physico-chemical parameteres of medicinal plant was given to particiapants.

Good Agricultural Practices of important MAPs

Dr. Saudan Singh
Chief Scientist
Crop Production and Protection Division

Information was provided on several topics in the presentation such as - Agro-Climatic zone in India and Agro-technique of traded medicinal and aromatic plants developed by the institute and their standardized cultivation techniques etc. Important aspects related to the safety and quality of medicinal plant materials and finished products were discussed in brief. Details on guidelines for the cultivation of medicinal plants and collection from wild source were shared during the session. Similarly participants were briefed on Good Agricultural Practices (GAP) of economically important crops –*Withania Sarpgandha, Kalmegh, Isabgol, Aloe vera, Senna, Satavar, Safed Musli, Pyrethrum, Brahmi, Mentha arvensis, Indian basil, Citronella, Palmarosa, Lemongrass, Vetiver, Geranium, Patchouli, Scented Rose*. In the end queries about the topic were addressed.

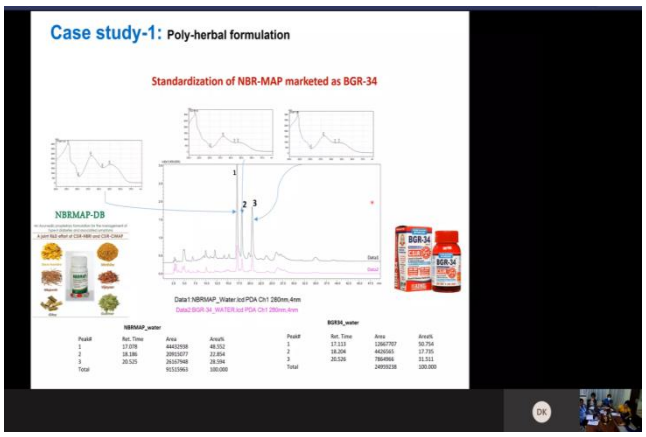


Quality Assurance of Raw Material and Medicinal Plants Derived Finished Products

Namita Gupta, Neerja Tiwari and Karuna Shanker*
Senior Principal Scientist
Phytochemistry Division

The session was one of the most interactive sessions during the training and in the session participants were introduced to the core concepts of Herbal and herbo-mineral formulation, prepared as per described in the monographs in Ayurveda, Unani, Yoga and Naturopathy, Siddha and Homoepathy. Dr. Karuna Shanker discussed about quality parameters required for raw plant drugs and extract in AYUSH medicines and permissible Levels of Contaminants for AYUSH Products. To understand the concept more clearly, details on Identity, purity and strength parameters of ten most selling raw herbs [Ayurvedic Pharmacopeia of India] were discussed in brief. Quality parameters of *Withania somnifera* drug and SOP for Rapid Analysis of Aflatoxins without derivatization Using Ultra Performance Liquid Chromatography and Fluorescence Detection was shared in detail.

Information on quality assurance guidelines release by WHO (World Health Organisation) and ICH (International Council for harmonization) for herbal medicines was given. Quality Parameters in AYUSH Medicines as described in The Ayurvedic Pharmacopeia of India were also elaborated. During the practical session, participants learn the common procedure and methods required for the Standardization of crude drug materials (*assessment of identity, purity, and strength of the raw drugs). Quality Tests were performed by the participants for better understanding.



Chemical Characterization of Essential oils: analytical methods for Determination of quality

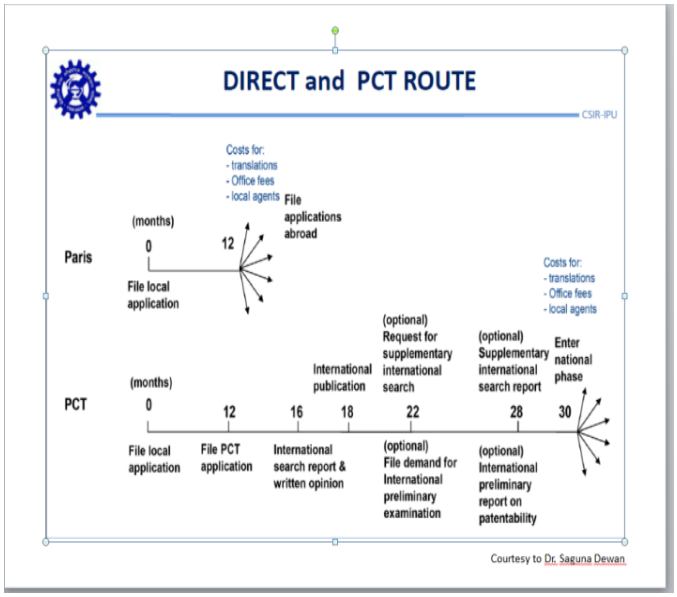
Dr. Chandan S Chanotiya
Principal Scientist
Phytochemistry Division

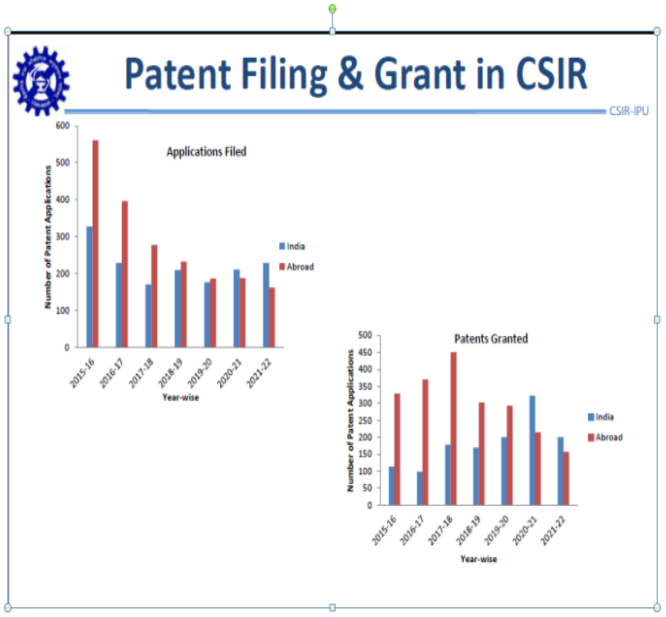
The session on "Aroma" was one of the most interactive and discussion oriented sessions during the training and it began with a brief overview on essential oils. Participants were given details on essential oils and their characterized based on the standard parameters. The hands on training was conducted in accordance with the specified procedures and fundamental principles of GC. The Theory of Single/Triple Quadrupole, Data quantification and Data acquisition, General Software and Method building all were explained in detail. Details on variation in odour among Ocimum/Mint varieties were shared. Brief information about Standardization Body on Essential Oils i.e. Bureau of Indian Standards (BIS) and The International Organization for Standardization (ISO) was given during the session.

Intellectual Property Rights in Medicinal and Aromatic Plant

Dr. Sumit Ghosh
Senior Principal Scientist
Plant Biotechnology Division

Introduction about IPR with specific focus on Patent Coopeartion Treaty(PCT), PCT regional offices and its filing procedure. Role of CSIR in protecting Traditional Knowledge of India and information on CSIR-Traditional Knowledge Digital Library (TKDL) was shared with the participants. According to data as on date, more than 4.24 lakh formulations/ practices have been transcribed into the TKDL database. Details about CSIR-CIMAP generated intellectual property through research in the area of medicinal and aromatic plant varieties, agrotechnology, bioactivities, chemical processes and product formulations were given during the session.





Current Perspective in the International Trade amongst the IORA countries

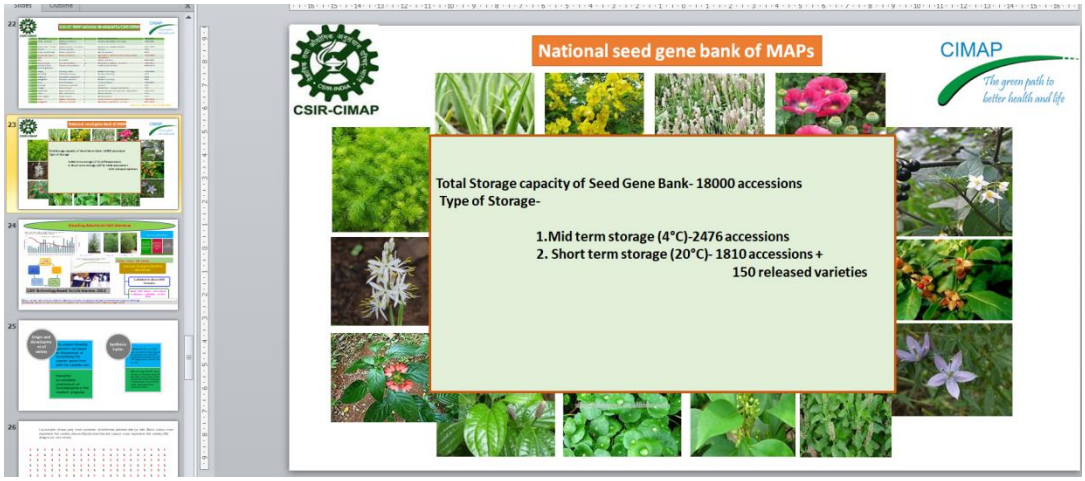
Dr. R. K. Srivastava
Principal Scientist
Business Development Group

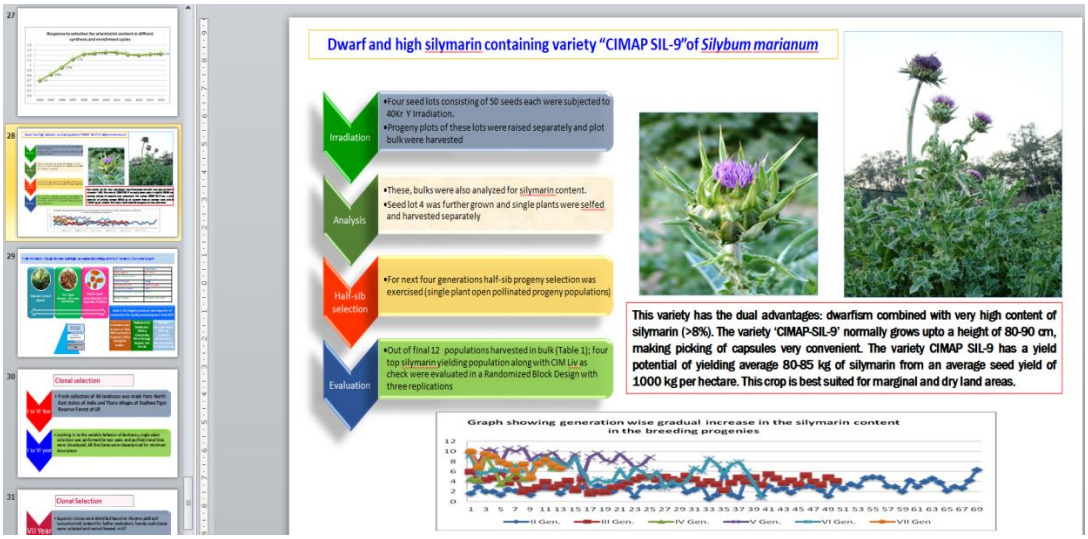
In this session, participants were introduced to the Traded Medicinal Plant species in IORA countries. Information on major cultivated and traded medicinal and aromatic Plants in India was provided to the participants. In addition, current data on essential oil-producing crops and state-wide production of oils was shown. The role of CSIR-CIMAP in developing the mint industry in India from a menthol importing country to the leading global producer & exporter of menthol mint oil by increasing its cultivation, short duration & high yielding varieties and improved agro and processing technologies were shared with the participants. Details on skill cum-technology up-gradation training programme conducted by the institute for farmers, entrepreneurs, distillers, exporters/importers, perfumers, corporate houses for farming/contract farming, and their processing with value addition were showcased.

Breeding techniques for genetic improvement of Medicinal and Aromatic plants

Dr. Anil Kumar Gupta & Gunjan Tiwari
Plant Breeding and Genetic Resource Conservation

A detailed briefing was given by the faculty on various topics viz. major challenges and opportunities in the breeding of MAPs, Germplasm Conservation, Development of genetically improved varieties, major breeding methods used for the development of improved varieties in MAP'S (Clonal Selection, Population Improvement, Pure (true) lines, Mutation Breeding). Additional information on MAP varieties developed by CSIR-CIMAP, National seed gene bank of MAPs were given during the session. Detailed discussion was held on each phase and queries of participants were answered.





Strategic utilization of marginal lands through cultivation of Medicinal and Aromatic plants

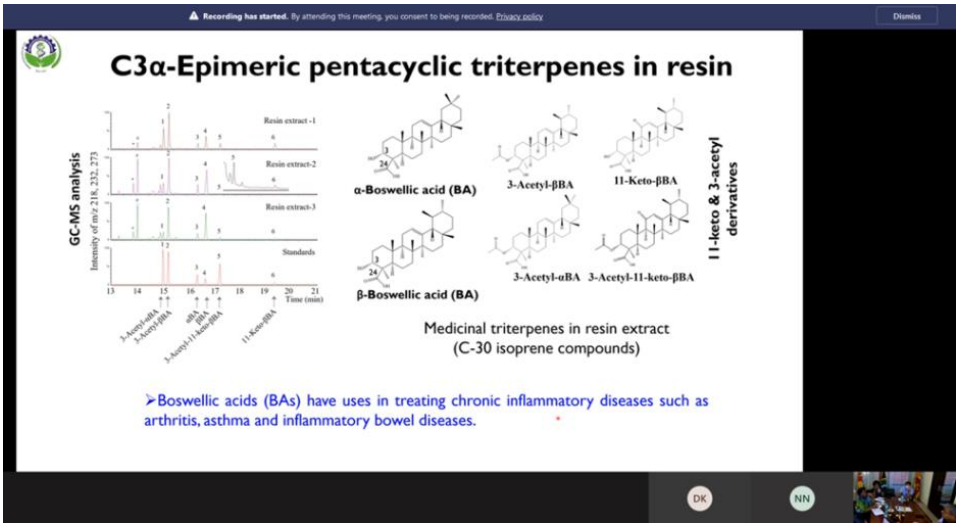
Dr. Rajesh Kumar Verma
Senior Principal Scientist
Crop Production & Protection

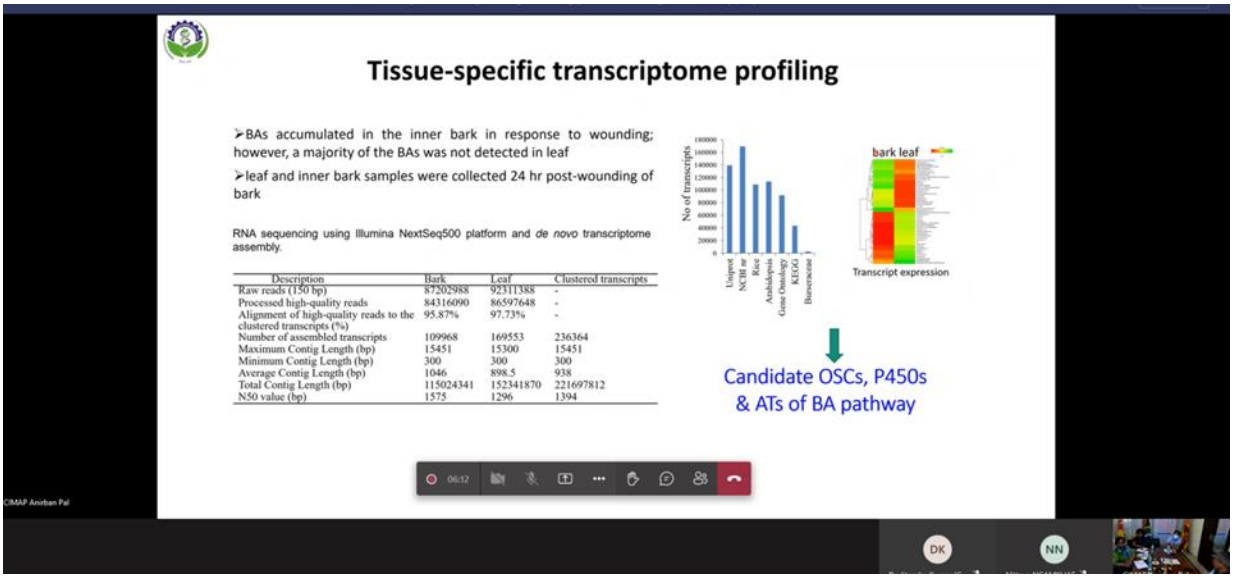
In this session participants were introduced to the core concepts of different environmental stresses. Brief information on the agricultural lands susceptible to low productivity and resource degradation and the responsible reasons including terrain, poor soil quality, salinity, or limited rainfall and problematic soils (Salt affected soils, Acidic soils, Moisture stressed soils, Water-logged soils, Other types). Causes of salinity, relative tolerance of some medicinal and aromatic crops to soil salinity were discussed during the session. Relative tolerance of selected medicinal and aromatic crops to soil sodicity and Phytoremediation Using Aromatic Plants Cultivation of medicinal and aromatic crops in different categories of wastelands were the key topics of the presentation. To observe and experience MAPs in natural environment, trainees were taken to the field trips.

Biotechnological interventions of Medicinal and Aromatic Plants

Dr. Sumit Ghosh
Senior Principal Scientist
Plant Biotechnology Division

The session began with an overview of major activities of plant biotechnology division at CSIR-CIMAP. Information on decoding the network of Metabolic Pathways in cells using Multi-OMICS was discussed. Moreover, this session also had a brief discussion on an integrated approach of pathway elucidation, genomic resource generation, pathway elucidation and engineering in Ocimum, understanding triterpene biosynthesis in (*O. basilicum*) and key enzymes of basil triterpene pathway. Other topics covered during the session were- Elucidation pathway of Boswellia oleo-gum resin, C3α-Epimeric pentacyclic triterpenes in resin, Volatile monoterpenes in resin and Engineering phytochemical pathways in yeast and tobacco.





CSIR AROMA MISSION
Atma Nirbhar Bharat through CSIR-Aroma Mission

Dr. Alok Kalra
Emeritus Scientist,
CSIR-CIMAP

The session began with an overview of the project "Aroma -Mission", operated in diversified land type in various biogeographic zones of India. CSIR's Aroma Mission aims to increase the income of the farmers through cultivation of high-value and high-demand aromatic crops. The mission program helped in the production of an additional 700 tonnes of essential oil for perfumery, cosmetics and pharmaceutical industries, and the use of these oils in value addition and herbal products would generate a business of at least 200 crores. The need and importance of value addition of essential oils were emphasized by the faculty. Moreover, the success story of mission program was also shared with participants. Faculty shared the pride moment when Prime Minister of India Narendra Modi, talked about the success of "Aroma Mission Program" in the 'Mann Ki Baat' radio program.

Diversity, Distribution and Conservation status of Indian Medicinal Plants

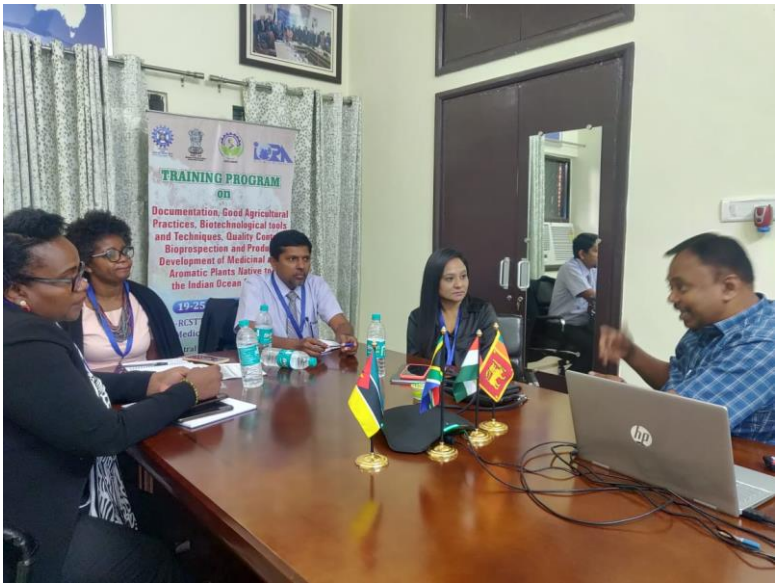
Dr. V. Sundaresan
Principal Scientist
Plant Breeding & Genetic Resource Conservation

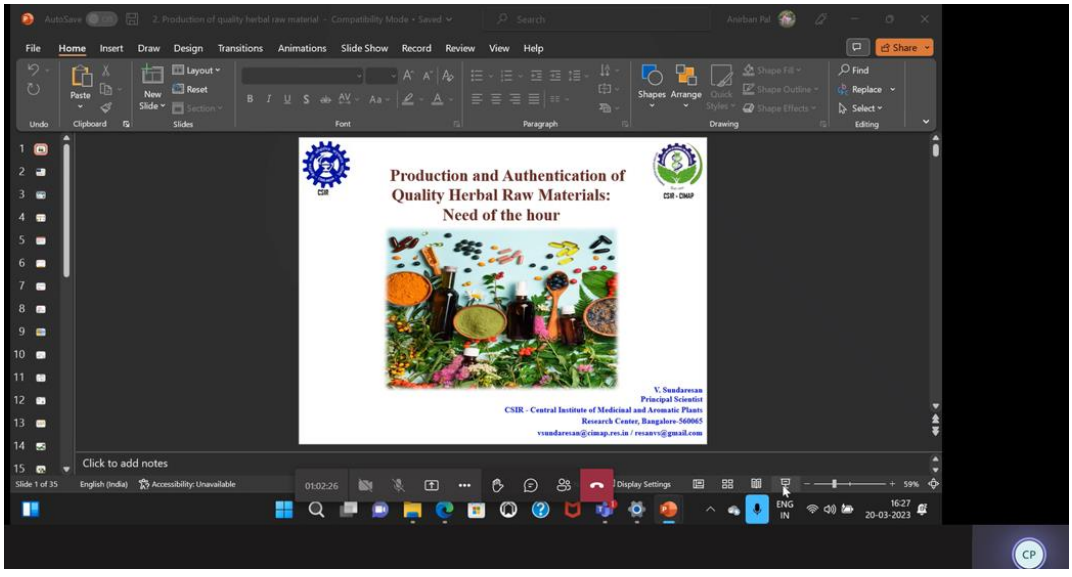
The session began with an overview of landscapes and Biodiversity Hotspots in India. Faculty discussed about the variety of information about the endemic medicinal and aromatic plants (MAPs) of India and their distributions. Major highlights of the session were- National efforts towards conservation of medicinal plants, protection and conservation of the species through in-situ and ex-situ conservation (botanical gardens, field gene banks, seed gene banks, in-vitro gene banks and cryogen banks). Details about National Gene Banks for Medicinal and Aromatic Plants at CSIR-CIMAP were shared with participants along with Regulatory and policy framework in India for conservation of MAPs. Detailed discussion was held on existing Traditional health care system in IORA Member States and its protection.

Production and Authentication of Herbal Materials: Need of the hour

Dr. V. Sundaresan
Principal Scientist
Plant Breeding & Genetic Resource Conservation

The session started with knowing the challenges associated with the standardization of raw material purity of herbal drugs along with Adulteration, Substitution, and heavy metal contamination in raw material. Information on Authentication methods of herbs and herbal products including molecular-based analysis, chemical fingerprinting, and macroscopic and microscopic evaluation was described during the lecture. Techniques about cultivation practices, post-harvest management, and primary processing techniques were shared in details. Information about the Ayurvedic Pharmacopoeia of India (API) standards describing the quality, purity, and strength of selected drugs was shared. Lastly the role of Online Market platforms like "e-CHARAK", an e-Channel for Herbs, Raw materials, and Knowledge for information exchange between various stakeholders involved in the medicinal plant sector was discussed.

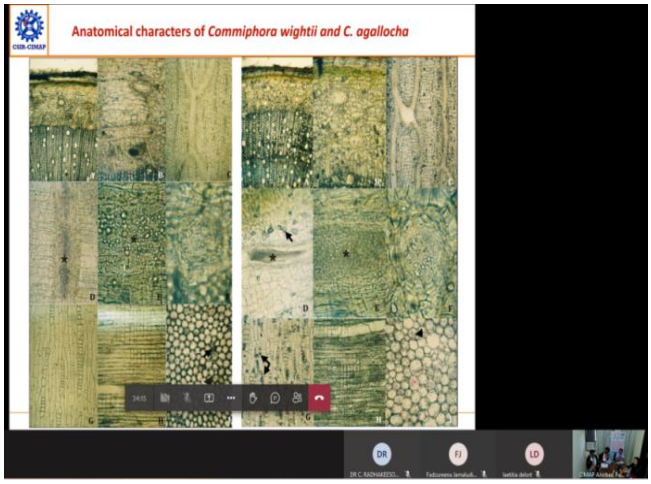




Herbarium Documentation, Inventorization and Digitization

Dr. Narendra Kumar
Senior Scientist
Plant Breeding & Genetic Resource Conservation

In this session, an overview of the Herbarium was given to participants. The elaborated highlights of the session were the introduction, history, types, and role of the herbarium. Details discussion on tools and techniques used in the processing and maintenance of herbarium specimens was held. Information on Digital Herbarium, tools, software, methods (data collection, identification, and database preparation) was given during the session. The participants were taught how to use floras for identification of plants in the field. Hands-on-training on the Processing of Specimen (Collection, Pressing and Drying, Identification, Labeling, and Mounting) was conducted for a better understanding of the subject and techniques involved. Participants visited Herbarium established at CSIR-CIMAP, Lucknow Campus.



Processing and value addition technologies for MAPS

Dr. Sudeep Tandon
Chief Scientist
Phytochemistry Division

The training covered both lectures and hands on experience in the field. The session started with demonstration of Processing Technologies for Medicinal and Aromatic Plants. Brief discussion on Distillation technology for essential oils, Important Parameters affecting Essential Oil Yield and Quality were discussed. Faculty briefed all the steps involved in Processing Technologies for Medicinal Plants, which were an initial step in achieving quality research outcome. Live Demo on Post-Harvest Techniques Supercritical Fluid Extraction (SCFE) Technology, which has come as a revolutionary development in the field of processing of natural products was also elaborated.

Quality evaluation of the Essential oils

Dr. Ram Swaroop Verma
Principal Scientist
Phytochemistry Division

The training covered both lectures and hands on experience. Participants actively participated in experimental sessions; they performed some standard experiments with experts' i.e Essential oil purity testing methods i.e. Analysis of physical parameters and Chemical analysis. To develop their analytical techniques Hands on experiments for qualitative and quantitative analysis of essential oil samples using Gas chromatography-mass spectrometry (GC-MS) were performed by the participants in the presence of faculty and scholars.

Regulatory Process of Herbal Products Development in India

Dr. Dnyaneshwar Umrao Bawankule
Senior Principal Scientist
Bioprospection and Product Development

The session began with an overview of scientific guidelines on herbal products development which help medicine developers prepare marketing-authorisation applications for human medicines. There was a brief discussion on the Indian agencies related to herbal products and their licensing: Drugs & Cosmetics Act Department of Ayurveda, Yoga & Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) New Drug Application (NDA), Central Drugs Standards Control Organization (CDSCO) Food Safety and Standards Authority of India (FSSAI). Further, Guidelines to ensure the reproducibility and quality of R& D work related to herbal product development, the standard operating procedures (SOP) as Good Agricultural Practice (GAP), Good Supply Practice (GSP), Good Laboratory Practice (GLP), Good Manufacturing Practice (GMP), Good Clinical Practice (GCP) were discussed with participants.

Agri-entrepreneurship through Medicinal and Aromatic Plants: Opportunities and Challenges

Dr. Sanjay Kumar
Senior Principal Scientist
Technology Dissemination and Computational Biology Division

In this session, participants were introduced to MAPs-based entrepreneurship development in different parts of the country. In the global era medicinal and aromatic plants (MAPs) cultivation opens up new possibilities for high gains for farmers with major scope for progress in the rural economy. Details on high yielding MAPs varieties released by CSIR-CIMAP and their current market values and future prospects were shared. Success stories and economical aspects of MAPs in the country had been deliberated upon during the session.

Application of Unmanned Aerial Vehicles (UAVs) in Precision Agriculture

Dr. Manoj Semwal
Senior Principal Scientist
Technology Dissemination and Computational Biology Division

The technical session started with knowing the Remote Sensing technique which is commonly used to monitor crop fields, providing effective solutions for Precision Agriculture in the last many years. The participants learnt about Unmanned Aerial Vehicle (UAV) based remote sensing offering great possibilities to acquire field data for precision agriculture applications in a fast, easy and cost- effective way compared to satellite systems. Demonstration on drone data acquisition and processing for precision agriculture was given to generate prescription maps and plans, focusing treatments more efficiently and reducing costs.

Medicinal and Aromatic Plants based Products developed at CSIR-CIMAP

Dr. Anirban Pal
Senior Principal Scientist
Bioprospection and Product Development

Increasing global demand for products derived from medicinal and aromatic plants has provided ample entrepreneurial opportunities to process these plants for value- added products. Dr. Pal described the role of CSIR Central Institute of Medicinal and Aromatic Plants in developing many herbal products for societal welfare. CIMAP has successfully marketed a series of Personal Hygiene Products, Hair-Care formulations, Disinfectants, Mosquito repellents, Pain relievers, Immunity boosters, Oral care formulations, Anti-diabetic formulation, and Room air disinfectants through entrepreneurs and established firms. Details about Technology Business Incubation Center (TBIC) at CSIR-CIMAP were shared with participants. TBIC facilitates technology transfer and enables new entrepreneurs/start-ups in the area of MAPs based herbal products to start production at a small scale.

Training Evaluation

At the end of the training, participants were given training evaluation forms to share their feedback. The majority of participants who provided feedback said that they are benefitted with the program and would recommend the course to their colleagues and shared that the faculty provided helpful assistance and agreed that the course had exposed them to practical knowledge and practices along with tools and technologies related to the field.

Valedictory Session and Certificate Distribution Ceremony

Closing ceremony of the training was led by Director, CSIR- CIMAP, Dr. Prabodh K. Trivedi. Dr. Trivedi thanked the participants for their active participation in the training. He also congratulated them on successful completion of this training course and hoped that the knowledge gained would help the implementation of the activities in their respective countries.

Visit to CSIR- National Botanical Research Institute, Lucknow, India

Visit to Field Gene Bank, CSIR- CIMAP, Lucknow, India

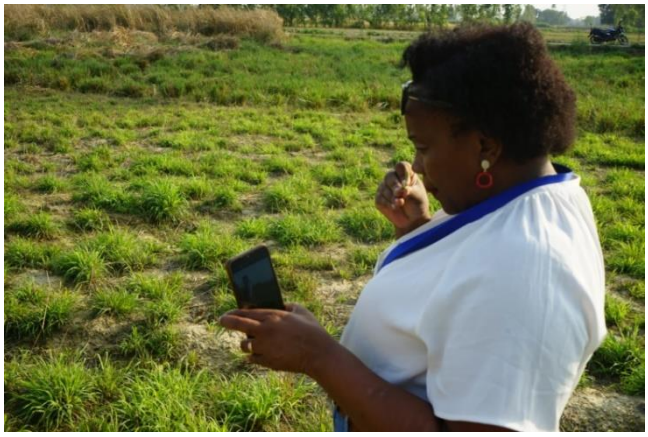
Visit to Vermicomposting and Mushroom Unit at CSIR-CIMAP

Visit to Phytochemistry Laboratory

Visit to Field Distillation Unit

Visit to Herbal Product Industry

Visit to Manav Park (Medicinal and Aromatic Plants Value Garden)



Field Visit and Interaction with Small Scale Entrepreneur's

Visit to Technology Business Incubation Centre, CSIR- CIMAP

Welcome Dinner for IORA Member States Delegates

Cultural Exposure Organized for IORA Member States Delegates