Contents

ABOUT CSIR-NEIST, JORHAT

CSIR-North East Institute of Science and Technology (Formerly Regional Research Laboratory) Jorhat, Assam was established in 1961 under the aegis of Council of Scientific & Industrial Research (CSIR), New Delhi as one of the multidisciplinary CSIR laboratories. The constituent laboratories of CSIR are grouped into five broad areas such as Physical Sciences, Chemical Sciences, Biological Sciences, Engineering Sciences and Information Sciences depending upon the type of work, objective and the nature of responsibilities vested on these laboratories. On this basis, CSIR-NEIST is one among the seven laboratories under the Chemical Science group. Being the first and foremost R&D Institute in North East India, CSIR-NEIST has been engaged in multidisciplinary R&D activities contributing to the industrial growth and economic prosperity of the region as well as the country. The major thrust of R&D activities of CSIR-NEIST has been to develop indigenous technologies and knowledge base by utilizing the immense natural wealth of the North Eastern region of India. The North Eastern region of the country being bestowed with an abundance of material and bio-resources like petroleum, natural gas, minerals, tea, aromatic and medicinal plants, the laboratory was assigned to undertake research for development of expertise and know-how for a wide range of industries and extension works.

In accordance with the charter, goal and objectives, the Institute has focused its R&D mainly on five broad areas, viz., (i) Biological Science, (ii) Chemical Science, (iii) Engineering Science, (iv) Geo Science, and (v) Materials Science. But by considering the recent advance in artificial intelligence and machine learning, the institute currently added another broad area *i.e.* Advanced Computation and Data Sciences Division (ACDSD), for which the institute's broad focused area is extended to six. The Institute has two branch laboratories one is at Itanagar, Arunachal Pradesh and another is at Imphal, Manipur which are involved

in extension activities and locality based R&D works. The Institute has developed expertise in the areas like natural products chemistry, drugs and drug intermediates, VSK cement technology, agro-technologies, petrochemicals, crude-oil transportations, paper and paper products, beneficiation chemicals, ecology and environment studies, geotechnical investigations, foundation design engineering, soil investigation and building materials including testing & analyses. Over the years, the Institute has generated more than 130 technologies and developed expertise in multiple areas of which a large number, specially Micro, Small and Medium (MSM) technologies were commercially successful by setting up of various industries throughout the country. On the basis of the technologies developed, CSIR-NEIST bagged CSIR-Technology Award continuously for four years from 2010 to 2013, besides several awards received by the scientists of the Institute. CSIR-NEIST has transferred herbal drug technology to 6 pharmaceutical companies namely M/s Kudos Laboratories India Ltd, New Delhi, M/s Altis Life Sciences, Himachal Pradesh, M/s Multani Pharma Ltd., New Delhi, M/s Naturoveda Organics Pvt.Ltd., Kolkata, M/s Ayur Force Organics Pvt.Ltd., New Delhi and M/s Ridhi Sidhi Medicare, Noida, New Delhi, from various parts of the country. Over the years, CSIR-NEIST has also earned its name in the field of IPR with total 341 patents granted in India and 54 patents granted in abroad. Moreover more than 560 patents have been filed in India and abroad by CSIR-NEIST till date. In frontier areas of fundamental and applied research, more than 4100 research papers have been published in journals of high national and international repute.

Some major accolades received by CSIR-NEIST are (1) FICCI Award in the year 1982 & 1985 for development of technologies and rural development activities; (2) NRDC Awards for development of process technologies in the year 1972, 1984 & 1985; (3) SIDC Award in 1987; (4) Industrial Promotion Board Award in 1988; (5) CSIR Technology Awards for four consecutive years from 2010 to 2013 and State Science Award 2019.

The Institute has also earned its name by rendering quality testing/analytical services for various samples like water, soil, fertilizers, building materials, cement, iron & steel, stones, oil & petroleum products, coal, minerals, fibres, paper, boards, natural products, etc. The major beneficiaries of these services include industries, entrepreneurs, private and public enterprises, researchers, students and others.

The Institute is committed to focus and design its activities at different point of time in accordance with the national commitments and priorities. The Institute also has tie-up with other research and academic institutions for functional and other co-ordinations for HRD and S&T developments of the region in particular and the country as a whole. Efforts are being made to further evolve the Institute as a leading S&T player in the present global scenario.

FROM THE DIRECTOR's DESK

It gives me immense pleasure and pride to present the Annual Report of CSIR-North East Institute of Science and Technology (CSIR-NEIST) for the year 2023-24 at the 64th NEIST Foundation Day Celebration. CSIR-NEIST has been engaged in research and development activities with a mandate to effectively use the immense material resources of North Eastern (NE) region and to provide R&D inputs for developing the economy of the NE region in particular and the country in general. Since I took over the post of Director in February, 2023, it has been an amazing experience for me on a personal level to lead an Institute that has a legacy of pursuing high R&D inputs in bringing qualitative improvement in the lives of the people. Being the only CSIR lab for the entire NE region of India, CSIR-NEIST occupies an exceptional space in the developmental activities of all eight states.

I am delighted that we have organized many programmes, conferences, skill development and Jigyasa programmes. The Institute was honoured by the visit of Eminent Scientists, Directors/Vice-chancellors of various laboratories, Institutions and Universities as well as several Ministers. It has been a truly learning and motivating experience to all the scientists to interact with such eminent personalities. Our budget, ECF, publications in high impact factor journals, patents, transferred technologies, and scientific ambience are excellent. I hope that we will continue to work with dedication and enthusiasm.

CSIR-NEIST has also organized for the first time a seminar on 'Crosstalk between Animal Research & Alternatives (NSARA-2023)' during 7-9 September, 2023. This event is first of its kind in north east India in which 170 research scholars and students participated from different academic and research institutions of the region. The seminar included one-day workshop followed by scientific sessions on laboratory animal ethics and management, and also on alternative scopes to animal research. Also the 10th Convention of Society for Ethnopharmacology, India-cum-National Seminar on Ethnopharmacology for Bio-economy: The New Paradigm (EBNP-2023) was held at CSIR-NEIST Jorhat from November 28 to November 30. The event witnessed the active participation of traditional healers, known as "bez" in Assamese, in an exhibition adding a unique dimension to the conference's overall purpose. The objective of the conference was to present and discuss scientific research in the context of traditional knowledge related to the use of locally available herbs and organisms for curing diseases. CSIR-NEIST along with its branch laboratories has organised various seminars, workshops, conferences, events, hands on training on mushroom cultivations, vermicompost, essential oil extration etc throughout the year.

I am incredibly joyful that a new plant species Begonia Narahari has been discovered from Arunachal Pradesh by scientist from CSIR-NEIST and honored to Dr. G Narahari Sastry, Former Director CSIR-NEIST, in recognition of his immense contribution in S&T intervention in North East. Moreover, CSIR-NEIST has developed and registered two Ornamental

Caladium varieties, Jor Lab CL-24' INGR 23114 and 'Jor Lab CL-12' INGR 23115 under CSIR-Floriculture. Out of the two registered varieties, one has been transferred to one agripreneur for cultivation.

CSIR NEIST inaugurated a polyhouse on 20th May 2023 and dedicated it to the Pfutsero Floriculture Cluster, leading by a young enthusiastic female entrepreneur, Ms Vasalu Puro for extension of floriculture activities. CSIR NEIST also established a "Rural Bioresources Centre" in Udalguri, an Aspirational District in Assam with financial support from Department of Biotechnology, Govt. of India. The Bioresource Centre is mostly equipped with the technologies for making products (7 different products) from waste Banana pseudostem. Moreover, Eight numbers of bioreactor for the multiplication/production of OP-12 Biofertilizer were installed in the all the states of North-East India.

It is indeed a proud privilege to mention that Dr. Natarajan Velmurugan, Senior Scientist, CSIR-NEIST was selected to participate in the 43rd Indian Scientific Expedition to Antarctica (43 rd ISEA) organized by National Center for Ocean and Polar Research, Ministry of Earth Sciences, Government of India. During this monumental expedition, he was on voyage and conducting research works in Bharati and Maitri Research Stations located in Larsemann Hills and Schirmacher Oasis, respectively, from December 2023 to March 2024. Also, Pride of CSIR-NEIST Mrs. Rumi Borah, won the Runners Up Trophy in Carrom (singles) representing CSIR-NEIST in the final of the prestigious SSBMT(Indoor) tournament held at IMMT Bhubaneswar during 15-19 March 2024.

The Institute continued to render its services to the people of the NE region through various programmes and activities. On the societal front, the Institute along with its branch laboratories in Imphal (Manipur) and Itanagar (Arunachal Pradesh) imparted training and demonstration of its low-cost technologies like Mushroom Cultivation, Handmade Paper and Banana Fibre Extraction, and cultivation of Medicinal & Aromatic Plants to the rural masses to provide them avenues for earning livelihoods. The programmes under human resource development have been significant, with an increased number of students from the region and outside.

I, sincerely, acknowledge the steady support, guidance and encouragement received from Director General, CSIR, Research Council & Management Council and also thank once again every member of the Institute for their sincere contributions, hard work and dedication in the overall achievements and progress of the Institute. We are extremely fortunate to be a part of CSIR, an organization that has made its recognition in the revival of Indian Industry, Science & Technology and has been playing an exceptionally vital role to give its best at all the times.

18 March, 2025

(Prof. V M Tiwari)
Director, CSIR-NEIST

MEMBERS OF MANAGEMENT COUNCIL

2023-24

Dr G N Sastry, Director
CSIR-NEIST, Jorhat
Chairman

Dr Arun Bandyopadhyay
Director, CSIR-IICB, Kolkaka
Member

Dr Jatin Kalita
Principal Scientist
CSIR-NEIST
Member

Dr Archana Moni Das
Principal Scientist
CSIR-NEIST
Member

Dr Sanjib Gogoi
Principal Scientist
CSIR-NEIST
Member

Dr Jayashree Chiring Phukan
Scientist
CSIR-NEIST
Member

Dr Hridoy Jyoti Mahanta
Scientist
CSIR-NEIST
Member

Dr Archana Yadav
Senior Technical Officer
CSIR-NEIST
Member

Shri Rama Shankar Sharma
Controller Finance of Accounts
CSIR-NEIST
Member

Shri Prasoon Kumar
Administrative Officer
CSIR-NEIST
Member- Secretary

MEMBERS OF RESEARCH COUNCIL
2023-24

Dr. U S N Murty
Director,
NIPER, Guwahati, Assam
Chairman

Dr. Sanjay Nene
CEO, Innovation Biological
Pvt. Ltd, Pune
External Member

Prof. Pulok Kumar Mukherjee
Director, IBSD,
Manipur
External Member

Dr. G. Narahari Sastry
Director, CSIR-NEIST,
Jorhat
Member

Dr. Amit Awasthi
Senior Professor
THISTI NCR, Haryana
External Member

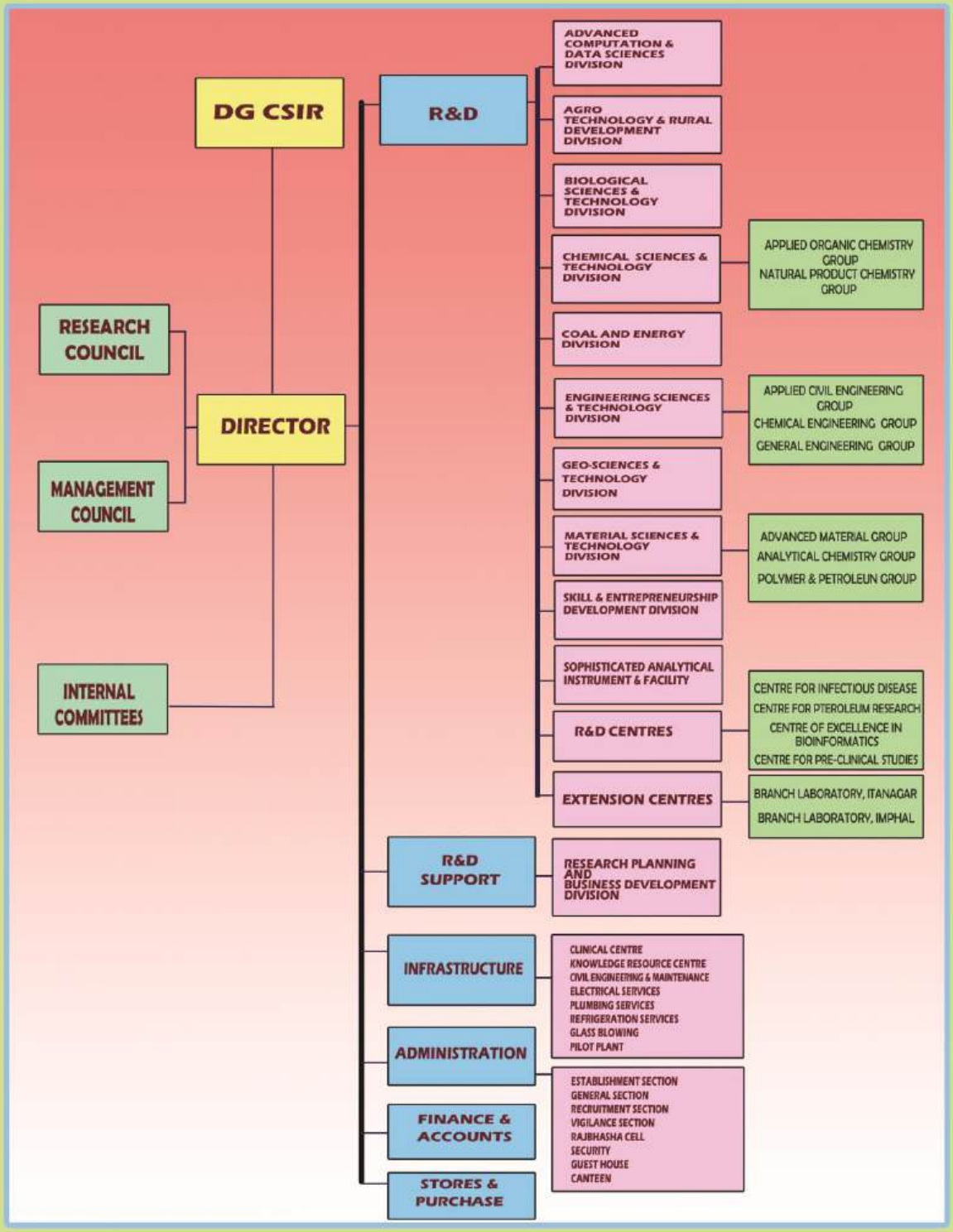
Dr. Subhra Chakraborty
Director
NIPGR, New Delhi

Dr. Sunil R. Parekh
Cadila Health Care Limited,
Zydus Group
External Member

Dr. Avanish Kumar Srivastava
Director,
CSIR-AMPRI, Bhopal

Dr. Preeti Srivastava
Sr Scientist, CSIR Hq,
New Delhi
CSIR Hq. invitee

ORGANIZATION STRUCTURE



CSIR-NEIST AT A GLANCE

2023-2024

RESOURCE BASE

Infrastructural	
R&D Divisions & Centers	14
Branch Laboratories	02
Seismic Stations	27

HUMAN RESOURCES

Total S&T Staff	
Scientists	88
Technical Officers/Assistants	56
Support Staff (Technicians/ Lab. Attendants/Assistants)	47
Administrative Staff	48

FINANCIAL

	(Rs in Lakhs)
Government Allocation	13718.537
From Contract R&D and Consultancy	1137.925
Testing/ Analytical Services	50.506
Royalty/ Premia	0.027

BUDGET

	Sanctioned (Rs in Lakhs)
Recurring	10240.805
Capital	2128.501
Network Project (task force)	
Capital	129.307
Recurring	1219.924

R&D PERFORMANCE: 2023-2024

Knowledge Generation

Total Papers published	211
International	208
National	03
International peer reviewed Journals (Having IF)	191
National peer reviewed Journals (Having IF)	03
Book Chapters	01
Monograph	01
Average IF	5.03
Highest IF	**27.6**

Technological Output

Technology Developed	01
Technologies released to industry	04

Extramural & Human Resource Development

Sr Research Fellows	34
Jr Research Fellows	66
DST-NPDF	01
Women Scientist	02
DBT-RA	03
Project Fellows	223
Summer Trainee	71
Winter Trainee	120

Patents Filed

India	05
Abroad	01

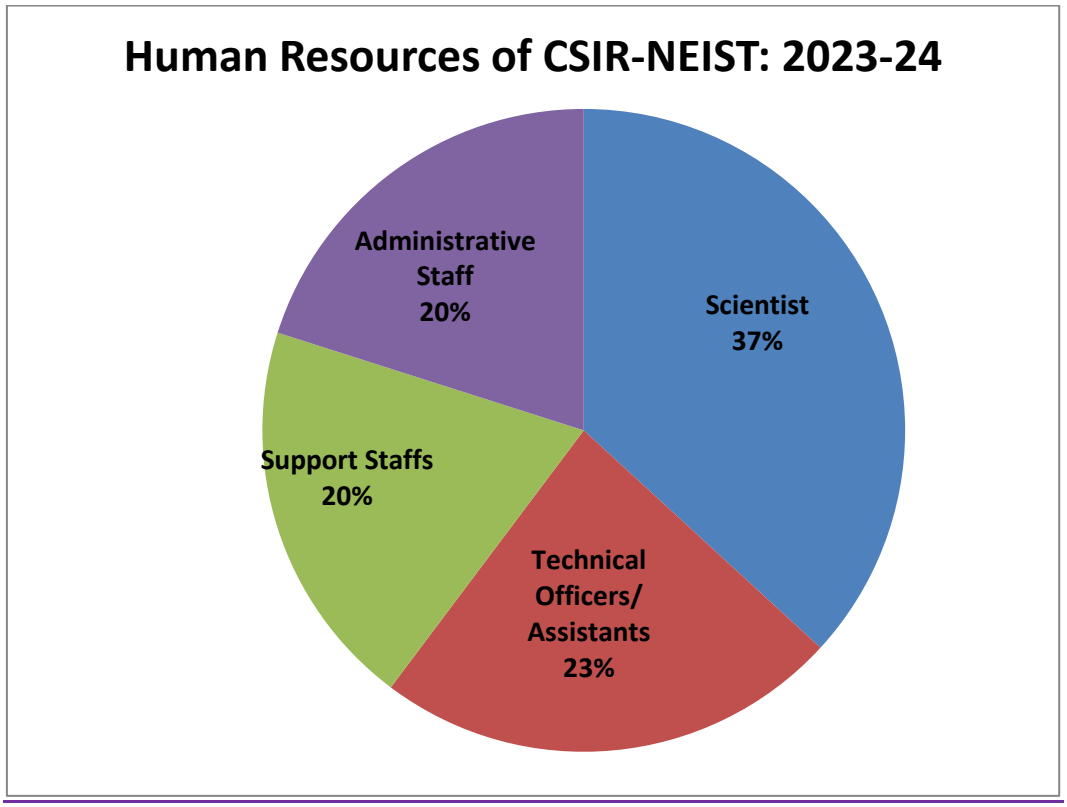
Patents Granted

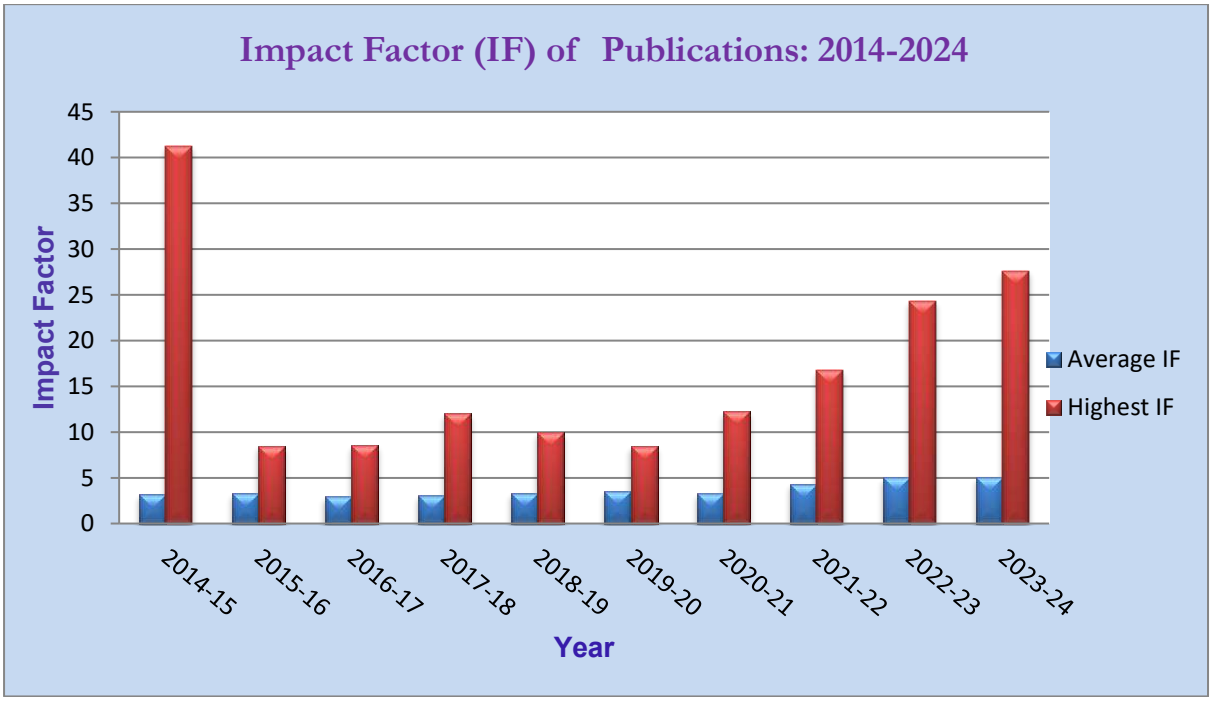
India	07

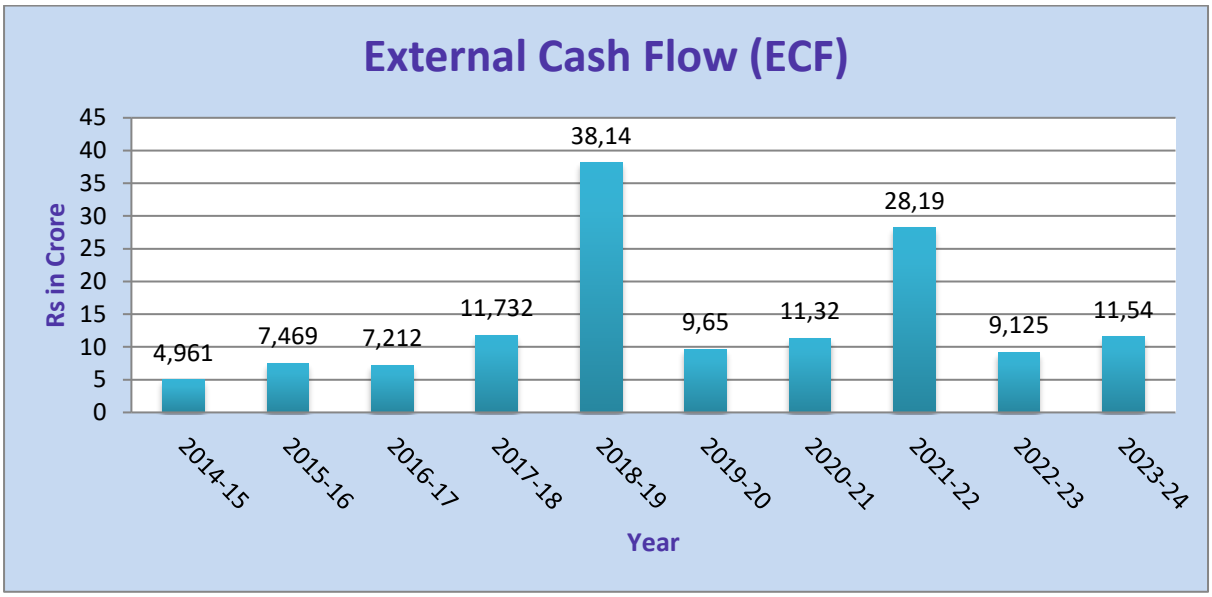
Copyrights Registered

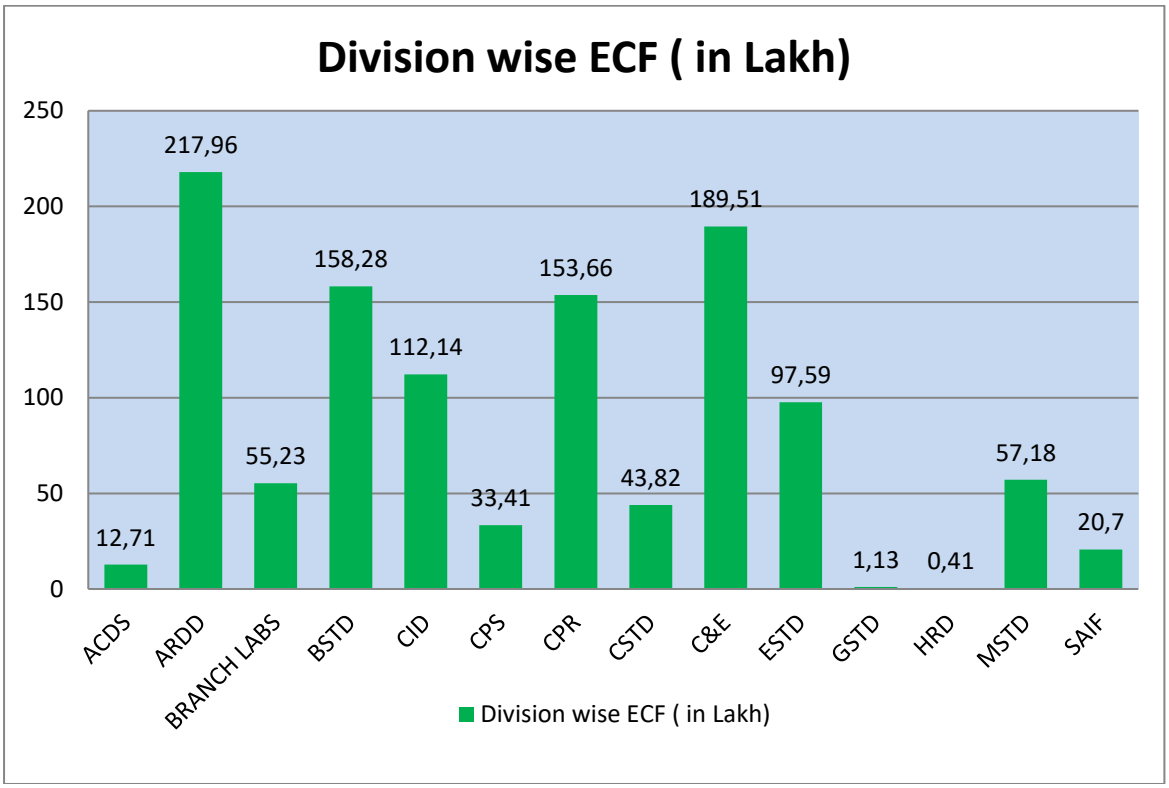
India	04

PERFORMANCE INDICATOR






External Cash Flow (ECF)
Rs in Crore
45
40
35
30
25
20
15
10
5
0
4,961
7,469
7,212
11,732
38,14
9,65
11,32
28,19
9,125
11,54
2014-15
2015-16
2016-17
2017-18
2018-19
2019-20
2020-21
2021-22
2022-23
2023-24
Year


Division wise ECF (in Lakh)
250
200
150
100
50
0
12,71
217,96
55,23
158,28
112,14
33,41
153,66
43,82
189,51
97,59
1,13
0,41
57,18
20,7
ACDS
ARDD
BRANCH LABS
BSTD
CID
CPS
CPR
CSTD
C&E
ESTD
GSTD
HRD
MSTD
SAIF
Division wise ECF (in Lakh)

R & D DIVISIONS AND THIER ACTIVITIES

ADVANCED COMPUTATION & DATA SCIENCES DIVISION

The Advanced Computation and Data Sciences division was established in March 2019 with the vision to build a center of excellence in advanced computation and data science. In 2021, Department of Biotechnology (DBT), Govt. of India recognized the division as a Center of Excellence in BIF. The mandate of the division is to conduct fundamental and applied research in Computational Modelling, Data Science Spanning, and indigenous open-source software development based on artificial intelligence (AI), machine learning (ML), deep learning (DL) and IoT to bridge the gap between basic research and applied research.

Ongoing Projects

In-house, Grant in aid & Consultancy Projects

Project Title: **Centre of Excellence for Advanced Computation and Data Sciences**
Project No: **GPP-0389**
Funding Agency: Department of Biotechnology (DBT), Govt. of India
PI & Members: Dr G Narahari Sastry (Co-ordinator), Dr Selvaraman Nagamani (PI), Dr Hridoy Jyoti Mahanta (Co-PI), Mr Debabrata Das (Co-PI), Dr Ratul Saikia (Co-PI), Dr Saikat Haldar (Co-PI)
Objectives:

- Indigenous open-source software for computational drug discovery: development of disease-specific web portals.
- Development of clinical data repository for Societal Health Advancement.
- Computer-aided drug design and molecular modelling.
- Harnessing NE biodiversity and traditional knowledge.
- Machine learning and Data Science applications in food and nutrition in NE India.
- Development of databases, computing, modelling and informatics tools.
- Human resources development in molecular modelling and data sciences integrated with bioinformatics applications.

Salient Achievements:

- The development of a robust Molecular Property Diagnostic Suite with the drug discovery and machine learning modules to help the student community to perform the CADD calculations seamlessly. The protein-protein interaction studies and computational drug repurposing helps in the identification of ‘hot-spots’ residues and potential drug molecules. First of its kind herbal formulation database specifically to India harnessing traditional knowledge of India in general and NE region in particular. Effective integration of Chemoinformatics and machine learning models are helpful in developing different machine learning models for toxicity prediction.
- Developed disease independent module ‘fragment library’ and integrated to the Molecular Property Diagnostic Suite (MPDS), an open access disease specific web

portal indigenously developed to strengthen the computational drug discovery in the world

- Development of MPDS portal on COVID-19 ($MPDS^{COVID-19}$). The portal has disease dependent modules on various aspects like pathways, mutations, drugs, proteins, epidemiology study etc. specific to COVID-19 and disease independent modules for data analysis like QSAR, virtual screening, sequence alignment, alongside compound library, fragment library and advanced modules.

Project Title: **Research Exposure cum Training Programme for Students from North-Eastern and UTs of Jammu and Kashmir and Ladakh**

Project No: **GPP-0410**

Funding Agency: Department of Science and Technology (DST), Govt. of India

PI & Members: Dr G Narahari Sastry (Co-ordinator), Dr Hridoy Jyoti Mahanta (PI)

Objectives:

- Interactions of students with the pioneers of the respective research areas, which will provide valuable learning experience and insight into the advancement in the respective thrust areas.
- Hands-on working experience on high-end R&D equipments (s) available in the respective host institutes/organizations, which will provide them exposure to take up research and prepare them for writing quality proposals for seeking research funding.
- To guide students through a short-term research-oriented project.
- To prepare them for competitive examinations for PhD programs.

Salient Achievements:

- 20 participants from Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Sikkim, Nagaland, Tripura and Jammu & Kashmir were nominated to join the training program.
- Training was provided to the participants by experts from IITs, Central Universities, and CSIR-Labs.
- Around 14 speakers have visited the training program and delivered lectures to the participants.
- The training is for improving the skills and experience of the participants in the areas of AI and ML and their applications in areas of natural sciences.

AGROTECHNOLOGY AND RURAL DEVELOPMENT DIVISION

The main objectives of the division are the exploration of the medicinal and aromatic plants (MAPs) resources of North-East India and identification of their economic and industrial values for development of technologies. The value addition of the germplasm through development of different products and dissemination of proven technologies to people, government organizations, entrepreneurs for generating employment and economic development is an important focus area of the division. Societal program in the form of awareness, training, skill development of entrepreneurship, MAP cultivation, bee-keeping is also the objectives of the division.

Ongoing Projects

Mission Mode Projects

Project Title: **CSIR Aroma Mission (Phase-II)**
Project No: **HCP-007**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Mohan Lal (PI), Dr Mantu Bhuyan, Dr Saikat Haldar, Dr Dipanwita Banik, Mr Jayanta Jyoti Bora, Mr Dipankar Neog, Dr S B Wann, Dr H B Singh, Dr B C Baruah
Objectives:

- Development of sustainable models for the cultivation of aroma crops
- Value addition and waste utilization
- Knowledge/technology generation and utilization
- Skilling, entrepreneurship development, and market linkages
- Promotion of aroma crops for reducing import burdens or having great export potential

Salient Achievements:

- The field experiment on *Kaempferia galanga* zero tillage experiment for the year 2023-24 was recorded and found that in zero tillage condition, the rhizome yield was 4.94 t/ha, whereas the rhizome yield for conventional tillage practice was found to be 5.48 t/ha. Experimental trial with *Spacing=6 & Fertilizer=6 treatment* for *Kaempferia galanga* revealed that spacing of 30×30cm and 150:60:40 N:P: K with a yield of 6.84t/ha compared to 4.6 t/ha obtained in control.
- The M_2 population of Rosemary plants has been planted in the experimental field trials. Development of region-specific agrotechnology is happening in different climatic conditions of NE India. The Quality Planting materials were generated at institutional and farmer's progressive farms. A total of 51 lakh slips for lemongrass, 45 lakh slips for citronella, and nine lakhs cutting for patchouli were generated. Twenty-one-day awareness and training programs were conducted during the year.

Project Title: **CSIR-Floriculture Mission (Phase II)**
Project No: **HCP-0037**
Funding Agency: CSIR, New Delhi

PI & Members: Dr Mantu Bhuyan (PI), Dr Dipul Kalita (Co-PI), Dr Kalyani Medhi, Dr Mohan Lal, Dr S P Saikia, Dr Dipanwita Banik, Dr Pankaj Bharali, Dr Sumit Singh, Dr Kalpataru Dutta Mudoi, Mr Sanjay Chanda, Mr Himangshu Lekhok

Objectives:

- Production of Quality Planting Materials
- Expansion of Area under Floriculture
- Post-harvest and Value Addition
- Integration of Apiculture with Floriculture
- Effective Market Linkage
- New Variety Development and Registration

Salient Achievements:

- Production of Quality Planting Materials:
  - A total of **40 kgs of seeds** of Marigold, Ranunculus, Peony, Chamomile, **1 lakh** corms of Gladiolus, **30,000 bulbs** of Tulip, **10,000 plantlets** of Orchid were achieved of the target given.
  - 3,04,300 nos. of plantlets of crops like Gerbera, Rose, Chrysanthemums, etc. were produced.
  - A total of **2330** plants such as *Papilionanthe teres* (Roxb.) Schltr., *Begonia handelii* Irmsch., *Begonia roxburghii* (Miq.) A.DC., *Begonia thomsonii* A.DC., *Lycopodium* sp., *Selaginella* sp. were produced by clonal propagation
  - Production at Floriculture Polyhouse: **1550 nos.**
- **Expansion of areas under floriculture crops and integration of apiculture with floriculture**: **110 ha**
  - Floriculture gardens in schools: **17**
  - Farmer cluster of NE region: **57**
  - Awareness/Training/ Skill development programs organized: **57**
  - Beneficiary farmer: **1268**
  - Distributed Naturally Ventilated Polyhouse: **1**
- **Post-Harvest and Value Addition:**
  - An herbal infusion resembling tea has been crafted, aimed at enhancing immunity from *Rhododendron arboreum* Sm
  - Various drying techniques are employed here to standardize the shelf life of the dried flowers, which can be utilized as raw edible flowers during the off-season period.
- **Effective Market Linkage:**
  - Number of Pushp Krishi Mela/Workshop/training program/skill development/ Meets: 5 nos.
- **New Variety Development and Registration:**
  - CSIR-NEIST has developed and registered two Ornamental Caladium varieties, ‘Jor Lab CL-24’ INGR 23114 and ‘Jor Lab CL-12’ INGR 23115, and others are in progress. One of the two registered varieties has been transferred to one agripreneur for cultivation.
  - A new *Begonia* (Begoniaceae) species from Mishmi Hills of Arunachal Pradesh, India Phytotaxa 637 (3).

In-house, Grant in aid & Consultancy Projects

Project Title: **Sustainable Utilization of Bioresources of NER for Strengthening Bioeconomy of Society**

Project No: **OLP-2090**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Mantu Bhuyan (PI), Dr S P Saikia, Dr Dipul Kalita, Dr Dipanwita Banik, Dr Mohan Lal, Dr Tridip Phukan, Dr Sumit Singh, Dr Twahira Begum, Dr. Kalpataru Dutta Mudoi, Mr Sanjoy Kumar Chanda, Mr Himangshu Lekhak, Dr Dipanka Dutta

Objectives:

- Exploration, acclimatization, domestication, conservation, inventorization, and value addition of plant diversity of North East India
- Lignocellulosic derived value-added products, processes, and technology from agro-waste materials.
- Development of High-performance Thin Layer Chromatography (HPTLC) method for the quality assessment of essential oils from aromatic plants
- Micropropagation of significant plant resources of NE India
- Production protocol of different varieties of mushrooms and skill development training on growing mushrooms for the development of rural entrepreneurship
- Value addition of important bioresources of NE India for human health, agriculture, and management of insect pests.
- Developing farmer-friendly technology for beekeeping and training farmers on scientific beekeeping.

Salient Achievements:

- Conservation priority areas of endangered *Nepenthes khasiana* & *Begonia aborens* were studied under climate change scenarios using ecological niche modeling.
- Maintenance of the CSIR-NEIST Herbarium and accession numbers were attached to 12000 herbarium sheets. Names of the identified specimens (inclusive of 325 specimens of Dr E.K. Janaki Ammal) were verified. The edited and corrected information of 2000 specimens of 51 families from the database was incorporated in MS Access format with scanned images as a base towards virtual herbarium.
- Biodegradable fibre with commercial potential was extracted and characterized from a novel source palm grass leaves for circular bioeconomy.
- In-vitro regeneration, in comparison with 2-iPand other cytokinins emphasizing pitcher development and stability in genetic makeup, was studied in *Nepenthes khasiana* Hook. f.7.
- With different drying techniques, essential oil yield and composition was tudied in Spiny coriander (*Eryngium foetidum* L.). Fatty aldehydes, especially trans-2-dodecenal, majorly abundant key aromatic flavour of spiny coriander underwent probable enzymatic reduction to alcohols upon long-term oven-drying, affecting the oil quality.

- Higher accumulation potential of vitamin D2 in *Tremella fuciformis* Berk (TF) was established. Moreover, the impact of UV treatment on antioxidant capacities and total polyphenol content of TF was also studied.
- Protocol of in vitro propagation of *Garcinia Morella* Desr*.,* a minor fruit tree of Assam*,* was established.
- A biodegradable formulation has been developed for the surface coating of paper plates. Paper plates are also made from paper waste. Tensile test, double fold, water absorbency, etc. analysis has been completed as per ASTM/IS method
- The impact of polyvinylchloride microplastic (PVC-MP) on tomato plants at the genetic and protein levels was studied, and it found lower levels of light-harvesting pigments, D1 protein, RuBisCO, and modulation of nutrient absorption were among the factors responsible for growth suppression in tomato plants upon exposure to PVC-MP.
- Collection of honey samples of *Apis cerana* from other geographic regions of northeast India. Complete physicochemical profiling is undertaken to control and ensure the quality of honey samples through IRMS and AAS testing facilities.

In vitro culture of *Garcinia morella* for shoot regeneration

In vitro shoot multiplication of *Garcinia Morella*

- Extraction, physicochemical and structural characterisation of leaf fibres were carried out from palm grass, ***Curculigo capitulata*** (Lour.) Kuntze for sustainable and cleaner production of textile and allied cellulosic applications highlighting circular bioeconomy (**Fig**).

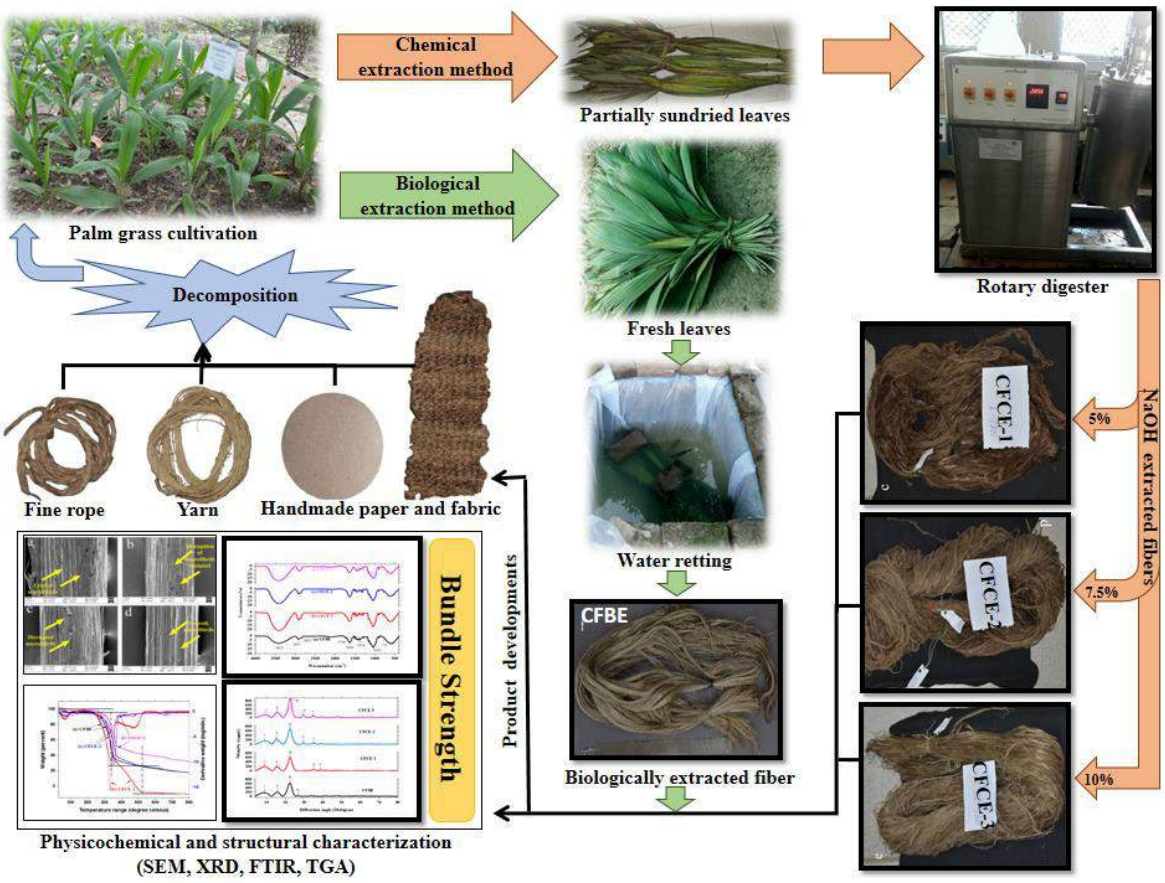


Fig. Extraction, physicochemical and structural characterisation of leaf fibres of ***Curculigo capitulata*** (Lour.) Kuntze for cleaner production and industrial applications.

- Effect of postharvest drying on physicochemical properties, volatile yield, composition, and sensory attributes of rhizome of shell ginger, *Alpinia zerumbet* (Pers.) B.L. Burtt & R.M. Sm. was carried out for commercial use, highlighting freeze drying as the most efficient technique to retain the natural qualities.
- *In-vitro* regeneration of endangered carnivorous pitcher plant *Nepenthes khasiana* Hook. f. was achieved with a detailed study on *in-vitro* pitcher development using growth regulators and stability in genetic makeup using molecular markers in micropropagated plants.
- Ecological niche modelling (ENM) was used to identify conservation priority areas and to predict the climate change impact on the future habitats of endangered *Nepenthes khasiana* Hook. f. Similarly, the impact of climate change was predicted on habitat suitability and morphological traits of *Begonia aborensis* Dunn in Northeastern India which is an endemic taxon of Indo-Myanmar hotspot (Fig 2).

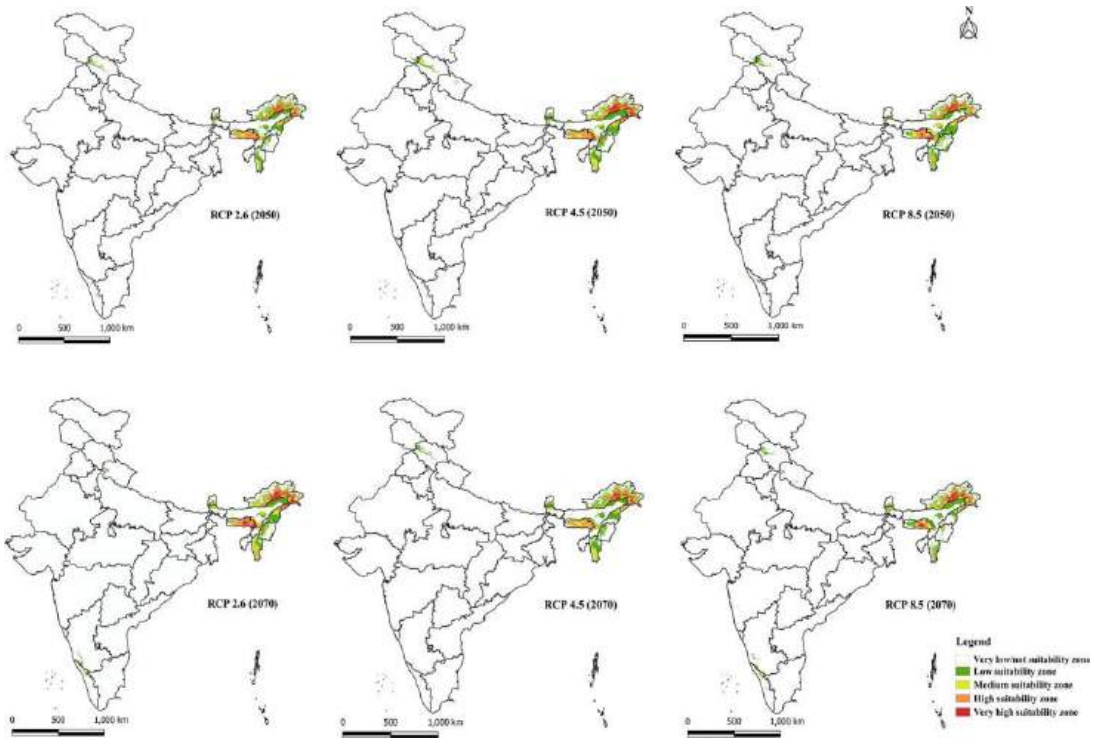
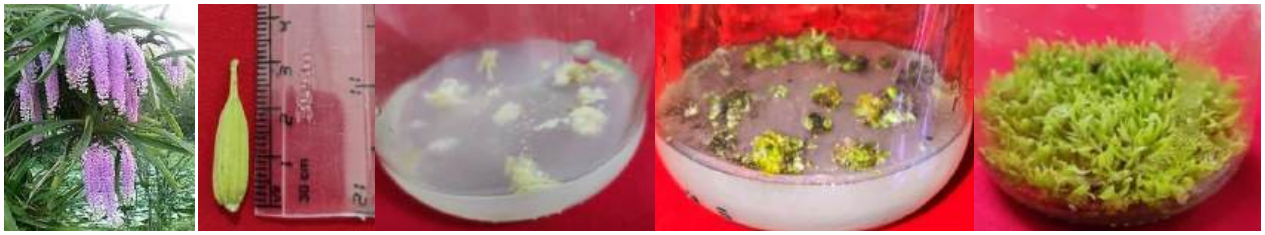


Fig. Predicted habitat suitability of *B. aborensis* under different RCP scenarios of RCP 2.6, RCP 4.5, and RCP 8.5 for 2050 and 2070.

- **Maintenance of the CSIR-NEIST Herbarium:** The herbarium was registered under Index Herbariorum, New York Botanical Garden (https://sweetgum.nybg.org/science/ih/) with an acronym CSIRNEIST. Each herbarium sheet was manually accessioned, and accession numbers were attached to 12000 sheets. Names of the identified specimens (including 325 specimens of Dr E.K. Janaki Ammal) were verified as per www.ipni.org., www.theplantlist.org, current APG, and IV classification, and the information was extracted from herbarium label to incorporate in a database. The edited and corrected information of 2000 specimens of 51 families from the database was incorporated in MS Access format with scanned images having 600 dpi (flatbed scanner, hp Scanjet N9120) as a base towards virtual herbarium.
- **Maintenance of the CSIR-NEIST Botanical Garden**: The collected wild plant species with ornamental, economic potential, threatened and others like *Begonia spp.*, *Curculigo* spp., Orchids spp., *Zingiberaceae* members by previously conducted field tours from Arunachal Pradesh, Meghalaya, Nagaland and Assam were multiplied and maintained at CSIR-NEIST, Botanical Garden.
- **CSIR Floriculture Mission Phase II (HCP0037)**: Germplasms of wild ornamentals were introduced and acclimatized at CSIR-NEIST, Botanical Garden. Nearly 1200 cuttings of *Papilionanthe teres* (Orchidaceae) were raised, 170 of *Lycopodium spp.* (Lycopodiaceae) and 200 of *Selaginella* (Selaginellaceae), 50 each of *Begonia roxburghii* (Miq.) A. DC., *Begonia thomsonii* A. DC. and *Begonia handelii* Irmsch.

- ***Rhynchostylis retusa:*** Semi-matured capsule of *R. retusa* was collected and cultured into the HMS medium for *in vitro* primary PLB formation. Thereafter secondary PLB were formed in MS medium. Varied concentration of different organic additives and PGRs were used for shoot and root development prior to primary hardening.



- ***Cymbidium aloifolium:*** *In vitro* seed germination of *Cymbidium aloifolium* (L.) Sw. was established from semi matured pods of the species. Tissue culture technique has been widely used for the *in vitro mass propagation* of this commercially important orchid. *In vitro* mass propagation of this orchid was established on MS medium with successful primary and secondary hardening.

Fig. *In vitro* multiplication of *C. aloifolium*

Project Title: **Establishment of BioNEST Bioincubator Facility at CSIR-NEIST, Jorhat**
Project No: GPP-379
Funding Agency: Biotechnology Industry Research Assistance Council (BIRAC), Department of Biotechnology (DBT), Government of India
PI & Members: Dr Dipul Kalita (PI), Dr Rituraj Konwar (Co-PI)
Objectives:

- To generate ideas and promote innovation.
- To nurture start-ups and their sustainability.
- To develop strong business models.
- To facilitate strong industry-academia interaction for mentoring start ups.

Salient Achievements:

- Cultivation and curation of winning Ideas for various BIRAC funding scheme including Biotechnology Ignition Grand (BIG), Grand Challenge India (GCI), Small Business Innovation Research Initiative (SBIRI) for Aspirants:
- Organised numerous programs to facilitate awareness among student, researchers, grassroot-level entrepreneurs etc. & vigorous mentorship sessions including, proposal writing tricks provided to potential applicants to assist them individually in idea shaping, procuring team members application writing etc.
- **Empowering startups & innovators to secure IPR through mentoring & guidance support:** Approx. 510 numbers of innovators & startups were guided throughout planned sessions.
- **Induction of innovators, entrepreneurs and startup into BioNEST incubation facility:** Provided incubation support to innovators/ entrepreneurs/ startup working on diverse sectors. The list includes four startups and one innovator namely Chayi Trails Pvt. Ltd. from food &beverages sector working on production of Kombucha and other products from Assam tea collected from the different small tea growers; Resolins Technology LLP in the sector of waste management involved in formulating a decentralized system and henceforth provide the best sustainable scientific solution towards zero waste management to Govt. & private enterprises; CK Udyog Food Private Limited working on food processing sector to bring forth a variety of products such as flavoured vinegar, spreads etc. keeping honey as a major ingredient; NGT Treemate Private Limited working in the sector of Agri and allied areas to build a mobile application for scheduled plantation guidance with alarming system, disease detection in plants, geo-tagging and medical prescription of plants. Innovator, Sayed Zahid Mustabin, developing a modified process for minimizing the extraction cum processing time of Agarwood Oil without compromising quality. His ideas fall under Industrial Biotechnology sector.

Fig. Various mentoring sessions on **BIRAC funding schemes, IPR guidance etc.** for grassroot Entrepreneurs, innovators and start-ups.

Fig. Glimpses of incubatees activities under the support of CSIR-NEIST BioNEST

BIOLOGICAL SCIENCES & TECHNOLOGY DIVISION

Biological Sciences and Technology Division (BSTD) is a multi-disciplinary division devoted to frontline research in the areas of modern biology. The vision and mission of BSTD is to develop indigenous technologies by utilizing the bio-resources of North East India. During the period, the division is specifically engaged in R&D, particularly in the following areas-

- Soil microbiota for environmental care and development of PGPR-based Biofertilizer technology for alleviation of multi-stress of crops for sustainable agriculture.
- The elucidation and development of abiotic & biotic stress tolerance and genetic improvement of quality, nutrition and yield traits in plants using a range of cell biological, functional genomics and CRISPR/Cas-based genome engineering approaches.
- Bioremediation of crude oil contaminant soil and sludge degradation
- Understanding bacterial drug resistance and therapeutics development

Ongoing Projects

In-house, Grant in aid & Consultancy Projects

Project Title: **Exploration and Utilization of Bioresources for Socio-economic Upliftment of North East India**
Project No: **OLP-2081**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Ratul Saikia (PI), Dr C Chikkaputtaiah, Dr Anil Kumar Singh, Dr Sachin R. Geed, Dr. Prachujya Dutta, Dr. Udita Basu, Mrs Archana Yadav, Dr Jyoti Lakshmi Hatiboruah, Mrs Polakshi Bordoloi, Ms Anita Kachari
Objectives:

- Microbial/plant resources characterization using multi-omics approaches
- Use of bioresources for various applications *viz*., agricultural, environmental, and health care prospects

Salient Achievements:

- ***Performance evaluation of a developed Consortium in lab-scale composting and slurry bioreactor for petroleum waste:*** A lab-scale study was conducted to evaluate the biodegradation of oily sludge using different combinations of oily sludge (10-40% w/w) with an isolated potential consortium. The maximum total carbon removal of 40.33% was achieved with 10% oily sludge. Subsequently, the biodegradation rate was enhanced in a slurry bioreactor using 10% oily sludge. The scalability of the process was assessed for crude oil biodegradation using the developed consortium in two different systems, STR and ALBR, achieving high removal rates of total petroleum hydrocarbons (TPH); 80.10% in STR and 76.41% in ALBR. Lab-scale composting and microcosm work of the developed technology for petroleum waste are ongoing to enhance its scalability for field applications. The performance of the developed consortium for crude oil/sludge biodegradation was evaluated in a 7L lab-scale bioreactor (**Fig.**). Further scalability of the developed consortium for large-scale applications is currently in progress.

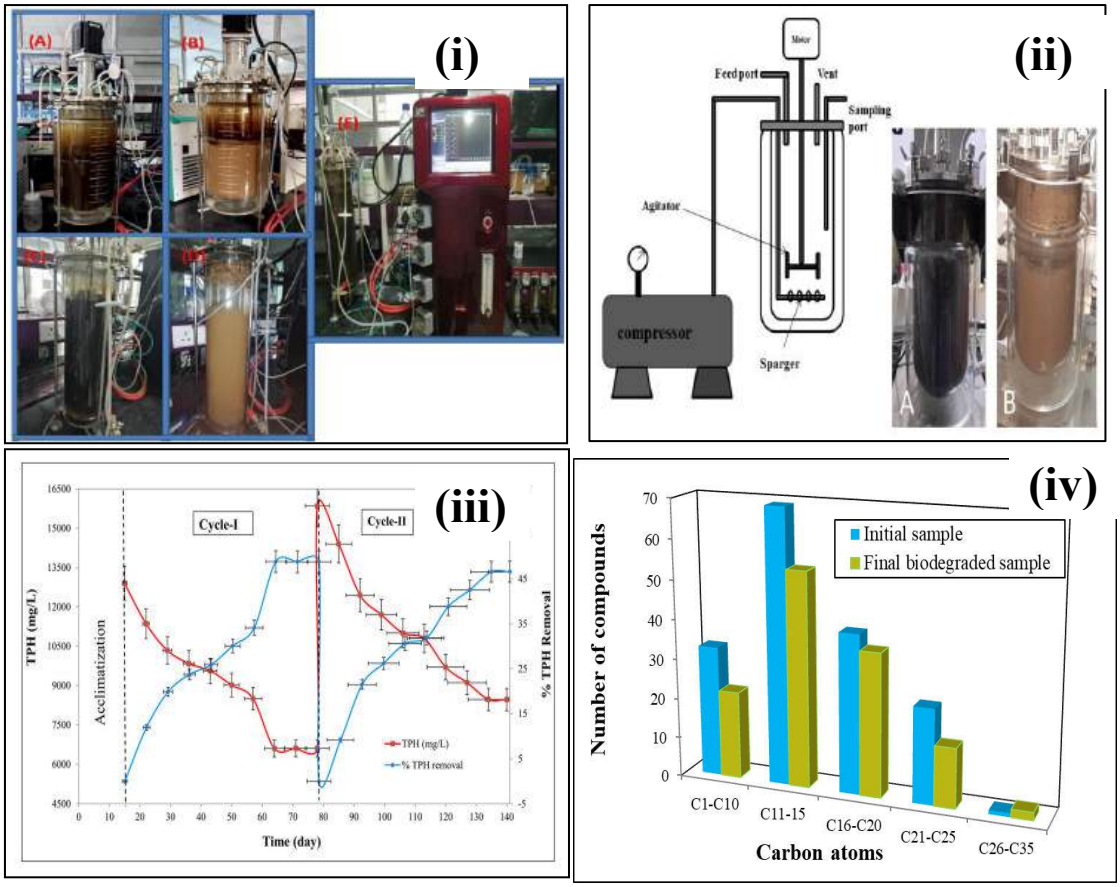


Fig. Performance Evaluation of Developed Consortium:(i) Bioreactor systems used for crude oil biodegradation: (A) Airlift bioreactor filled with 2% crude oil and consortia before startup, (B) Airlift bioreactor after the 10th day of the biodegradation experiment, (C) STR bioreactor before startup, (D) STR bioreactor after the 10th day of the biodegradation experiment, (E) complete bioreactor setup. (ii) Slurry bioreactor used for oily sludge biodegradation: (A) before treatment (15th day) and (B) after treatment (140th day). (iii) Performance of slurry bioreactor for the treatment of oily sludge. (iv) GC-MS analysis of initial (before treatment) and final (after treatment) samples of the slurry bioreactor.

- ***Biochemical profiling of Mungbean plants inoculated with PGPR under NaCl-Induced Salt Stress:*** Plants are sessile organisms that have to deal with a plethora of environmental stresses primarily salt stress severely constraining their growth and reproduction. The utilization of plant growth-promoting soil microbiota has emerged as a promising approach to address the challenges associated with food security and sustainable agriculture in the face of climate change and diverse agricultural practices. In our recent investigations, we focused on the impact of environmental stresses on plant growth, particularly salt stress, and the potential role of plant growth-promoting rhizobacteria in mitigating these effects. Our study compared the effects of inoculating rhizospheric soil with *Bacillus subtilis* JPR79 or *Pseudomonas aeruginosa* on plant growth under NaCl-based saline conditions. Preliminary results revealed that *B. subtilis* JPR79 significantly enhanced various plant growth parameters compared to non-inoculated stressed plants and those inoculated with *P. aeruginosa*. Notably, at salt concentrations of 60 mM and 120 mMNaCl, total chlorophyll content in plants inoculated with *B. subtilis* JPR79

increased by 48.2% and 41.8% respectively, compared to control plants. In contrast, *P. aeruginosa* inoculated plants showed lower increases of 22.6% and 16.9% at the same salt concentrations. Furthermore, *B. subtilis* JPR79 inoculation led to notable improvements in fresh weight (21% and 53.33%), dry weight (48% and 133%), and relative water content (10% and 8.4%) at 60 mM and 120 mMNaCl concentrations, respectively, compared to control plants **(Fig.**). These findings underscore the potential of *B. subtilis* JPR79 in promoting plant resilience to salt stress, offering a promising strategy for enhancing agricultural sustainability and food security in the face of climate change (Kumar *et al*., 2023, ***Environment & Experimental Botany***).

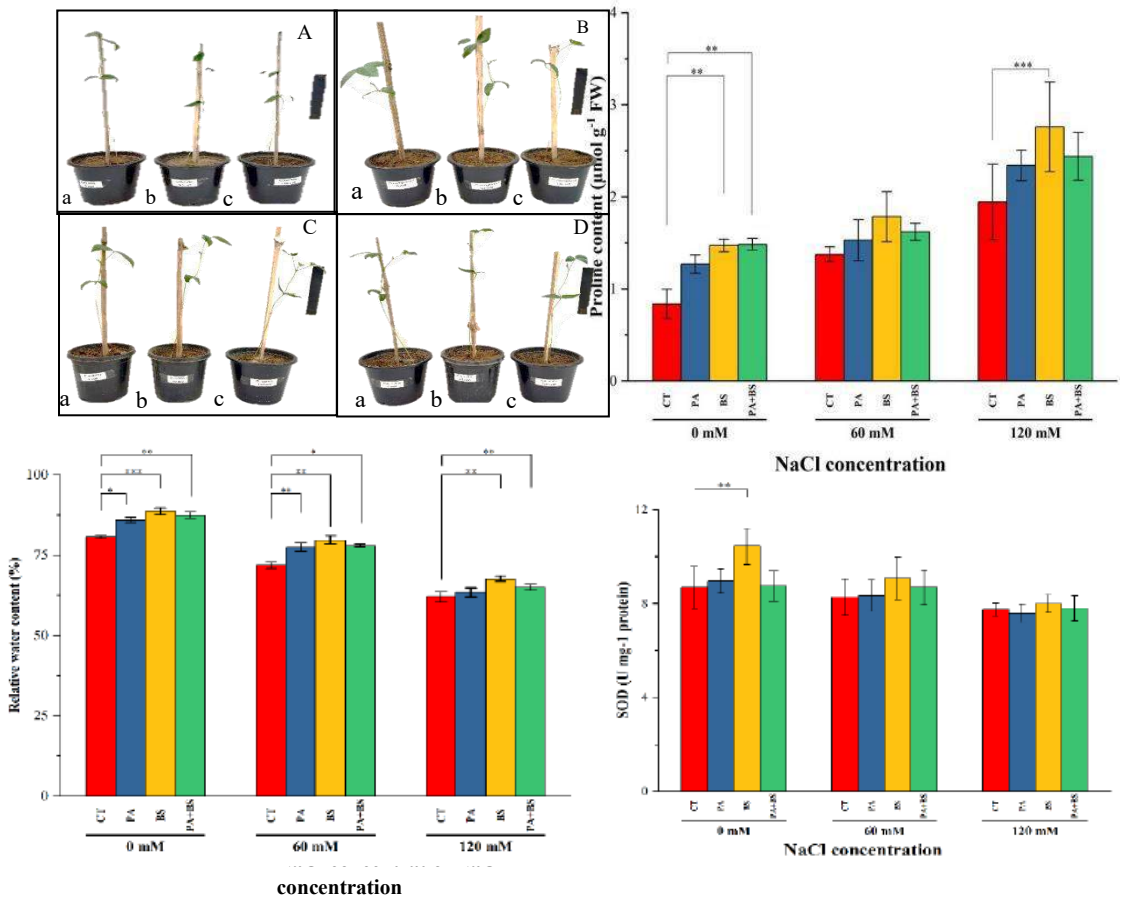


Fig. Effect of PGPR inoculation on plant growth promotion attributes under NaCl-induced salt stress. (A) CT: control; (B) PA: *P. aeruginosa*; (C) BS: *B. subtilis*; (D) PA+BS: co-inoculation of B and C; (a) 0 mMNaCl; (b) 60 mMNaCl; (c) 120 mMNaCl.

- ***Systemic resistance induced by rhizobacteria in BhutJolokia (Capsicum chinense Jacq.) suppressed the collar rot disease:*** Collar rot disease caused by *Rhizoctoniasolani*is a major constraint to the commercial cultivation of BhutJolokia (*Capsicum chinense*Jacq.) in North-East India. However, the management of the disease is not addressed comprehensively in this plant. Some plant growth-promoting rhizobacteria (PGPR) can control plant diseases by triggering induction of resistance systemically, and emerge as a highly promising approach to reduce the use of chemical fungicides. In this study, five selected PGPR strains were tested for plant growth promotion and induced systemic resistance (ISR) for controlling the disease. Salicylic acid (SA) is a phytohormone

and activates the immune system in plants against various diseases, but very less is known about its function as a signaling molecule specifically for systemic acquired resistance (SAR) or ISR. The application of the specific PGPRs was found to augment the ISR in BhutJolokia plants and led to increase SA content in the plant **(Fig.).** The rise in SA significantly reduced necrosis, chlorosis, and collar rot symptoms in plants, effectively inhibiting the mycelial growth and sporulation of the pathogen, *Rhizoctoniasolani*. In split root techniques, it was observed that more SA was accumulated in root tissues at the bacterized site compared to the non-bacterized side, and reduced after 45th day. Quantification of SA production in PGPRs and induced plants was carried out and found that the bacterial strains produced more SA than in induced plants. Expression of the defense-related geneswas analyzed which were highly expressed in ISR plant. Microscopic observation revealed that no internal changes occurred in PGPR treated plant cells similar to the untreated plant, that indicated no harmful effect of the bacteria in the host cell.The present study insights into the induction of SA using the PGPRs to control fungal diseases in BhutJolokia during ISR. This study demonstrates the possible application of the PGPR strains as a biocontrol agent for sustainable management of the disease (Gogoi*et al.,* ***ScientiaHorticulturae****).*

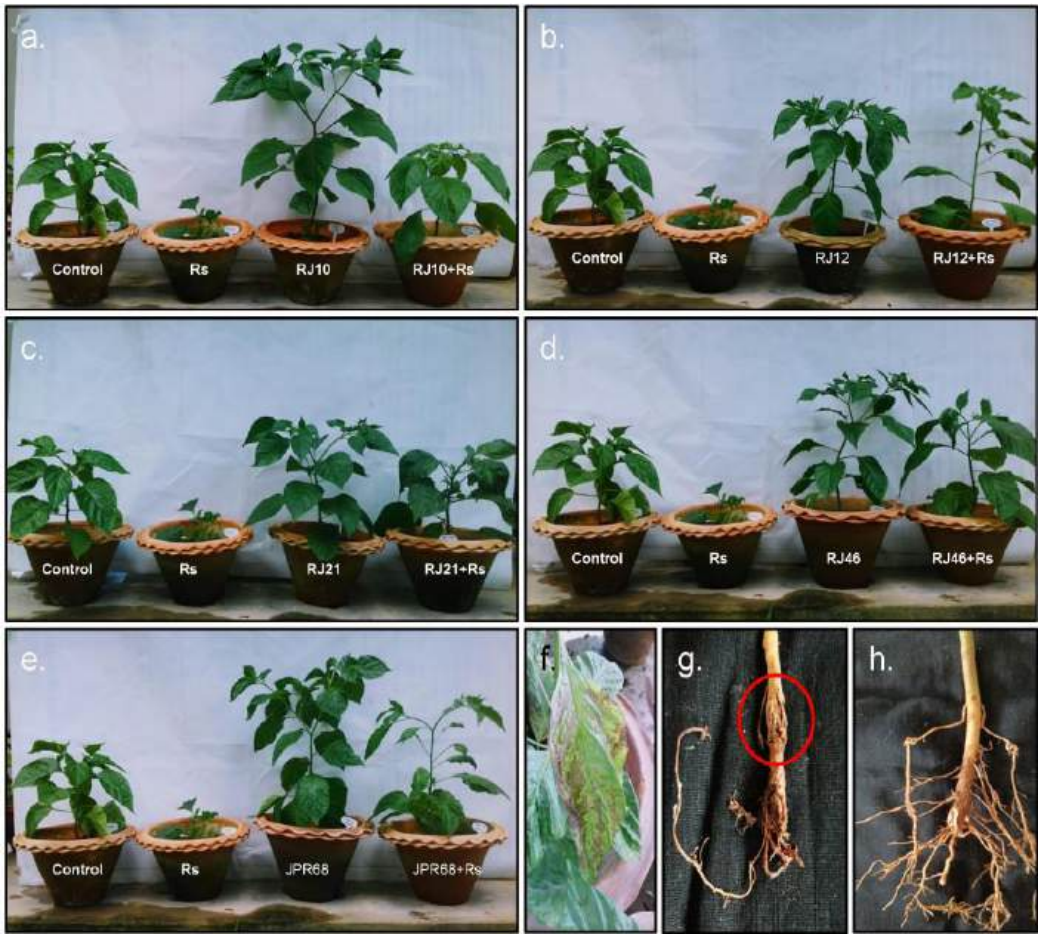


Fig. Induced systemic resistance in BhutJolokia plant against *Rhizoctoniasolani* (Rs).a. Control, Rs, RJ10, RJ10+Rs; b. Control, Rs, RJ12, RJ12+Rs; c. Control, Rs, RJ21, RJ21+Rs; d. Control, Rs, RJ46, RJ46+Rs; e. Control, Rs, JPR68, JPR68+Rs; (*Rhizoctoniasolani*-Rs,*Serratia nematodiphila*-RJ10, *Ochrobactrum pseudogrignonense*-RJ12, *Serratiaureilytica*- RJ21, *Bacillus subtilis*- RJ46 and *Bacillus*

megaterium-JPR68); f-g. Symptoms such as leaf lesions and collar rot were observed in pathogen stress plants; h. Healthy collar region/basal stem of pathogen stressed plant treated with PGPR. RJ+Rs: PGPR (RJ) pre-treated plant challenged inoculated with the pathogen, Rs.

- ***CRISPR/Cas9-based genome editing and functional analysis of SlHyPRP1 and SlDEA1 genes of Solanumlycopersicum L. in imparting genetic tolerance to multiple stress factors:*** *Solanumlycopersicum* L. is an economically important crop, but its yield and productivity have been severely impacted due to different abiotic and biotic stresses. The recently identified *SlHyPRP1* and *SlDEA1* are two potential negative regulatory genes in response to different abiotic (drought and salinity) and biotic stress (bacterial leaf spot and bacterial wilt) conditions in *S. lycopersicum* L. The present study aimed to evaluate the drought, salinity, bacterial leaf spot, and bacterial wilt tolerance response in *S. lycopersicum* L. crop through CRISPR/Cas9 genome editing of *SlHyPRP1* and *SlDEA1* and their functional analysis. The transient single- and dual-gene *SlHyPRP1* and *SlDEA1* CRISPR-edited plants were phenotypically better responsive to multiple stress factors taken under the study. The study reveals that the combined loss-of-function of *SlHyPRP1* along with *SlDEA1* is essential for imparting significant multi-stress tolerance (drought, salinity, bacterial leaf spot, and bacterial wilt) in *S. lycopersicum* L. The main feature of the study is the detailed genetic characterization of *SlDEA1*, a poorly studied 8CM family gene in multi-stress tolerance, through the CRISPR/Cas9 gene editing system. The study revealed the key negative regulatory role of *SlDEA1* that function together as an anchor gene with SlHyPRP1 in imparting multi-stress tolerance in *S. lycopersicum* L. **(Fig.)**. With these upshots, the study's key findings demonstrate outstanding value in developing sustainable multi-stress tolerance in *S. lycopersicum* L. and other crops to cope with climate change (Saikia*et al.,*2024, ***Frontiers in Plant Science***).

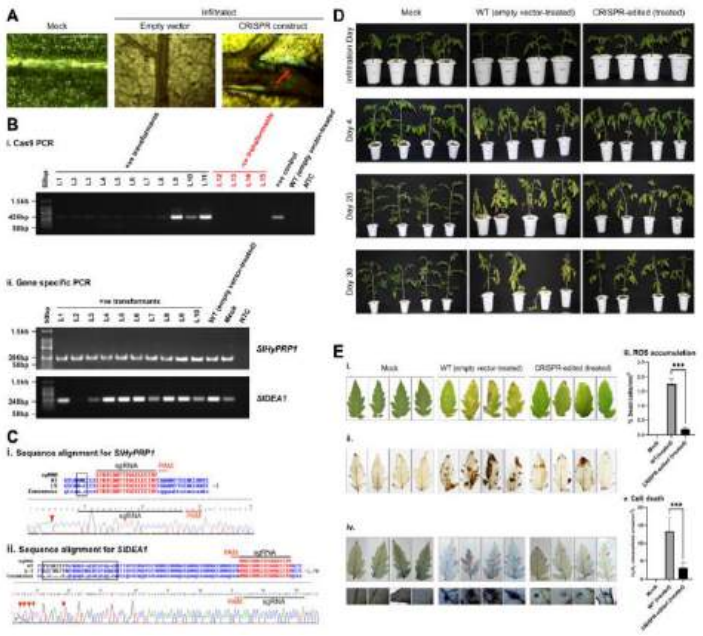


Fig. Bacterial leaf spot stress response study of CRISPR transformants of *SlHyPRP1* and *SlDEA1.* (A) GUS and molecular confirmation of CRISPR transformants of SlHyPRP1 and

SlDEA1 leaves. (B) Primary confirmation of dual-gene CRISPR transformants through PCR using Cas9 primers. (C) Sanger sequencing alignment of the gel-purified products of *SlHyPRP1* (i) and *SlDEA1* (ii) genes showing base substitution and deletion. (D) Phenotypic analysis of transiently transformed *S. lycopersicum* L. seedlings grown and exposed to *X. campestris*pv. vesicatoria. (E) Visualization (photographic) of *X. campestris*pv. *vesicatoria*-infected 1-month-old leaves of WT (empty vector-treated) and CRISPR-edited (treated) plants.

- ***Unraveling the role of effector proteins in Bipolaris oryzae infecting North East Indian rice cultivars through time-course transcriptomics analysis.:*** *Bipolarisoryzae*, causing brown spot disease in rice, is one of the neglected diseases reducing rice productivity. Limited knowledge is available on the genetics of host-pathogen interaction. Here, we used time-course transcriptome sequencing to elucidate the differential transcriptional responses of the pathogen genes in two contradictory infection-responsive rice hosts. Evaluation of transcriptome data showed similar regulation of fungal genes within susceptible (1733) and resistant (1846) hosts at an early stage however, in the later stage, the number was significantly higher in susceptible (2877) compared to resistant (1955) hosts. GO enrichment terms for upregulated genes showed a similar pattern in both the hosts at an early stage, but in the later stage terms related to degradation of carbohydrates, carbohydrate transport, and pathogenesis are enriched extensively within the susceptible host (**Fig.**). Likewise, similar expression responses were observed with the secretory and effector proteins. Plant pathogenic homologs genes such as those involved in appressorium and conidia formation, host cell wall degradative enzymes, etc. were reported to be highly upregulated within the susceptible host. This study predicts the successful establishment of *B. oryzae* BO1 in both the host surfaces at an early stage, while disease progression only occurs in the susceptible host in later stage (Singh et al., 2023, ***Fungal Biology***).

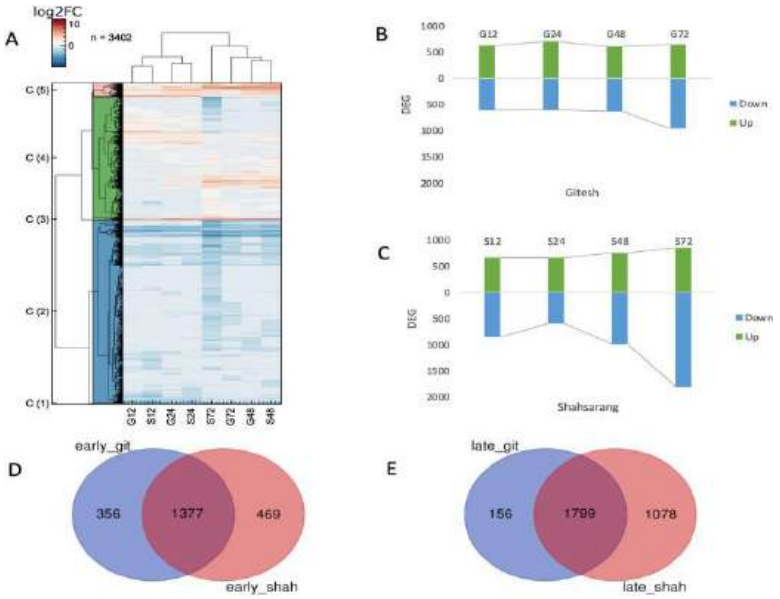


Fig. Expression trend of *B. oryzae* genes in Gitesh and Shahsarang rice host. (A) A Heatmap of all differentially regulated genes (3402 genes) in each time points shows early-stage samples forming one cluster and later-stage sample forming another cluster.

(B) Trend of regulated genes in resistant (Gitesh) host cultivar. (C) Trend of regulated genes in resistant (Shahsarang) host cultivar. (D) Number of genes intersecting in early-stage between resistant and susceptible host. (E) Number of genes intersecting in late-stage between resistant and susceptible host.

- ***Screening for brown-spot disease and drought stress response and identification of dual-stress responsive genes in rice cultivars of Northeast India:*** Rice cultivation in Northeast India (NEI) primarily relies on rainfed conditions, making it susceptible to severe drought spells that promote the onset of brown spot disease (BSD) caused by *Bipolarisoryzae*. This study investigates the response of prevalent NEI rice cultivars to the combined stress of drought and *B. oryzae* infection. Morphological, physiological, biochemical, and molecular changes were recorded post-stress imposition. Qualitative assessment of reactive oxygen species through DAB (3,3-diaminobenzidine) assay confirmed the elicitation of plant defense responses. Based on drought scoring system and biochemical analyses, the cultivars were categorized into susceptible (Shasharang and Bahadur), moderately susceptible (Gitesh and Ranjit), and moderately tolerant (Kapilee and Mahsuri) groups. Antioxidant enzyme accumulation (catalase, guaiacol peroxidase) and osmolyte (proline) levels increased in all stressed plants, with drought-tolerant cultivars exhibiting higher enzyme activities, indicating stress mitigation efforts. Nevertheless, electrolyte leakage and lipid peroxidation rates increased in all stressed conditions, though variations were observed among stress types. Based on findings from a previous transcriptomic study, a total of nine genes were chosen for quantitative real-time PCR analysis. Among these, *OsEBP89* appeared as a potential negative regulatory gene, demonstrating substantial upregulation in the susceptible cultivars at both 48 and 72 hours post-treatment (hpt) (**Fig.**). This finding suggests that *OsEBP89* may play a role in conferring drought-induced susceptibility to BSD in the rice cultivars being investigated (Das *et al*., 2024, ***Physiology and Molecular Biology of Plants***).

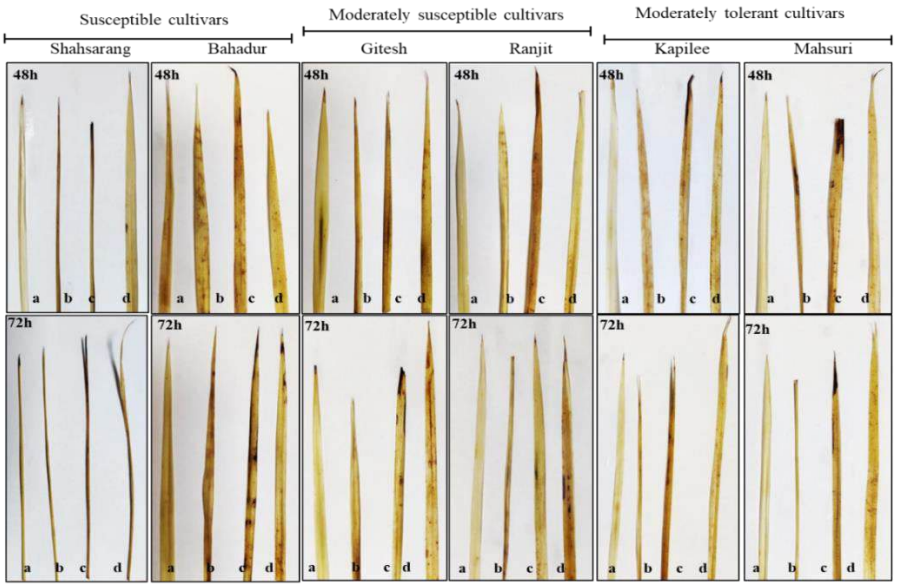


Fig. Histochemical DAB Assay for monitoring the effects of single (Drought, BSD) and dual stress (Drought-induced BSD). The various stress regimes are depicted as (a) Control (b) Drought (c) BSD (d) Dual stress (Drought-induced BSD).

- **Identifying beta-lactamase diversity in resistant bacterial strains for rapid differential diagnosis:** β-Lactam antibiotics, widely used to treat various bacterial infections, including both Gram-negative and Gram-positive strains, function by binding to the Penicillin-binding protein (PBP) involved in bacterial cell wall synthesis, thereby inhibiting cell wall formation and causing cell death. However, their pervasive use has led to increased bacterial resistance. Bacteria can resist β-lactam antibiotics through mutations in the *pbp* gene, reducing PBP's affinity for these antibiotics, or by producing enzymes that degrade the β-lactam ring. The latter, a significant concern for global health, involves nearly 3,650 unique enzymes capable of targeting multiple β-lactam antibiotics. These resistance enzymes, originally from environmental bacteria, have evolved to counteract the widespread use of β-lactam drugs. The study involves the characterization and classification of these enzymes and understanding their evolutionary phylogeny **(Fig.).**

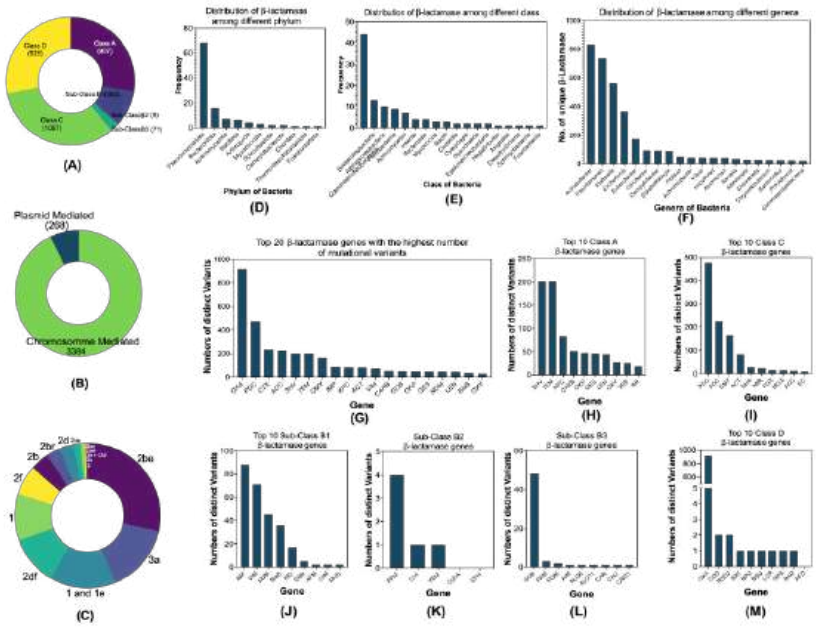


Fig. The figures (A-C) collectively depict the distribution and diversity of β-lactamase enzymes. Where (A) the overall distribution of genes in four Molecular classes and subclasses, (B) the distribution of β-lactamase genes into chromosomes and plasmids, and (C) the distribution of genes based on the new functional phenotype-based classification. (D-G) shows the overall distribution of genes in various bacterial genera, phyla, and classes, highlighting significant variations. (D) bar chart listing the β-lactamase gene distribution among different phyla with the most mutational variants, (E) bar chart showing the β-lactamase gene distribution among top 20 class, (F) unique β-lactamase enzymes across various bacterial genera. The genera are listed on the x-axis, while the number of unique enzymes is indicated on the y-axis, (G) bar chart displaying the top 10 Class A β-lactamase genes by the number of distinct variants. (H-M) shows the distribution of the top 10 β-lactamase genes for different Molecular classes and sub-classes.

- **Decoding the regulators of host-virus interaction using infectious clones of begomoviral strain causing leaf curl disease in *Capsicum* in North East India:** A thorough screening in Jorhat district has identified leaf curl disease-like symptoms in BhutJolokia plants (**Fig.A**). Leaf samples were collected from infected plants and tested for the presence of begomovirus using virus-specific degenerate primers to amplify DNA A, DNA B and beta satellite genomes of begomoviruses (**Fig.B**). Among the seven infected samples screened, one was identified as infected with begomovirus. Screening and sequencing of the amplicons identified the virus as Tomato leaf curl Joydebpur virus with DNA A and beta satellite genomic components **(Fig.C**). The virus has a monopartitte genome with DNA A (2.7 kb) and a betasatellite (1.3 kb). Infectious clones have been developed for the viral strain by cloning the 1.4x genome of DNA A and betasatellite into binary vector pCAMBIA2301 using restriction enzyme-based approach**(Fig.D)**. The infectious clones are currently being evaluated for their efficiency in causing leaf curl symptoms in chilli plants including *Capsicum annuum*, *C. chinense* and *C. frutescens*. Analysis of publicly available RNAseq dataset has also identified probable role of auxin signalling pathway gene and glutaredoxin in host-virus interactions in *C. annuum*. Further characterization of these regulators will shed some light into their role in plant immune response against begomoviruses.

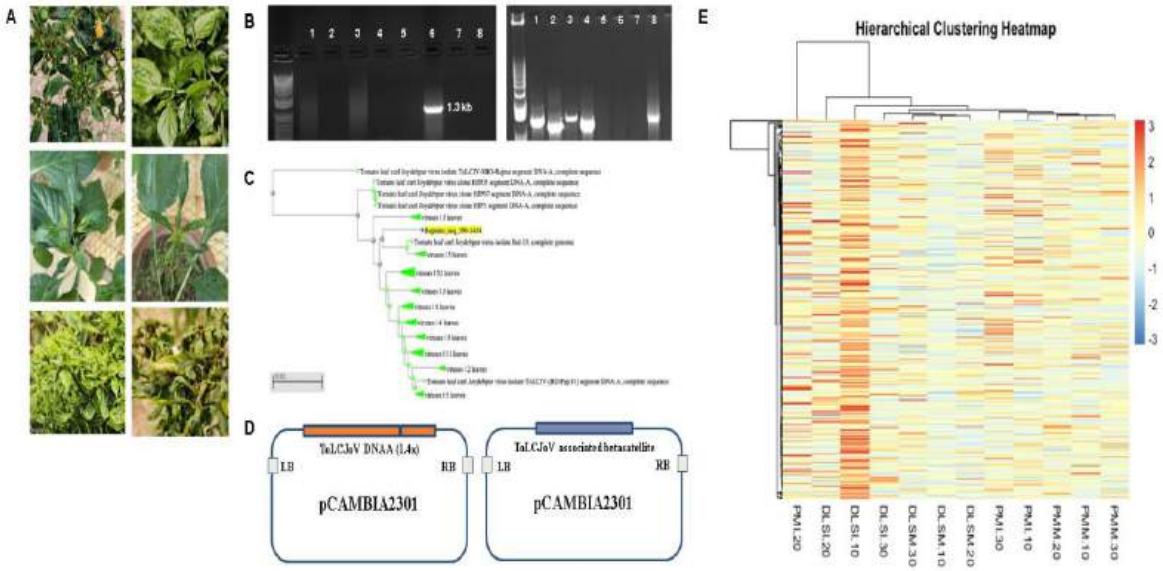


Fig. A. The infected plant samples from nearby field showing various degree of disease phenotype. **B.** Screening of begomovirus genome sequence in infected plant samples. (i)The sixth lane of the agarose gel image confirms the presence of begomovirus. (ii) The first four lanes confirm the various fragments of DNA A, the lanes 5-7 exhibits the absence of DNA B genomic fragments while presence of betasatellitegenome is confirmed in lane 8. **C.** The viral genome both DNA A and betasatellite has been sequenced and phylogenetic analysis confirms the sequence to be Tomato leaf curl Joydebpur virus. **D.** Vector map of infectious clones of Tomato leaf curl Joydebpur virus with1.4x genome of DNA A and betasatellite cloned into binary vector pCAMBIA2301. **E**. Heatmap exhibiting genes highly upregulated in resistant variety compared to susceptible chili line during chili leaf curl disease.

- **Development of insect protein hydrolysate from the pupae of a common edible insect*Antheraeaassamensis,* and evaluation of its inflammation activity in cell culture based model:** In the present study, comprehensive protein extraction from pupal samples was executed, succeeded by a hydrolysis process employing the endopeptidases pepsin and pancreatin, both of which are naturally occurring under standard physiological conditions. It is crucial to emphasize that bioactive peptides present in Protein Hydrolysate (PH), characterized by their lower molecular weight profiles, possess the capacity to penetrate the intestinal lumen and engage directly with selective cell surface receptors. Moreover, previous studies reported anti-inflammatory peptides, which have lower molecular weights derived from egg white (Zhang *et al*., 2019) and a commensal bacterium (*Faecalibacteriumprausnitzii*) (Quevrain*et al*., 2016). These findings underpin the rationale for selecting PH-containing bioactive peptides, sourced from *A. assamensis* pupae, characterized by molecular weights less than to 30 kDa. The protein content of the Muga pupae is 47.268 g/100g. The protein content of the hydrolysates treated with pep+pan, pan, pep are 37.625 g/100g, 48.839 g/100g and 46.553 g/100g respectively. The protein content of PH passed through molecular cut is 38.008 g/100g, 31.366 g/100g and 32.3482 g/100g, respectively. The gel of SDS-PAGE showed a number of bands ranging from 75 to 15 kDa in the PH obtained by PEP + PAN hydrolysis. Furthermore, the gel provided evidence that a higher number of peptides with lower molecular weight were generated after hydrolysis with two enzymes (PEP + PAN) compared to single **(Fig.A).** Further, we analyzed the free radical scavenging activity of PH in cell-free systems as **Fig. (B, C and D).**

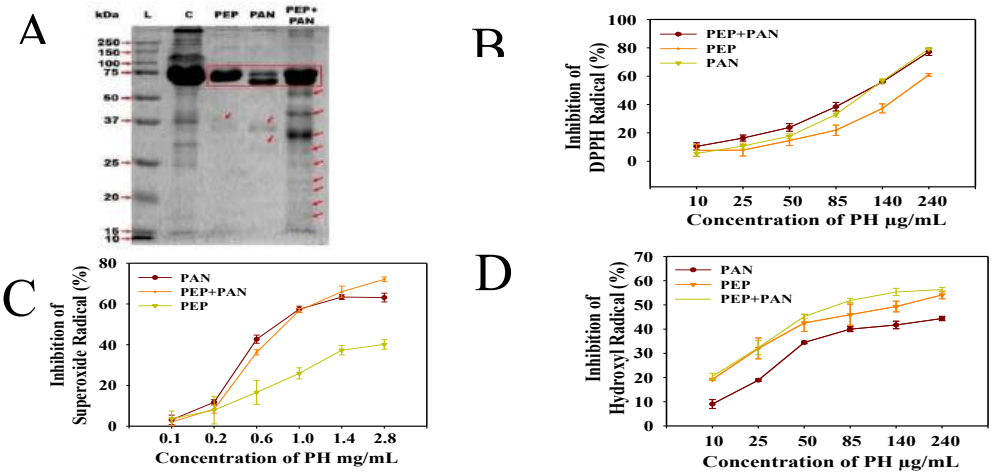


Fig. (A) SDS PAGE of PH obtained by pepsin (PEP), pancreatin (PAN), and PEP + PAN digestion, red arrows indicate the peptide bands that were produced after hydrolysis; (B) DPPH, (C) Superoxide and (D) Hydroxyl radical scavenging activity of PH produced by PEP, PAN and PEP + PAN digestion and passing through 30 kDa MWCO membrane.

Project Title: **Biofertilizer for Yield Enhancement in Normal to Water Stress Conditions for Entrepreneurship Development**

Project No: **GPP-377**

Funding Agency: Department of Biotechnology (DBT), Govt. of India

PI & Members: Dr Ratul Saikia (PI), Dr Dipankar Neog, Dr C. Chikkaputtaiah, Dr Anil Kumar Singh, Er. J J Borah, Dr Jatin Kalita, Dr Rituraj Konwar, Er. T H Ahmed, Dr Himangshu K. Borah, Mrs. Archana Yadav

Objectives:

- To optimize and scale-up the PGPR strain(s) in 600 L Bioreactor from already optimized in 100 L Bioreactor.
- Training, Demonstration of the Technology for Entrepreneurship Development.

Salient Achievements:

- Eight numbers of bioreactor for the multiplication/production of OP-12 Biofertilizer had already been supplied and installed in the all the states of North-East India. The hands-on training for OP-12 biofertilizer production was provided to- i.SIRD-Meghalayaon 15th -16th May 2023,ii. NEIST-Branch Laboratory-Itanagar, on 5th-6th June, 2023, iii. Organic KrishiSewa Gut (Self Help Group), Ghilamora, Lakhimpur, Assam,on 7th -8th June, 2023, iv. SIRD-Sikkim, Jorethangon 21-22nd Nov., 2023, v. SIRD, Kohima, Nagalandon 10 -11th October, 2023, vi. Department of Forestry & Biodiversity, Tripura University on14–15thDec., 2023, iv.M/S Amrit Organic, Duliajan, Assam. Additionally, Biofertilizer application-cum- awareness programs were conducted at these sites. Biofertilizer packets (1.5 Kg/packet) were distributed to each of the participants which were produced in the training itself.

SIRD-Meghalaya (15-16th May, 2023) NEIST-BLIT, Itanagar (5-6th June, 2023)

Organic KrishiSewaGut (Farmer Cluster) Ghilamara, Assam (7- 8th June, 2023**)**

SIRD, Kohima,Nagaland (10 -11th Oct, 2023) SIRD-Sikkim, Jorethang,(21-22nd Nov,2023)

Department of Forestry & Biodiversity, Tripura University, Agartala (14 – 15thDec, 2023)

Fig. OP-12 Biofertilizer production facilities establishment-cum-training in the states of North-East India

Project Title: CRISPR/Cpf1 based Dual-Gene Editing Of *Osebp89* and *Oscrk10* Genes, and Molecular Genetic Analysis for Dual-Stress Tolerance to Brown Spot Disease-Drought in Indica Rice (North East Indian) Cultivar

Project No: GPP-416

Funding Agency: SERB, Govt of India

PI & Members: Dr Channa Chikkaputtaiah (PI), Dr N. Velmurugan (Co-PI), Dr Tridip Phukan (Co-PI)

Objectives:

- Stable genetic transformation of dual-gene CRISPR constructs of *OsEBP89* and *OsCRK10* into Indica rice (North East Indian rice cultivar) and molecular evaluation of CRISPR editing events of single and dual-gene transformants
- Phenotypic evaluation of single and dual-gene edited lines of *OsEBP89* and *OsCRK10* for dual-stress tolerance (GE_1) and understanding their*in vivo* protein-protein interaction
- Genetic evaluation of heritability of dual-gene CRISPR/Cpf1 editing events and stability of dual-stress (BSD-drought) tolerance in NE Indian rice cultivar under greenhouse conditions (GE_2)

Salient Achievements:

- The study has successfully generated CRISPR/Cas12a-based plant expression constructs of *OsEBP89* and *OsCRK10* genes through a three-way gateway-based recombination method. Understanding of molecular and genetic interaction between

OsEBP89 and *OsCRK10* genes in imparting dual-stress tolerance to brown-spot disease and drought is on-going in North East Indian rice cultivar Shahsarang.

Project Title: **To Improve the Efficiency of Genome Editing with CRISPR-Cas9 and- to Create Novel Sources of Epigenetic Variation in Plants**
Project No: **GPP-420**
Funding Agency: SERB, Govt of India
PI & Members: Dr Channa Chikkaputtaiah (PI), Dr N. Velmurugan (Co-PI), Dr Tridip Phukan (Co-PI)
Objectives:

- To improve the efficiency of CRISPR-Cas9 mediated genome editing in tomato using a high efficiency TRBO based delivery system
- Generate epigenetic knockout mutants through CRISPR – Cas9 mediated genome editing in tomato and rice for creation of epiRILs
- Generate epigenetic variants in tomato and rice via brief exposure of seedlings to inhibitors of histone deacetylases

Salient Achievements:

- The study has constructed the CRISPR/Cas9 cassettes to clone into TRBO vectors to target the *XSP10* gene in *Solanumlycopersicum*. The study has designed CRISPR-Cas9/Cpf1 sgRNAs for targeting *OsDDM1a*, *OsDDM1b,* and *OsDRM2* genes of *Oryza sativa* and *SlDDM1a*, *SlDDM1b* and *SlDRM2* genes of *S. lycopersicum* for CRISPR/Cas9 genome editing and CRISPR-i.

CHEMICAL SCIENCES & TECHNOLOGY DIVISION

The Chemical Sciences and Technology Division (CSTD) is a major multi-disciplinary division of CSIR-NEIST, Jorhat, devoted to frontline research in organic and natural product chemistry. This CSTD consists of two research groups, namely, Applied Organic Chemistry Group (AOCG) and Natural Products Chemistry Group (NPCG).

The Applied Organic Chemistry Group (AOCG) is dedicated to frontline research in basic & application-oriented organic chemistry. This group has been actively engaged in the area of bioactive molecules, with the main emphasis on the development of process/routes for drugs/drug intermediates and the synthesis of new molecular entities (NMEs).

The Natural Product Chemistry Group has been involved in the phytochemical investigation of selected traditionally reputed medicinal plants of the Northeastern region of India for drugs, pest management, and nutraceuticals. This group, during the last three decades of its existence, has investigated a large number of plants and isolated quite a few interesting molecules of different classes having novel structures and published ~ 500 research papers in peer-reviewed National and International journals. The department has filed a sizeable number of patents and developed several technologies, and transferred to private industries, as well.

Ongoing projects

Mission Mode Projects

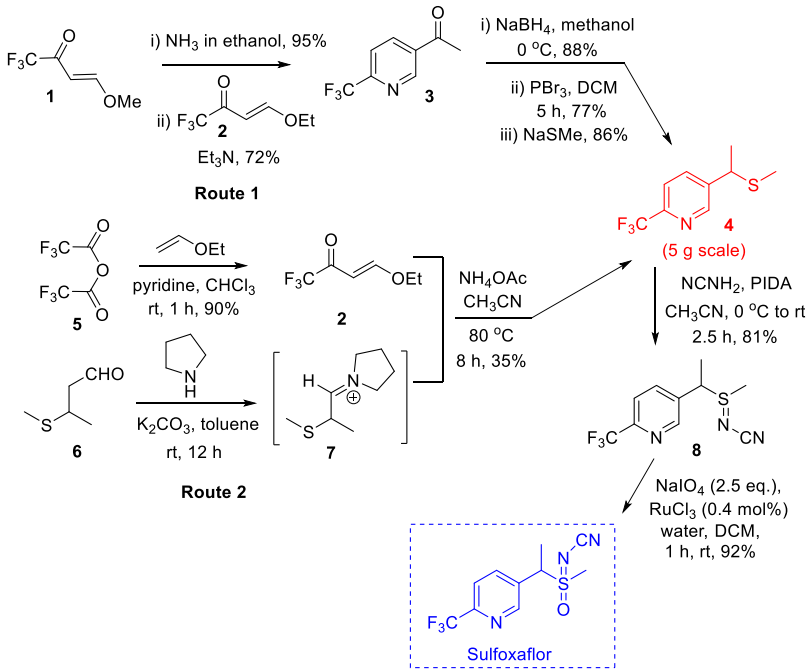
Project Title: **Innovative Processes and Technologies for Crop Protection Chemicals-Sulfoxaflor (Agromission-2)'**
Project No: **HCP-049**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Sanjib Gogoi (PI), Dr Pallab Pahari (Co-PI), Dr Pranjal Gogoi, Dr Ram A. Maurya , Dr A M Das
Objectives:

- Synthesis of sulfoxaflor through a cost-efficient process
- IPR and technology transfer

Salient Achievements:

- Sulfoxaflor is a systemic insecticide which acts as a neurotoxin against sap-feeding insects. EPA has approved the use of sulfoxaflor on alfalfa, corn, cacao, grains (millet, oats), pineapple, sorghum, teff, teosinte, tree plantations, and restored the uses on citrus cotton, cucurbits (squash, cucumbers, watermelons, some gourds), soybeans, and strawberries. According to the label, it poses no significant risk to human health and poses a lower risk to non-target wildlife, including pollinators, than other registered alternative products. Market size of sulfoxaflor was ~ $ 190 million during 2019-20. Corteva agriscience holds a modified patent which will be over by 2027. The original patent and modifications thereafter have already been expired. Consequently, in this project it is proposed to develop a non-infringing and economically viable process for sulfoxaflor.

- Worked on two alternative schemes for the synthesis of 5-(1-(methylthio)ethyl)-2-(trifluoromethyl)pyridine (**5**). In the first one, we started with vinyl ether **1**. Amination with ammonia, followed by reaction with unsaturated ketone **2,** produced pyridine **3**. A three-step reaction sequence consisting of keto reduction, hydroxy bromination, and thiolation produced the expected pyridine **4** in an overall 40% yield. Compound **4** has been prepared on a 5 g scale.



Scheme 1

- In the second method, we started with triflic anhydride and ethyl vinyl ether. The condensation reaction produced unsaturated ketone **2**, which was reacted with an intermediate imine **7**, prepared from thioaldehyde by reaction with proline. This reaction provided our required pyridine intermediate **4** in 35% yield. The pyridine **4** was then converted to sufoxaflor in two steps. The reaction of **4**with cyanamide and PIDA provided sufimine **8**, which, on oxidation with $RuCl_3$ and sodium periodate, produced the final compound.

Project Title: **Innovative Processes and Technologies for Crop Protection Chemicals-Fluopicolide (Agromission-2)'**

Project No: **HCP-049**

Funding Agency: CSIR, New Delhi

PI & Members: Dr. Subrata Ghosh (PI), Dr. Arup Roy (Co-PI), Dr. Gakul Baishya, Dr. Atul More , Dr. A M Das

Objectives:

- Development of Fluopicolide via an economically viable non-infringing process
- To use an Industry-friendly process that avoids high pressure set up
- To avoid toxic reagents like KCN

Salient Achievements:

- As a modern fungicide, fluopicolide exhibits a high level of activity against a range of omycete diseases in different crops such as potato, tomato, vines, brassicas, cucurbits, lettuce, onions, leeks, peppers, etc., and its spectrum can cover the most important genera of the orders Peronosporaceae and Pythiacae.
- The original patent and modifications thereafter have already expired or will be expiring very soon, making the fungicide ready for production by various companies. Consequently, an economical and commercially viable manufacturing process of fluopicolide was required to achieve sustainable growth in agriculture. Herein, The team are in the process of developing an economical and commercially viable Non-infringing manufacturing process for fluopicolide. Bence scale synthesis is complete. The team are now scaling up the process.

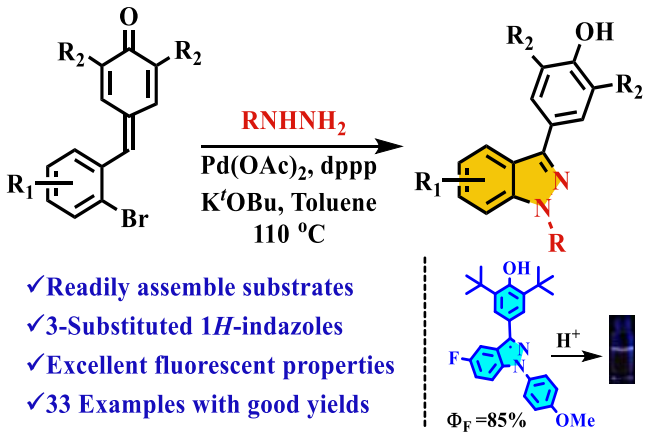
In-house, Grant in aid & Consultancy Projects

Project Title: **Natural Products/Phyto-Pharmaceuticals/Herbal Formulations/ New Chemical Entities for Value Addition**
Project No: **OLP-2045**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Archana Moni Das (PI)
Objectives:

- Bioassay guided extraction and isolation of secondary metabolites from selected medicinal plants against different diseases and phytochemical investigation of the active extracts for drug like molecules.
- Development of newer methods for the synthesis of natural products and bioactive molecules.
- Studies on Natural Product extracts for their phyto-pharmaceuticals, chemical profiling, identification of marker compounds and herbal formulations.
- Maintenance of the state-of-the-art equipment facilities and providing services.

Salient Achievements:

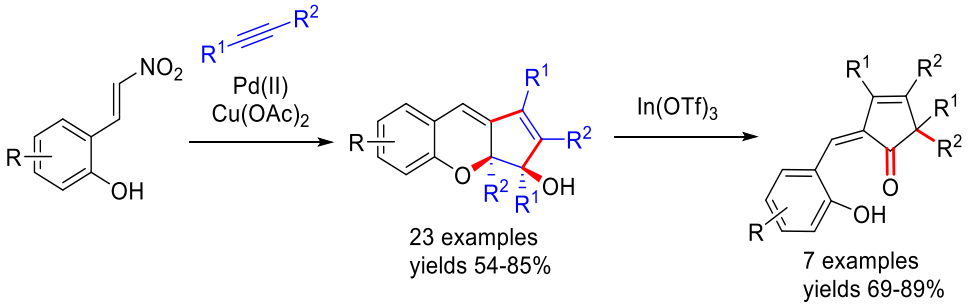
- Synthesis and Photo-physical Properties of 3-Substituted 1*H*-Indazoles:



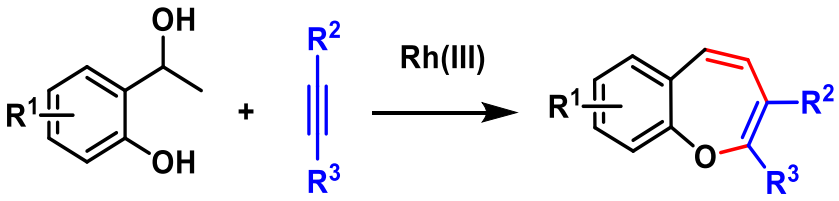
A Pd-catalyzed cascade process for the direct synthesis of 3-substituted 1*H*-indazole employing *p*-quinone methide (*p*-QM) and arylhydrazine through Pd-catalyzed double C-N bond formation via 1,6-conjugate addition is reported. This reaction strategy

affords efficient and practical access to synthetically important diverse 3-substituted 1*H*-indazoles in good yields. Photophysical properties of the synthesized 3-substituted 1*H*-indazoles are investigated and some of them showed very good fluorescence properties with quantum yields up to 85%. Also, the synthesized 3-substituted 1*H*-indazole exhibits acid-sensitive fluorescence turn-off activity.

- An unprecedented Pd(II)-catalyzed annulation reaction is developed for the synthesis of cyclopenta[*b*]chromane derivatives bearing tertiary hydroxyl group. In this reaction, readily available 2-(2-nitrovinyl)phenols are annulated with two molecules of disubstituted alkynes via denitration to afford a wide range of the annulated products. Additionally, one novel In(III)-catalyzed dehydroxylative 1,2-phenyl shift reaction is also performed on some of the synthesized chromane derivatives to afford cyclopentenones.

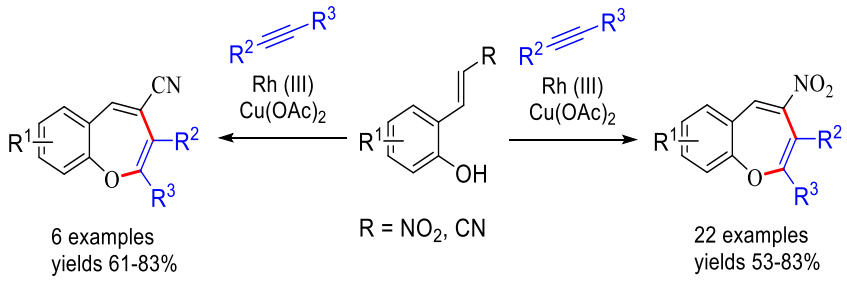


- An unprecedented (5 + 2)-cycloaddition reaction of *ortho*-hydroxyethyl phenol and internal alkyne was developed. This Rh(III)-catalyzed reaction provided benzoxepine derivatives which have very high biological significance. A wide range of *ortho*-hydroxyethyl phenols and internal alkynes were studied to provide the benzoxepines in high yields.

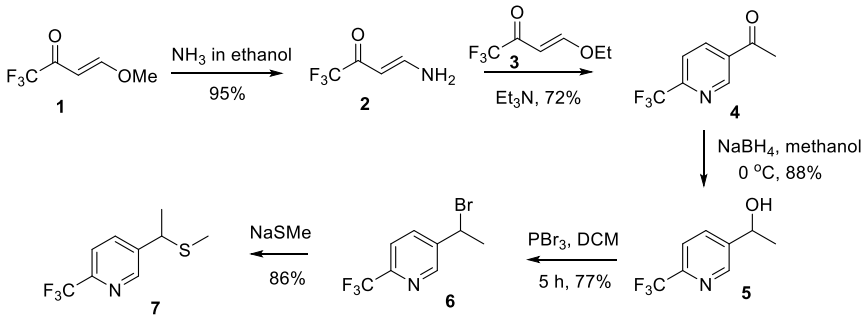


26 examples
up to 82% yield

- A Rh(III)-catalyzed annulation reaction of 2-(2-nitrovinyl)phenols and disubstituted alkynes is developed to complete the first synthesis of biologically important 4-nitro substituted benzo[*b*]oxepines. The same reaction conditions are also applied for the efficient synthesis of 4-cyano substituted benzo[*b*]oxepines which have high biological significance. Some of the synthesized 4-nitrobenzo[*b*]oxepines are easily transformed to triazole fused dibenzo[*b*]oxepines.

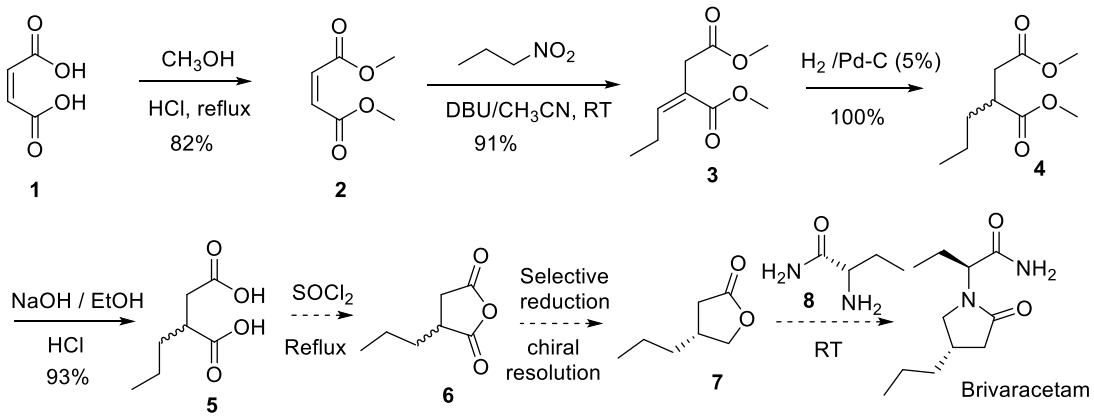


❖ Studies towards the synthesis of sulfoxaflor: We are working on developing a non-infringing synthetic route for sulfoxaflor, a systemic insecticide widely used in common vegetables like corn, grains, pineapple, tree plantations, citrus cotton, cucurbits, soybeans, and strawberries. Our process started with an attempt to synthesize a pyridine intermediate **7**, starting from triflic anhydride and methyl vinyl ether. The initial reaction produced vinyl ether **1**. Amination with ammonia produced enamine **2** which on reaction with unsaturated ketone **3** produced pyridine **4**. Reduction with borohydride produced **5**, which on bromination and thiolation produced the thiomethyl pyridine **7**. The final compound will be obtained by oxidation and condensation with cyanamide.



❖ Studies towards the synthesis of brivaracetam

We are working on developing a patentable synthetic route for brivaracetam, a third-generation antiepileptic drug, used for the treatment of POS. In our method, the reaction started with the esterification of maleic acid in methanol under acidic conditions. The product dimethyl maleiate was treated with 1-nitropropane in acetonitrile using DBU as a catalyst. The nitroaldol reaction gave the product **3** in 90% yield. Hydrogenation of the double bond using Pd-C gave the corresponding saturated product **4**. The saponification followed by acidification was carried out to get the diacid **5**. We are currently working on acid chloride-induced anhydride formation, which will provide the key intermediate 7 on selective reduction.



Project Title: **Enantioselective Synthesis of Spirocycles using Metal-Catalyzed Oxidative C-H Activation Reactions**

Project Title: **Cascade Enantioselective Ring Opening of Saturated Heterocycles: An Easy Access to Indomethacin, Euroticins, Agesamides, and their Analogs for Anti-Inflammatory and Cytotoxic Activity**

Project No: **GPP-409**

Funding Agency: SERB-Department of Science & Technology (DST), Govt. of India

PI & Members: Dr Atul A. More (PI)

Objectives:

- The main objective of this project is to explore hypervalent iodine (III) species in halogen bonding organo-catalysis. So far only a few reports are made in this direction.
- In these directions, the design and develop a cascade enantioselective ring-opening of the saturated heterocycles using catalytically generated hypervalent iodine as a Lewis acid catalyst is proceeded.
- Another objective of the same project has set to activate metal-ligand bond through Lewis's acid-base interactions with I(III) species in a catalytic cycle of a three-component Tsuji-Trostallylation reaction. This has not yet started.
- Once new reaction gets validated, the screening of various nucleophiles such as indoles, fluoro, trifluoro, etc. to synthesize a library of molecules/scaffolds that enrich with these added nucleophiles will be carry out.
- The application of this proposal has to be directed toward the synthesis of indomethacin, euroticins, agesamides, and their fluorinated/trifluoromethylated analogs for anti-inflammatory and cytotoxic activity.

Salient Achievements:

- Explore hypervalent iodine (III) species in halogen bonding organocatalysis for cascade enantioselective ring-opening of the saturated heterocycles and metal-ligand bond activation through Lewis acid-base interactions with I(III) species in Tsuji-Trost allylation reaction. So far, then team have screened various nucleophiles, Lewis acids, and transition metals. The method optimization and mechanistic details for these proposed reactions are underway. The team disclose a decarboxylative functionalization of arylacetic acids and oxidant-free facile electrochemical oxidative de-aromative oxy-alkyl amidation of indoles.

Project Title: **Exploiting Bergenin and its Derivatives for Natural Product-Based Drug Discovery in Rheumatoid Arthritis - Unlocking Anti-Inflammatory and Antinociceptive Potential Targeting IL-6**

Project No:

Funding Agency: SERB-Department of Science & Technology (DST), Govt. of India

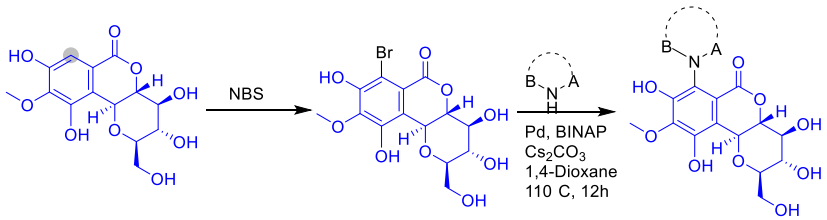
PI & Members: Dr Srinivas Ambala (PI)

Objectives:

- **Semi-Synthetic Modification of Bergenin:**
  - Implement semi-synthetic modifications of bergenin and its derivatives with bioisosteric alterations to enhance their pharmacological profile.
- **Pharmacological Potential Investigation:**
  - Investigate the pharmacological potential of bergenin and its derivatives for drug development targeting rheumatoid arthritis.
- **Biological Activity Enhancement:**
  - Assess and improve the biological activity of bergenin through a semi/diversity-oriented synthetic strategy.

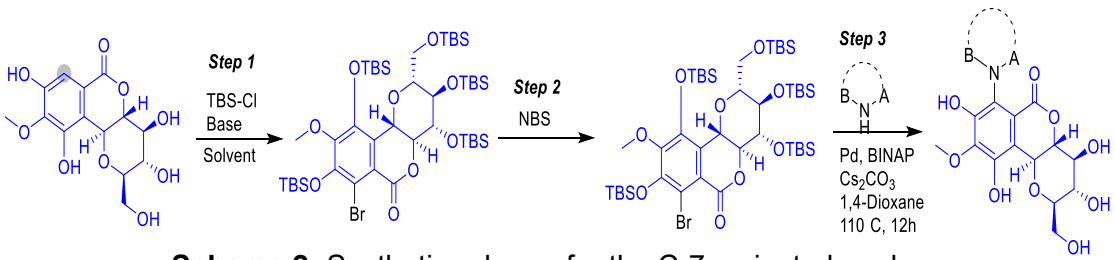
Salient Achievements:

- **New Compounds Synthesized:** We have initiated the new synthetic rout to synthesis a series of bergenin derivatives with enhanced pharmacological properties.



- **Scheme 2:** Synthetic scheme for the C-7 aminated analogs

- Polyhydroxy glycoside was directly treated with NBS to deliver bromo intermediated. unfortunately, the reaction failed to give the desired compound. Then we changed the scheme to protect the free hydroxy groups on bergenine with TBDMSCl under basic medium. The modified synthetic scheme is given below. Optimization studies are in progress for the below given scheme.



Scheme 2: Synthetic scheme for the C-7 aminated analogs

COAL AND ENERGY DIVISION

The Coal & Energy division is one of the leading research groups in the institute, working in the fields of coal sciences & technology and the energy-environment interface. Since its inception, the group has been engaged in resource quality assessment and the development of indigenous processes to optimize the utilization of NER low-grade, high-sulfur coals. Additionally, the division is involved in the quality assessment of coal resources, the development of carbon-based nanomaterials for energy applications, the utilization and transformation of biomass sources into valuable materials and chemicals, and various aspects of environmental issues, including participation in national emission inventories for this region. The division has a NABL accredited coal testing laboratory.

Brief achievement:

- **Testing & evaluation of coal samples for resource quality assessments:** Quality assessment of coal samples received from several Govt. and private parties through testing and evaluation through the coal testing laboratory leading to the generation of ECF as well as database.
- **Fabrication of pouch cell supercapacitors using abundant coal feedstock and their hybridization with Li-ion battery for e-rickshaw application:** The environmental concerns and market demands created high demands of electric vehicles (EVs), but still the energy storage systems are lagging behind the fuel-based vehicles. Even though recent development in battery technologies bring forth great opportunities for EVs, the necessity and a good supply chain of electrode materials, does not fulfill the requirement of EVs. In India, battery-operated e-rickshaws face challenges like insufficient charging facility, low driving range, high battery cost, battery replacement, and disposal. To address the power delivery issues, we have designed and developed an indigenous Hybrid Battery Management System (HBMS) using fabricated coal-based supercapacitors and commercial Li-ion batteries for application in an e-rickshaw. After implementing the developed hybridized battery management system (HBMS) in e-rickshaw, it showed the maximum speed of 45 km/h with additional power gain of 433 W. The analysis of data showed that the application of coal-based supercapacitors along with Li-ion battery had improved the overall performance of the e-rickshaw. Thus, this study has opened up a new venture of using abundant coal powder in fabricating low-cost pouch cell supercapacitor for using in EVs in a sustainable way that can influence the existing commercial battery market.

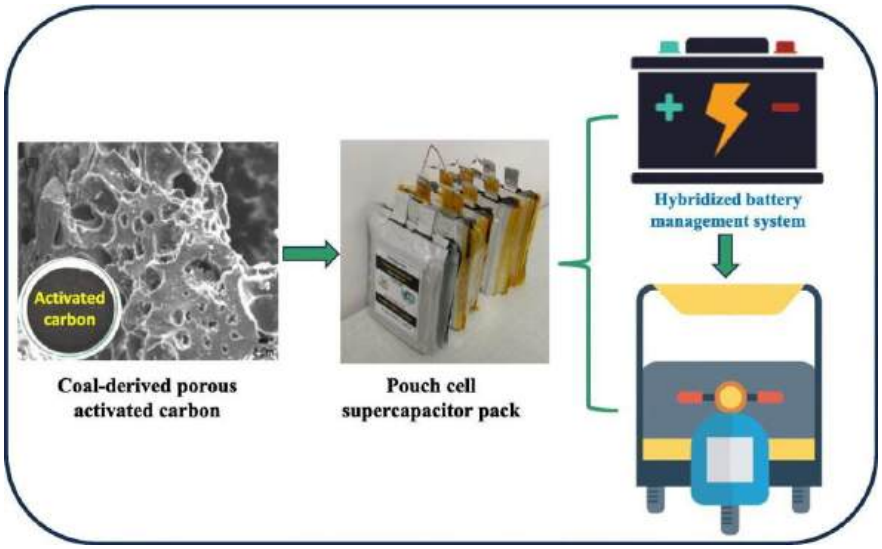


Fig. An advanced model of hybridized battery management system (HBMS) using coal-based pouch cell supercapacitors and Li-ion batteries for e-rickshaw applications. *Journal of Energy Storage. 78 (2024) 110312.*

- **Detection of fluoride ions using carbon quantum dots derived from coal washery rejects via a smartphone-based image-processing and machine learning approach:** Given the high toxicity and easy availability of fluoride ions in surface as well as ground water, an on–off–on fluorescence process-based fluoride ion sensor is developed by using highly fluorescent carbon quantum dots (CQDs) derived from coal washery rejects/waste coal (CWRs). The as-synthesized CQDs/Fe^{3+} was validated to be an excellent nanoprobe in aqueous conditions based on fluorescence quenching with high sensitivity towards F^- ions. The “turn off” fluorescence mechanism of the developed sensor (i.e., CQDs/Fe^{3+}) was investigated by using fluorescence quenching, TRPL (time resolved photoluminescence spectroscopy), XPS, and HR-TEM analysis. The developed CQDs/Fe^{3+} sensor was found to have promising applications in estimating trace F^- ions in real water samples with the working range of 0–20 ppm with a detection limit of as low as 0.3 ppm. The nanoprobe also shows high sensitivity of F^- ion detection in the presence of various anions, and was found to be non-toxic, environmentally benign, cheap, rapid, efficient, and most significantly selective. Furthermore, the nanoprobe was satisfactorily employed as a simple and alternative typical laboratory-based fluoride monitoring technique by using a smartphone based on image processing and machine learning approaches. CQDs will not only serve a significant role in fluoride diagnostic tools, but they are also safer and less hazardous than other conventional nanomaterials.

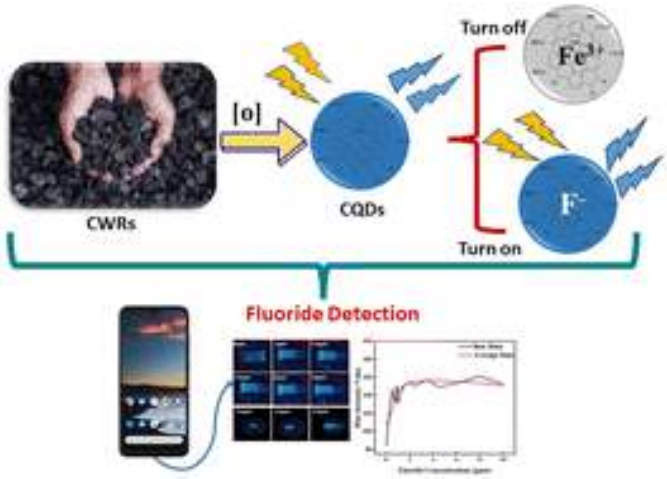


Fig. Determination of fluoride ions by the fluorescence spectroscopic technique and smartphone-based digital image processing. *New Journal of Chemistry, 48 (2024) 3862-3876.*

- **Waste-derived high-yield biocompatible fluorescent carbon quantum dots for biological and nanofertiliser applications:** Petroleum coke and kitchen tea residues are solid waste containing significant carbon contents. In this novel work, we have efficiently fabricated high quantum yield fluorescent carbon quantum dots (CQDs) from petroleum coke (Pet coke/PC) and kitchen tea residues (KTR) by using a simple and environmentally friendly process of chemical oxidation induced by ultrasonic energy. The cell-biology studies demonstrated their excellent biocompatibility with anti-cytotoxic, no significant reactive oxygen species (ROS) generation, and are non-genotoxic behaviors. Certain free radical scavenging activity was also observed, representing the presence of sensible antioxidant properties in the waste-derived CQDs. Further, the phytological investigation with Stevia rebaudiana plants demonstrates the promising potential of waste-derived CQDs to serve as a nanofertilizer, thereby enhancing plant growth. This study opens up a new avenue for gainful and sustainable utilization of industrial waste.

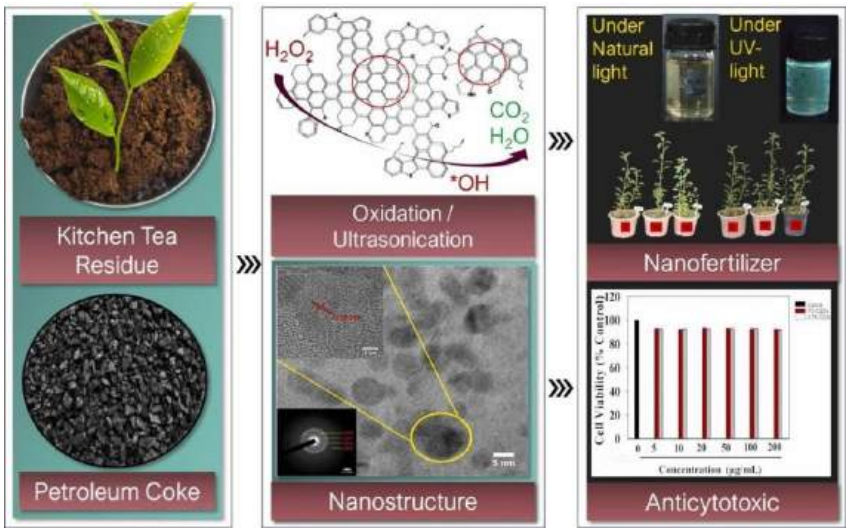


Fig. *In-vitro* cytotoxicity, genotoxicity, reactive oxygen species, and free radical scavenging activity of the synthesized CQDs along with the impact of the CQDs on phytotoxicity, plant

metabolites, and antioxidant properties.*Journal of Environmental Chemical Engineering. 11 (2023) 111344.*

- **Epoxidation and grafting route to prepare thin and flexible polymer film with high lignin content:** Recently, lignin has become one of the most important materials of interest in polymer development owing to its various properties, such as mechanical strength, renewability, and availability. However, a few well-known drawbacks, such as self-aggregation, low reactivity, low solubility, etc., have been limiting the large-scale application of lignin. Out of these drawbacks, the low reactivity of lignin has been stabilized as the primary cause behind the limited application. Therefore, in order to improve the lignin's reactivity, in this work, we have first incorporated the epoxy group by reacting with epichlorohydrin (ECH) to prepare epoxy lignin (EAcL). Excellent thin polymer film (≤250 microns thin) was successfully prepared from the Lig-g-PLA copolymers synthesized with higher EAcL (50 wt%) using the hydraulic hot press method. The DMA analysis showed that Lig-g-PLA copolymer films synthesized with higher LA concentration (EAcL:LA 1:4) showed higher mechanical strength and elastic response.

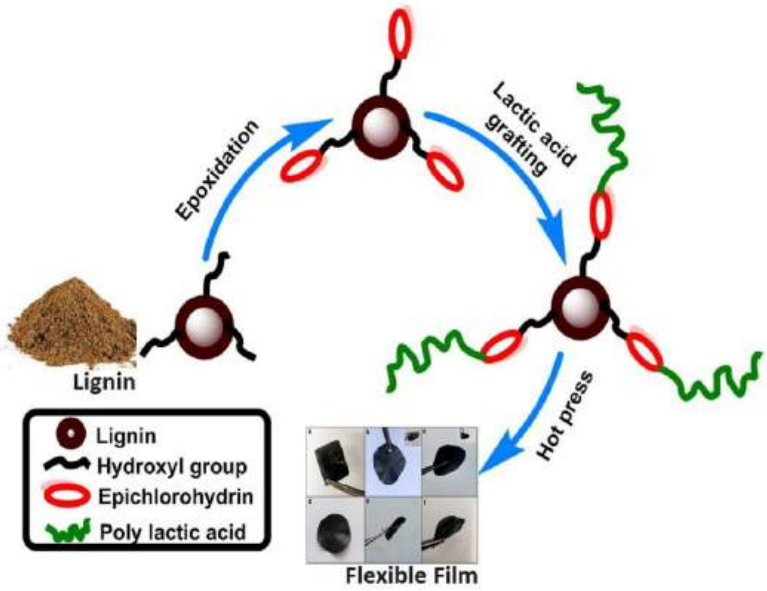


Fig. Method for the preparation of flexible lignin grafted polylactic acid copolymer film from lignin.

- **Metal catalyst-free selective acetosyringone synthesis from rice straw lignin:** In recent decades, due to abundance (second most abundant natural polymer after cellulose) and sustainability, lignin has attracted much interest from different researchers to use as a raw material for producing various value-added materials such as polymer and fuel. In addition to that, the aromatic structure of lignin makes it a suitable candidate for producing platform chemicals with aromatic rings. A green and cost-effective method was developed for the selective formation of acetosyringone via depolymerization of isolated rice straw lignin (RSL) by using metal catalyst-free conditions in the biphasic medium is demonstrated.

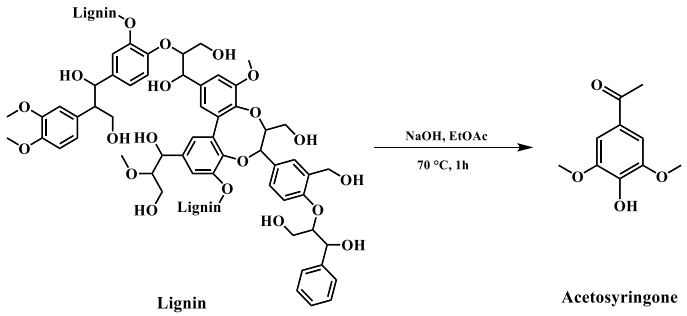


Fig. Depolymerization of rice straw lignin to synthesize acetosyringone.

- **Geochemical and petrological studies of high sulfur coal and overburden from Makum coalfield (Northeast India) towards mitigation of acid mine drainage:** Opencast coal mining produces trash of soil and rock containing various minerals, that are usually dumped nearby the abandoned sites which causes severe environmental concern including the production of acid mine drainage (AMD) through oxidation of pyrite minerals. In order to have a comprehensive overview of the AMD problem in Makum coalfield, the physico-chemical, geochemical, and petrological characteristics of the coal and overburden (OB) samples collected from the Makum coalfield (Northeast India) were thoroughly investigated. Pyrite (FeS_2) oxidation kinetics were studied by conducting the aqueous leaching experiments of coal and (OB) samples to interpret the chemical weathering under controlled laboratory conditions of various temperature and time periods, and to replicate the actual mine site leaching and further mitigation strategy.

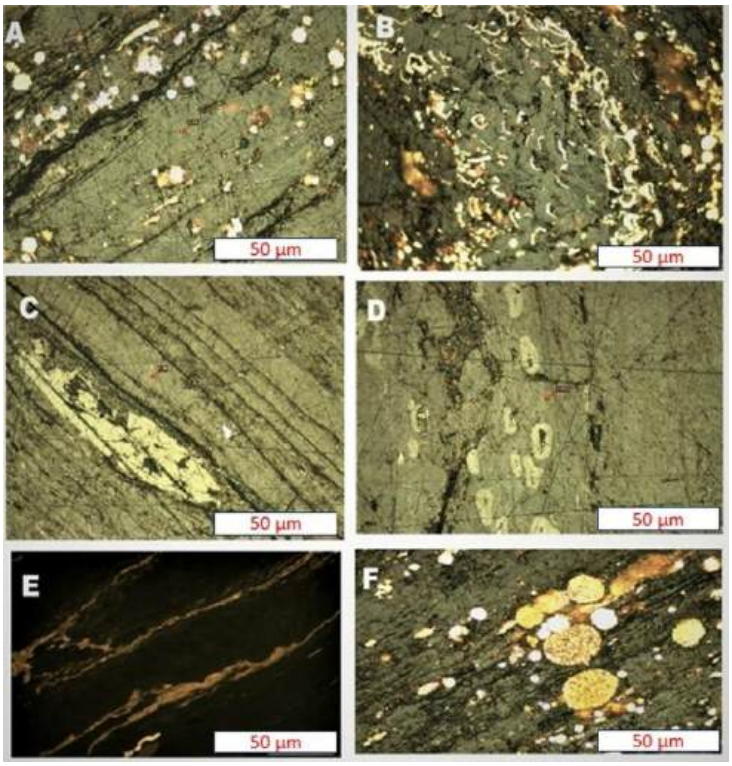


Fig. Macerals of Tirap colliery coals showingCollodetrinite and framboidal pyrites (in white light). *International Journal of Coal Science & Technology. 11(2024) 7.*

❖ **Geochemical and mineralogical evaluations of coal, shale, and mine waste overburden from Makum coalfield of the Northeast India:** The Cenozoic-age Makum coal from northeastern India offers numerous research opportunities because of its diverse geochemical and geological characteristics. Due to its high sulfur content, the coal has been found to be less useful for industrial purposes. So, the petrography study was used to better understand the process conditions of the coal in thermal plant and consequent environmental implications. According to the ICP-MS analysis, the samples indicate significant levels of rare earth elements including yttrium. The present study reveals higher concentrations of potential hazardous elements in the coal samples, with V, Cr, Ni, Cu, and Zn content in coal being considerably enriched compared to world-average concentrations. The correlation analysis reveals that the potential hazardous elements like Co, Ni, As, and Cu are associated with pyrite as they have strong affinity towards pyrite. This study also assists researchers in understanding the significance of Makum coal and provides numerous ideas for coal characterization.

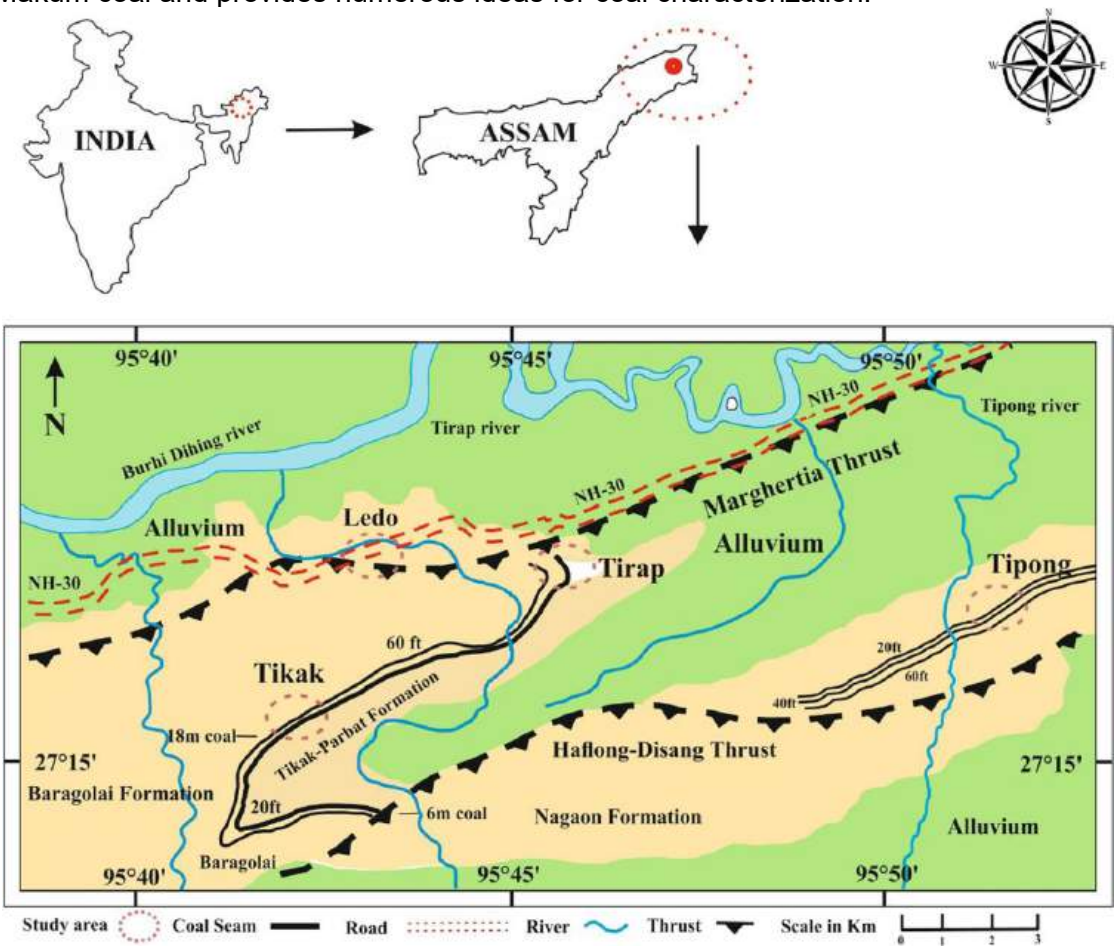


Fig. Makum Coal Basin regional geological map, Assam, India. *International Journal of Coal Science & Technology. 10 (2023) 44.*

❖ **Chemical and toxicological studies on black crust formed over historical monuments as a probable health hazard:** Studies to date have mostly investigated environmental factors responsible for deterioration of historical monuments. Black crusts formed on historical monuments are considered as factor for deterioration of structures or as an indicator of environmental status of the surrounding area. Black crust formed on

historical monuments has never been investigated as a health hazard. For the first time, our institute performed in vitro and in vivo toxicology studies of black crust formed on three culturally-rich historical monuments (Rang Ghar, Kareng Ghar, and Talatal Ghar) of the Indian subcontinent to test their toxicological effect. Black crust suspension in ultrapure water was found not to be considerably toxic to the cells upon direct short-term exposure. However, the sub-acute nasal exposure of the black crust suspension in Swiss albino mice produced lung-specific pathologies and mortality. Additionally, structural formation of the black crust along with the speciation of potentially hazardous elements (PHEs), polyaromatic hydrocarbon (PAHs), and other metals were investigated. Overall, these results indicate the potential of black crust deposited on historical monuments as health hazard owing to the atmospheric pollution of the surroundings. However, it may be noted that black crust and its components have very low possibility of health implication unless they are disturbed without proper care.

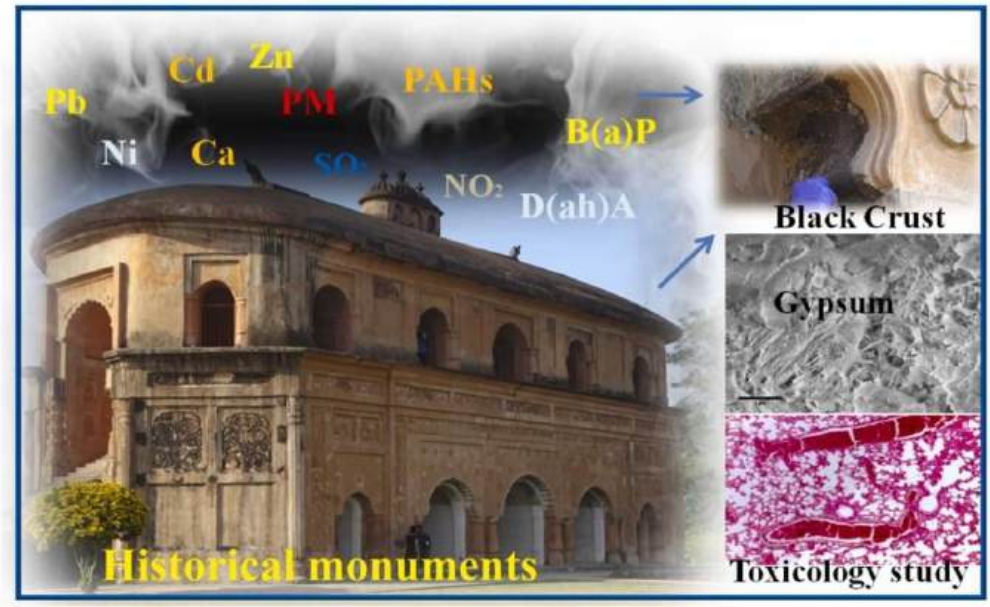


Fig. A detailed analysis of the deterioration of the worldwide heritage structures of Rang Ghar, Kareng Ghar, and Talatal Ghar in Northeast India is carried out owing to the formation of black crust and consequent health hazards.*Journal of Hazardous Materials. 464 (2024) 132939.*

- **Fabrication of carbon nanomaterials containing atomically dispersed early transition metals for sensing and electrocatalytic applications:** Single atom catalysts (SACs) represent a noble class of catalysts widely applicable to accelerate diverse reactions wherein the metal species are atomically dispersed on inorganic or organic support surfaces. Single atom catalysts (SACs) featuring MN_x(M = metal) active sites on carbon support have drawnconsiderable attention due to their promising enzyme-like catalyticproperties. We developed (ACS Appl. Mater. Interfaces **2023**, 15, 47902) a facile one-pot, low-temperature, wet impregnation method tofully utilize $M\text{-}N_4$ sites of manganese phthalocyanine (MnPc) bydecorating molecular MnPc over the sheets of graphene nanoplatelets(GNP). The high sensitivity and selectivity of the developed

colorimetric assay enable to quantitatively determine GSHconcentration in different biological fluids. The material, designated as CoN_4@C-SAC, has been employed as an efficient electrocatalyst for enhanced oxygen evolution reaction (OER).

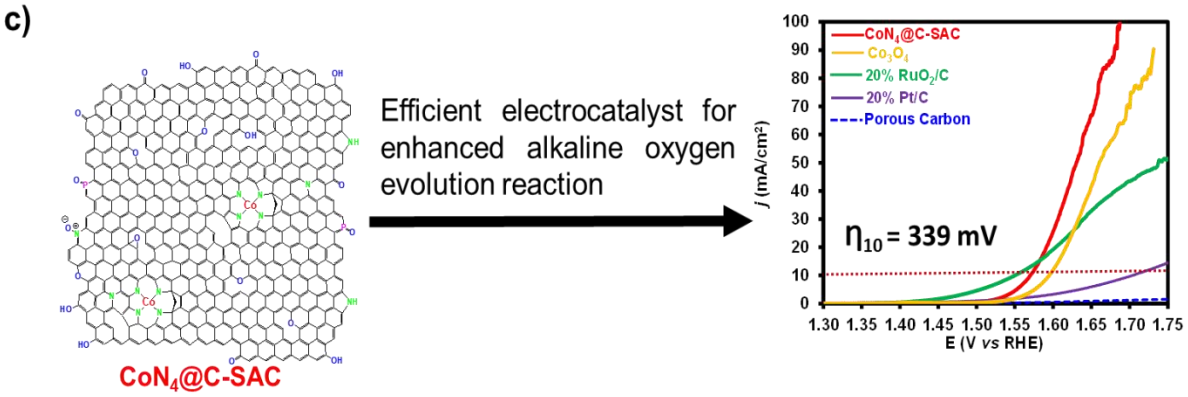


Fig. Application of a carbon-supported cobalt single-atom catalyst in oxygen evolution reaction.(ACS Applied Materials & Interfaces **2023**, 15, 47902)

- **Development of low-cost solid-state luminescent materials from coal-derived carbon quantum dots for potential optical applications:** With unique optical and chemical properties, carbon quantum dots (CQDs) find tremendous applications in chemistry, biology, and materials science to medicine. To expand the applicability of coal-derived CQDs from the liquid to solid state, we developed the sustainable synthesis of solid phosphors from coal-derived CQDs using poly(vinyl alcohol) (PVA) and silica (SiO_2) as an organic and inorganic matrix. The coal-derived CQDs exhibited blue fluorescence with 8.9 and 14.9% quantum yields. The CQDs were found to be self-co-doped with nitrogen and sulfur heteroatoms through surface and edge functional groups. Solid-state fluorescence of PVA/CQDs composite films confirmed that the CQDs retained their excellent blue emission in a dry solid matrix. Further, coal-derived CQDs caused high intensity white light emission with CIE coordinates of (0.312, 0.339) by endowing a suitable band gap structure in a SiO_2/CQDs solid phosphor for potential optical applications.

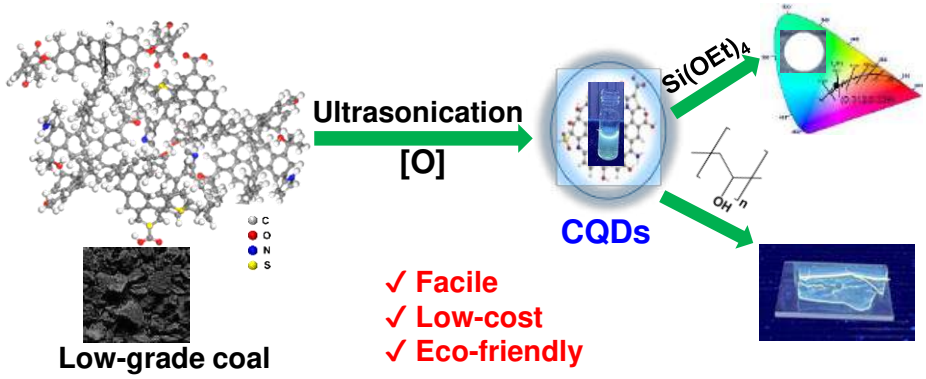


Fig. Schematic representation of the fabrication of solid luminescent materials from coal-derived carbon quantum dots. (ACS Omega **2023**, 8, 28, 25410)

ENGINEERING SCIENCES & TECHNOLOGY DIVISION

Engineering Sciences & Technology Division has three groups namely Applied Civil Engineering Group, Chemical Engineering Group and General Engineering Group and provides engineering inputs and services to different R&D projects of the Institute.

Applied Civil Engineering Group (Engineering Sciences & Technology Division) of CSIR – North East Institute of Science & Technology (Formerly RRL- Jorhat) is committed to Research & Development, Technical Consultancy, Testing and Evaluation of Building and Road Materials for Quality Control. The main areas of research include alternative building materials and structural engineering apart from geotechnical and transportation engineering. It has expertise in geo-technical, transportation and structural engineering.

Chemical engineering group provides a broad spectrum of engineering inputs to the other research and development groups at CSIR-NEIST. The group has expertise in coupled research of Applied and Basic research for generation of knowledge base and knowhow. The group is involved in industry-oriented research in the area of Separation and Purification Technology, Reaction Calorimetry, Food & Nutraceuticals and Reaction Engineering & Catalysis. Membrane Technology is one of the priority research area of the group. Design and development of membrane for specific applications, Transport phenomena in solid/liquid membrane-based separation, catalytic membrane reactors**,** facilitated transport in gas and liquid phases through host-guest chemistry are the basic/applied R&D work of the group. Membrane based Technology for separation of Biomolecules from natural feedstock, Racemic Resolution of drugs and pharmaceuticals, Gas separation, Treatment of Industrial waste etc. are the priority research work for Translational research from the group. Engineering analysis of chemical reaction systems i.e. reaction-diffusion phenomena in heterogeneous catalyzed reactions, Design and Scale up, Reaction calorimetry, development of process for food & nutraceuticals etc. are also the current activities of the group.

General Engineering Group of ESTD is associated with Engineering R&D, applied and translational research, technical consulting, testing and evaluation S&T intervention for rural development, entrepreneurship, and skill development activities are the main activities of the General Engineering Group of ESTD. Design and simulation, thermal-fluid analysis, advanced manufacturing, materials properties analysis, enhanced welding technology, etc. are some of the focus areas of study. Additionally, the group provided skill development instruction in a variety of crafts, including welding, plumbing, glass blowing, CNC, jacquard weaving, etc. Additionally, this group supplied fabrication, repair, maintenance, glass blowing services, repair and maintenance, refrigeration, and air conditioning services to the entire division.

Ongoing Projects

FTT and FBR Projects

Project Title: **Development of Microbial based Process for Bio-cement, Bio-brick and Self-healing Concrete Using Locally Available Resources.**

Project No: **MLP-1014**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Sanjay Deori (PI), Er Dipak Basumatari (Co-PI), Dr Ratul Saikia (Co-PI), Er Nibir Pran Borah, Er Rajib Das, Dr Archana Yadav

Objectives:

- Development of microbial based bio-cement for use as an alternative eco-friendly construction materials.
- To develop methodology for production of bio-brick and microbial or self healing concrete using bio-cement and locally available raw materials in North East region.
- Study the strength and other engineering characteristics of the developed microbial based construction materials.

Salient Achievements:

- About two third of the polluting gases come from cement production due to the burning of limestone/ Microorganism based bio-cemetation process has revealed a new path in the field of construction engineering. The idea of Bio-cement hails from the invention of the involvement of microorganism carbonate precipitation. Some of the bacteria precipitating CaCO3 are Sporosarcina Pasteuri, Bacillusmegaterium, L.sphaericus etc.

Fig. a. CaCO3 Precipitation by *Brevibacterium sediminis*in the left flask
b. Calcium Carbonate Precipitation Test

Bio-Cement Cubes after Failure in UTM

Project Title: **Process for recycling of tea factory wastewater**

Project No: **MLP-1020**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Bipul Das (PI), Er. Ravi Kumar Lingam (Co-PI), Dr Sanjib Gogoi (Co-PI), Er. Tobiul Hussain Ahmed (Co-PI)

Objectives:

- Collection and Characterization of tea factory wastewater.
- 10 liter/day tea factory wastewater treatment and validation upto environmental acceptable standards.
- Cost economics and profitability analysis for 500 liter/day wastewater treatment.

Salient Achievements:

- The proper disposal of wastewater with coloured discharge from tea industries is of major significance to the environment and aquatic life. In this study, coloured effluent wastewater from the tea industry was treated using an efficient acid-modified bio adsorbent in a fixed-bed adsorption column. The adsorbent is made from tea waste and is characterized by using sophisticated techniques such as FESEM-EDX, FTIR and XPS. At a constant input flow rate of 4 ml/min, the adsorption column's performance was examined at three different influent colour concentrations of 545.8 mg/L, 615.5 mg/L and 916.8 mg/L and bed heights of 17.5 cm, 19 cm, and 22 cm. At a bed depth of 22 cm, a maximum colour removal of 87.71%, breakthrough time of 840.0 min, exhaustion time of 1440 min, and adsorption capacity of 385.97 mg/g were achieved with an initial concentration of 916.8 mg/L. It was shown that a breakthrough occurred more quickly when inflow concentration was higher while a breakthrough occurred more slowly when bed depth was higher. The adsorption experimental data was fitted with the models of Thomas, Yoon-Nelson, Adams-Bohart and Yan. The Yan model is found to be the best-fitting ($R^2 > 0.9$) model. The wastewater has significantly changed the various physicochemical parameters after adsorption such as total dissolved solids (TDS) from 279 to 93 mg/L, electrical conductivity (EC) from 570 to 887 (µs/cm), dissolved oxygen (DO) from 1.4 to 7.4 mg/L, biochemical oxygen demand (BOD) from 210.4 to 12.81 mg/L, chemical oxygen demand (COD) from 1052 to 64.29 mg/L and colour (L*: 25.72 to 97.23; a*: 35.93 to 2.47; b*: 57.34 to 4.24) after adsorption. The bio adsorbent made from tea waste offers great potential for treating wastewater from the tea industry at a reasonable cost on an industrial scale.

Project Title: **Natural Biopolymer based Novel Electrospun and Ceramic Composite membranes for Treatment of Waste water**

Project No: **MLP-1021**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Swapnali Hazarika (PI), Dr Pravin G Ingole, Er Ravi Kumar Lingam, Er Partha Majumder, Mr Tobiul Hussain Ahmed

Objectives:

- Extraction of natural biopolymers from agricultural/industrial waste.
- Preparation of electrospun membrane from natural biopolymers with improved resistance to fouling and fine-tune performance by chemical modification of the membranes.
- Treatment of waste water for separation of organic pollutants and heavy metals from Oil and Petroleum industries waste water.

Salient Achievements:

- Cellulose acetate-based electrospun membranes have been prepared from agricultural waste and used for the treatment of oil-contaminated wastewater for the removal of oil, heavy metals and biological impurities. The surface of electrospun membranes has been modified with the addition of nanofillers such as graphene oxide, cellulose nanocrystals etc. The membrane shows contact angle 58.9˚ which indicates high surface wettability due to the highly porous nature, more empty space and higher surface area of the electrospun membrane. Figure in below represents the contact angle images of all the prepared membranes.

Skill Development Projects

Project Title: **Skill Development Training Program of CSIR NEIST under CSIR Integrated Skill Initiatives**

Project No: **NWP-100**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Dipankar Neog (PI), Er Dhanjit Das (Co-PI), Er. Jayanta Jyoti Bora

Objectives:

- "CSIR-Integrated Skill Initiative" is a national program on skill development initiated by Council of Scientific and Industrial Research (CSIR) using the expertise and infrastructure of individual laboratories situated across the country. Its aim is to equip young minds with the necessary technological skills through exposure to research laboratories at national facilities that will address the critical need for the technical skill gap created by the enormous usage of advanced technology. Under the Skill Development program, "CSIR-Integrated Skill Initiative", during the period 2023-2024, CSIR NEIST has conducted thirty (30) numbers of training programs and a total of 282 numbers of trainees have been trained. It was found from our previous record approximately 75-80% of students has either got employed or self- employed. In the recently completed weaving category of training, all the successful trainees have applied for bank financing to start the commercial production and the employment generation in this category is 100%.It is to be mentioned here that, on the occasion of National Handloom Day, 7th August,2023 some of our trained weavers have been selected by the Ministry of Textile, Govt. of India, to participate and interact with honourable Prime Minister at Pragati Maidan, New Delhi and showcase their handloom products on that auspicious occasion. It imparts the benefits of our training at the local ground level of the society and become self-sufficient at national level.

Salient Achievements:

- **Exhibition of handloom products produced by our trainees at Pragati Maidan, New Delhi:**10 numbers of our trained weavers have been selected to participate in the National Handloom Day @ 7th August 2023 at Pragati Maidan, New Delhi and to Interact with honourable Prime Minister.
- **Campus placement drive at CSIR-NEIST, Jorhat**: A recruitment drive has been organized at CSIR-NEIST campus by "Jenus Industries" and recruited almost 90% of our students under Assistant Electrician trade. Candidates had to undergo a personal interview round to prove their worth. This initiative has been taken under Skill and Entrepreneurship Development Division which aims to increase the skill man power and growing demand for jobs actually.
- **PMKVY 3.0:** CSIR-NEIST has successfully registered, For 13 QP's (Qualification Pack) under PMKVY 3.0. These QP's match with the trades on which we have been proving the skill training under CSIR-ISI – II. NSDC has extended validity of our TP (Training Provider) on the Skill India Digital Portal for further period of 3 years and currently we are under batch creation and student enrollment process for 13 QP's.
- **Certificate distribution and awareness program:** A certificate distribution session has been organised at ITI, Titabar under LED assembly and manufacturing training of Skill Development Initiative. An interactive and awareness session was also organised to educate the young minds about the need of LED equipment and it's potentials in the field of entrepreneurship.


Exhibition of handloom products produced by our trainees at Pragati Maidan, New Delhi

Campus placement drive at CSIR-NEIST, Jorhat.

Interactive session among students about LED equipment and potentials

In-house, Grant in aid & Consultancy Projects

Project Title: **Design and Development of 500 Kg Capacity Solar-Biomass Hybrid Distillation Unit with the Mobile Type Distillation Vessel and Its Field Demonstration For Entrepreneurship Development**

Project No: **GPP-376**

Funding Agency: Department of Science & Technology, Govt. of India

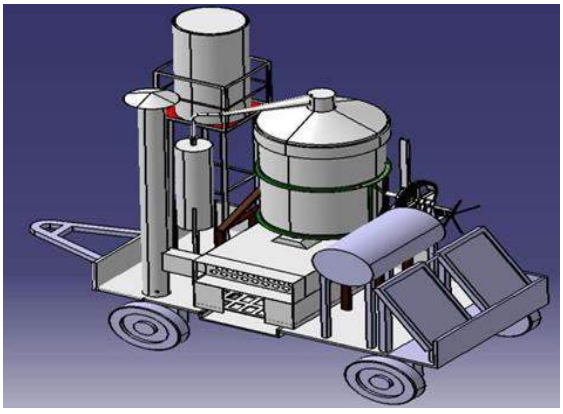
PI & Members: Er. Dhanjit Das (PI), Dr Dipankar Neog (Co-PI), Er. J. J Bora (Co-PI)

Objectives:

- Design and development of 500kg solar-biomass hybrid distillation plant with the mobile type distillation vassal and its field demonstration and subsequent transfer of technology to the identified industry partner along with potential and interested industries.
- Preparation of techno economic documents for the developed hybrid distillation plant with reference to the commercial dissemination of the technology.
- Training and demonstration of the developed hybrid distillation plant to the potential farmers by the identified industry partner.
- Laboratory scale demonstration of the steam / hydro distillation of 3 different potential high value plants viz.: Litsea cubeba (Lour.), Homalomena and Znathoxylum.

Salient Achievements:

- Fabrication and demonstration of laboratory scale (two different size 10 ltr. and 20 ltr capacity) distillation units based on the solar-biomass source of energy for extraction of essential oil from high value plants materials,
- Design, development and demonstration of 500 kg solar-biomass distillation plant and its analysis
- Training program was organized different location on North-Eastern Region (NER).



Trolley mounted essential oil distillation unit design and prototype


Training and demonstration of the essential oil distillation unit.

Project Title: **Separation of Industrial Gases by Thin-Film Nanocomposites and Mixed Matrix Membranes**

Project No: **GPP-414**

Funding Agency: DST, International Cooperation Division

PI & Members: Dr Pravin G. Ingole (PI), Dr Swapnali Hazarika (Co-PI)

Objectives:

- Synthesis of new functional materials with tailor-made properties.
- Researching and testing efficient and new separation methods (polymeric membranes with intrinsic microporosity (PIMs) and metal-organic frameworks (MOF) membranes) for flue gas purification. 4
- Designing new ionic liquids for supported ionic liquid membranes (SILMs), for effective separation of SO2, CO2 and NOX from the air.
- Experimental characterization of properties (permeation, sorption and mechanical properties, analysis by XPS, TEM, TGA, DSC, WAXS, SEM, IR etc.) and membrane modelling.

Salient Achievements

- Mixed Matrix Membranes (MMMs) for industrial gas separation are an excellent choice due to the incorporation of nanoparticles, which significantly enhance the membrane's surface area, thereby improving gas permeance. This project focuses on the novel preparation of MMMs for the separation of various gases, including CO2, CH4, and N2. The prepared MMMs were thoroughly characterized using a range of physicochemical techniques. The MMMs were fabricated using the phase inversion process, with UiO-66-NH2, graphene oxide (GO), and Cloisite@UiO-66 as nanofillers, and polysulfone (PSf) as the polymer matrix. Among the tested membranes, the Cloisite@UiO-66 incorporated MMMs exhibited the best performance, achieving a CO2 permeance of 89.02 GPU and a CO2/N2 selectivity of 26.68 at 1 bar pressure.

Project Title: **Design and development of manufacturing processes for commercial production and implementation of farming mechanization for small farms and hilly terrains**

Project No: **GPP-421**

Funding Agency: DST, International Cooperation Division

PI & Members: Dr Dipankar Neog (PI), Dr Biswajit Gogoi (Co-PI), Dr K Jayakumar, President, India Skillpedia Foundation, Ms Shelika Arora, India Skillpedia Foundation, Mr Naveen R M, India Skillpedia Foundation, Dr Rama Swami Bansal, Chief Scientist & Head, ISTAD, CSIR

Objectives:

- To Develop and launch a multipurpose agricultural machine which is well suited for use in small farms, backyards and home gardens, capable of performing multiple soil preparation, tilling, raking, weeding, formation of plantation beds, seed/ manure drop, digging of holes for planting saplings and other agricultural processes.
- Augers are used in the farming machine for Soil Excavation and other tilling, plantation bed preparation or pit digging works. To produce such augers in a continuous seamless batch mode.
    - the related multipurpose metal stock roll bending machine is to be made suitable for auger production
    - necessary automation for activation of hydraulic systems & electrical motors for movement of rollers, following trials
- Design of Components & Assemblies for Production, including decision on bought out components, parts or component assemblies, - in a way that the assembly can be done at field level by young entrepreneurs and the machine transported and carried as Knocked Down Component Assemblies.
- To Standardize the Specifications/ Dimensions & material aspects, production or sourcing of parts/ components and process of manufacture of components and assemblies (including modularity, packing, KDCA for
- Hand Operated Electric Battery Powered Hydraulics driven Trolley mounted Farming and Gardening Machine &
- the Diesel Engine Powered Driver Operated ATV Type Farming Machine.
- To undertake research studies on Soil Types and Torque requirements for various Agricultural Field Operations, with a view to optimize design and manufacture of farm machines for commercial use with lesser no of parts, rigidity, manoeuvrability, dynamic stability and functionality adapted to various field conditions.
- To undertake research studies on component wise simulation and model analysis of the designed device using simulation and modelling tools.

Salient Achievements

- The farm machinery with auger mechanism is undergoing construction.
- Studies on the auger's microstructure.
- Auger designs**.**

Project Title: **Development of Co-Gasification Process of NER Coal and Agro Residue Biomass for Generation of Power and Fuel**

Project No: **GPP-425**
Funding Agency: DST, Technology Mission Division
PI & Members: Dr Prasenjit Saikia (PI), Dr Binoy Kr Saikia (Co-PI), Dr Biswajit Gogoi (Co-PI)
Objectives:

- Development of a prototype for generation of power from co-gasification of coal and agro-residues abundantly available in North-East India.
- Optimization of the process for high yield of both liquid and gaseous fuel during co-gasification process

Salient Achievements

- CFD analysis of the tar filtration unit is undergoing

Project Title: **Structural Evaluation of Construction Quality of 400/200 Mariani Substation, Assam**
Project No: **CNP-482**
Funding Agency: Power Grid Corporation of India Limited (PGCIL)
PI & Members: Dr Leon Raj J (PI), Dr Sanjay Deori (Co-PI), Er Dipak Basumatari (Co-PI), Er Nibir Pran Borah, Er Rajib Das
Objectives:

- Assessing the likely comprehensive strength of concrete with the help of suitable correlations between rebound index and compressive strength.
- Assessing the quality of the concrete through ultrasonic pulse velocity test.
- Assessing the quality of the concrete in relation to standard requirements and assessing the quality of one element of concrete in relation to another conforming to IS 516 Hardened concrete.

Salient Achievements:

- This investigation helped in site quality check along with evaluation of the compressive strength of foundations of newly constructed structure.

Project Title: **Preparation of Performance Standard of Bamboo Chipping Unit**
Project No: **CNP-484**
Funding Agency: Assam Bio Refinery Private Limited, Numaligarh
PI & Members: Dr Jyoti Kumar Doley (PI), Er. Jayanta Jyoti Bora (Co-PI), Dr Dipankar Neog (Co-PI), Er. Dhanjit Das (Co-PI), Mr. Ankur Dip Boruah (Co-PI), Dr Dipul Kalita, Mr Makhan Bora
Objectives:

- A technical evaluation of Assam Bio Refinery Private Limited (ABRPL) bamboo chipping machine units in terms of performance and productivity.

Salient Achievements:

- A technical team from CSIR-NEIST, Jorhat visited ABRPL, Numaligarh for 8 working days on almost weekly basis. They performed current measurement and feed rate data collection on the chipping machine. To determine cutting tool material constituent the tool sample were collected in powder form from the site. A total of eight numbers of samples corresponding to 8 different cutting tools were collected.

Samples of bamboo chips of both Jati and Bhuluka bamboo were collected for chip quality and moisture content analysis in each visit. Each sample was analyzed in three iterations by using testing apparatuses like FESEM (EDX), Moisture analyzer etc.

ABRPL and CSIR-NEIST team at project site

Bamboo chipping machine.

Project Title: **Design and development of a commercial model of combined gasification and forced draft thermal conversion device**

Project No: **IHP240003**

Funding Agency: CSIR under RDSF category of CSPS-2024 scheme

PI & Members: Dr Jyoti Kumar Doley (PI), Er. Jayanta Jyoti Bora (Co-PI), Dr Dipankar Neog (Co-PI), Er. Dhanjit Das (Co-PI), Mr. Ankur Dip Boruah (Co-PI), Dr Dipul Kalita, Mr Makhan Bora

Objectives:

- To design and develop a combined gasification and forced draft thermal conversion device which would operate using waste agricultural products
- To improve the combined gasification and forced draft thermal conversion device at TRL 3 to a user friendly commercial model i.e. TRL 6 with following additional features:
  - Auto ignition mechanism of both gasification and fuel bed
  - Single knob control of power delivery through controlling the fuel gasification and charcoal combustion rate
  - Enclosed compact model with integrated control panel and power management system.

Salient Achievements:

- Design of the reactor is undergoing.
- Application for patent filling is undergoing.

Project Title: **Infrastructure maintenance**

Project No: **STS-2047**

Funding Agency: CSIR under RDSF category of CSPS-2024 scheme

PI & Members: Dr Dipankar Neog (PI), Dhanjit Das (**Scientist In charge**), Navajyoti Tamuly (**Workshop in charge**)

Objectives:

- Engineering support to R&D activities of NEIST

Salient Achievements:

- Fabrication of one no. vermicompost seiving machine under the project "Establishment of Bioresource Centre for making S&T Intervention in Banana Value Chain for Socio-Economic Development in Udalguri District, Assam"

Project Title: **MSME Idea Hackathon 3.0 (Women) as Host Insitute**

Funding Agency: MSME, GoI

PI & Members: Dr Dipankar Neog (PI),

Objectives:

- The objective of the scheme is to promote and support untapped creativity and to promote adoption of latest technologies in MSMEs that seek the validation of their ideas at the proof-of-concept level. The scheme also supports engagement with enablers who will advise such MSMEs in expanding the business by supporting them in design, strategy and execution.

Salient Achievements:

- 7th Project Monitoring and Advisory Committee (PMAC) Meeting of "MSME Innovative Scheme" a component under MSME Champions Scheme held under the Chairmanship of AS&DC (MSME) has approved two nos. of project for funding submitted under CSIR-NEIST as HI.

GEO SCIENCES & TECHNOLOGY DIVISION

The Geosciences & Technology Division's core activities have been seismology and seismic hazard assessment along with mass awareness programs. The division is engaged is seismic monitoring of the NE India and adjoining regions since 1982. Since inception the division has completed many important projects on seismic hazard assessment, seismic precursory study and crucial consultations in site-specific seismic investigations for mega engineering projects apart from basic research in seismology. The division is also maintaining a limited broadband seismic network in stand-alone mode along with strong motion accelerograph network and possess high-end geophysical equipment. A few students are registered for PhD program under AcSIR and the division is also a recognized centre for under DST-ASEAN Program for international student exchange.

Ongoing Projects

In-house, Grant in aid & Consultancy Projects

Project Title: **Sersmic Hazard Assessment and Mitigation in NE India**
Project No: OLP-2091
Funding Agency: CSIR, New Delhi
PI & Members: Dr Saurabh Baruah, Dr Manoj Kumar Phukan (PI), Dr Sangeeta Sharma (Co-PI), Dr Santanu Baruah (Co-PI), Dr Bijit Kumar Choudhury (Co-PI), Dr Debasis D Mohanty (Co-PI), Dr Saurabh Baruah, Dr Chinmoy Rajkonwar, Mr Sausthov M Bhattacharyya, Dr Timangshu Chetia
Objectives:

- Complete the procurement process of 10 new broadband seismographs and their field deployment, connect the seismic stations to central hub at GSTD for near real-time data retrieval.
- Continue monitoring of seismic activities along major active zones in NE India region and characterize them. Emphasis will be given for seismotectonic and geodynamic studies of the Indo-Burma Wadati-Benioff zone, Shillong Plateau and Kopili Fault zone
- Installation of an array of strong-motion accelerographs in some important cities of NE India, which include: Guwahati, Dibrugarh, Jorhat, Dimapur, etc.
- Broaden the Earthquake Hazard Awareness Program and cover more school & college students

Salient Achievements:

- **Active geodynamics and deformation beneath Indo-Burmese Wedge**
  We have analyzed the seismic data from the corresponding seismic stations from IBW and generated the comprehensive seismic anisotropy measurements beneath IBW. A Significant anisotropy beneath IBW signifies the current subduction related N-S deformation patterns caused by the mantle flow, which characterizes the tectonics of this region.

- **Larger earthquake scenario and hazard estimation of NE Region**

  A frequency-magnitude statistical probability modelling has been carried out to understand the large earthquake scenario and seismic hazard estimation for the whole NE Himalayan region. Analysis of earthquakes that occurred prior to 1980 is impossible due to the discontinuous nature of data. The analysis is performed only for the Shillong–Mikir plateau and the Arunachal Himalaya region, because of their high seismicity compared to the Assam-Foredeep region. For these two regions, we have selected some circular sub-regions with a specific radius (120km) from a central coordinate.

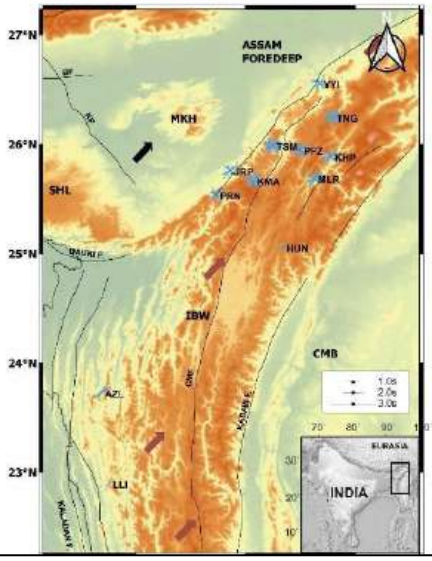


Fig: Representation of Mantle deformation pattern in IBR

- **Multilayer Modelling of Heterogeneity beneath the Eastern Himalaya: if the tectonics is controlled by more than one geophysical phenomenon?**

  Variations in the deformation patterns among closely spaced seismic stations along the entire eastern Himalayan orogeny comprising the Nepal Himalaya, Arunachal Himalaya and the Eastern Himalayan Syntaxis, require a depth localization of anisotropy to understand the region's present-day tectonics mantle dynamics. This eastern part of the Himalaya orogeny is most complex in its geodynamic settings because of the confluence of many tectonic forces such as the N-S Indo-Eurasian collision, the sudden acute turn of the EHS in the northeast flank, the oblique subduction beneath the Indo-Burmese range in the eastern boundary, and the presence of major continental scale geological structures or sutures, etc., which all contribute to a critical deformation mechanism. Although some past studies investigated the causes and mechanisms of mantle deformations beneath the eastern Himalaya, a comprehensive and detailed analysis of the source localization and depth of anisotropy is missing for this region, which is the focus of this study.

- **Landslide study of Makhuam village, Manipur:**

  A massive landslide occurred on 30th June 2022 (IST) at Makhuam village, located in the Tupul District of Manipur, Northeast (NE) India, in two coherent episodes of failure (Petley 2022; Das 2022). The first failure occurred around 12.30 am (IST), and the second followed at about 6 am (IST)(Das 2022). The construction worker camp of the ongoing Jiribam–Imphal new railway line project, along with a significant portion of the under-construction Tupul railway station building, was engulfed by the landslide (Fig. 1). The worst-ever landslide to hit the Indian state of Manipur affected at least 79 people, of which 18 sustained injuries and 61 died; 56 bodies were recovered, and five were still missing when the joint search operation was called off after 20 days of the extensive hunt (Jaiswal 2022). Nearly half of the deceased persons belonged to Indian army troops assigned to guard the building site, and the others were railway officials, construction workers, and local residents (Das 2022).

While about 435 m of the railway line was buried under the debris, along with the construction worker camp, it also temporarily blocked the west-flowing Ijai River (Fig. 2). Based on several reports, a combination of factors, including heavy rainfall and long-term exposure to rains of the excavated hill slopes for infrastructure expansion, lithology, and deforestation, are implicated in the disaster (Das 2022; Jaiswal 2022). The present article briefly attempts to shed light on the various factors that may have contributed to the landslide's occurrence, eg, climatic conditions, geological/seismological causes, and human activity. Remote sensing analysis is carried out to determine the extent of the landslide and assess the failure's nature. The article finally emphasizes the need to comprehend the underlying factors of the landslides in order to take preventative action against future occurrences.

- **Landslide & Flashflood Study of Dima-Hasao district:**

  During the monsoon season of 2022, the Dima Hasao district of Assam faced a series of landslides across multiple locations, resulting in significant damage to property and newly developed communication infrastructure. These landslides were caused by a combination of natural and anthropogenic factors. The region being host to one of the world's wettest monsoon belts and under tremendous tectonic stress with sedimentary geological formation is highly susceptible to landslides. In addition to these natural factors, the construction of communication infrastructure and roadways may have contributed to destabilizing the slopes and increasing the risk of landslides. Excavation activities for the expansion of highways and the conversion of railway tracks to broad-gauge may have altered the natural slope dynamics, exacerbating the severity of the landslides. This paper explores the causes and consequences of the landslides from an environmental determinism and possibilism perspective. It argues for the optimization of the neo-determinism fine line by identifying remedial countermeasures to prevent or minimize the impact of future landslides in the area. Effective communication and collaboration among the government, non-governmental organizations, community leaders, and the public are essential for reducing the risk of natural disasters and promoting sustainable development in landslide-prone regions. The identified countermeasures have practical implications for disaster management and planning in similar regions globally.

- **Spatial Coherency Model to estimate the central depth of heterogeneity beneath Eastern Himalayan Syntaxis.**

  This study encompasses the depth distribution and source localization of anisotropy beneath the Indian part of the EHS. The spatial coherency mechanism utilized to derive the depth estimation produces a maximum coherency between the piercing points along with a minimum *Fu* _at a depth of about 150 km (150 -200 km range), suggesting the source of anisotropy within the lithospheric mass beneath this EHS region. This particular estimation is supported by 125 SWS parameters, where a distinct minimum for the *Fu* _is obtained for the central depth of 150 km, supports the optimal depth of anisotropy for this particular EHS region. Despite the presence of several NW-SE geological and tectonic structures in the EHS region, the dominance of ENE-WSW trend of fast polarizations is suggestive of the deformations caused

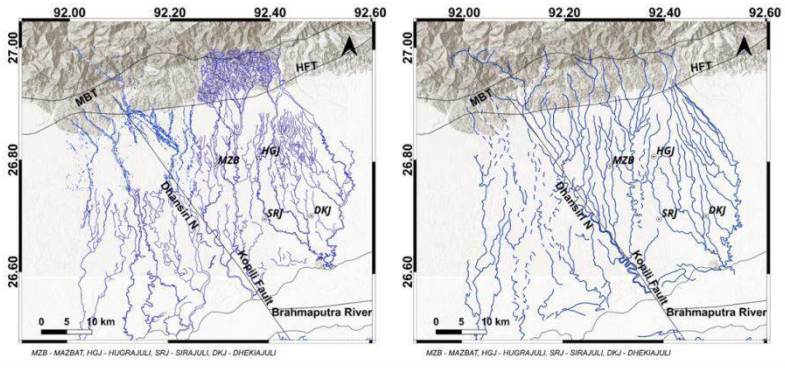
due to the superposition of highly stressed compressional lithospheric strain as a result of the India-Asia collision and the strain parallel mantle flow due to the collisional tectonics, with a possible contribution from crustal anisotropy (Hazarika et al., 2013). The Indo-Asia collision results in an arc perpendicular compressive stress in the EHS region which is complemented by the free slip boundary condition in the SE Asia in the proximity of syntaxis towards the oceanic subduction beneath the Indo-Burma Range (IBR), producing a constructional strain in this EHS region with a E-W/ENE-WSW extension and N-S/NW-SE contraction. Hence the observed fast polarization directions are parallel to the maximum shear planes in ENE-WSW directions as a result of lateral extrusion due to compression in this part of the Himalaya.

Project Title: **Mapping of Kopili Fault and Slip Rate Estimation for Smart City Development in Northeast India**
Project No: GPP-401
Funding Agency: SERB, Govt. of India
PI & Members: Dr Sangeeta Sharma (PI)
Objectives:

- Delineation and detailed surface mapping of the Kopili fault using remote sensing and GIS technique.
- Identification of active parts using morphotectonic, neotectonic and geophysical parameters.
- Estimation of recurrence period and slip rate.

Salient Achievements:

- **Morphometric and Morphotectonic study of some rivers in and around Kopili Fault: Comparison of drainage in the Northern part of Kopili fault region for two-time periods 2009-2011 and 1944:** In the northern part of the Kopili fault region all streams flows in nearly NS direction except Dhansiri N, which shows a NW-SE trend in both the period (Fig.). This indicates that Dhansiri N river is following the trend of the Kopili Fault.



(a) 2009-2011 (b) 1944

Fig: Drainage pattern in the northern part of the Kopili fault region at two different time period (a) 2009-2011 and (b) 1944. Solid black line indicates Kopili fault.

❖ **Seismicity Study of the Kopili Fault Region:**

The number of earthquake vs date shows that no. of earthquake is significantly higher in 1982 and which kept on increasing towards the end of 1994 between latitude 26N and 27N; and longitude 92E and 93E (Fig. 3). From 1965 to 1982 earthquakes in the region are very less. This time period can be regarded as strain accumulation period. This strain accumulation period is followed by a period of strain release from 1982 to 2021. The region shows peak release of strain in the year 1994. After 1994 the number of earthquake gradually decreases.

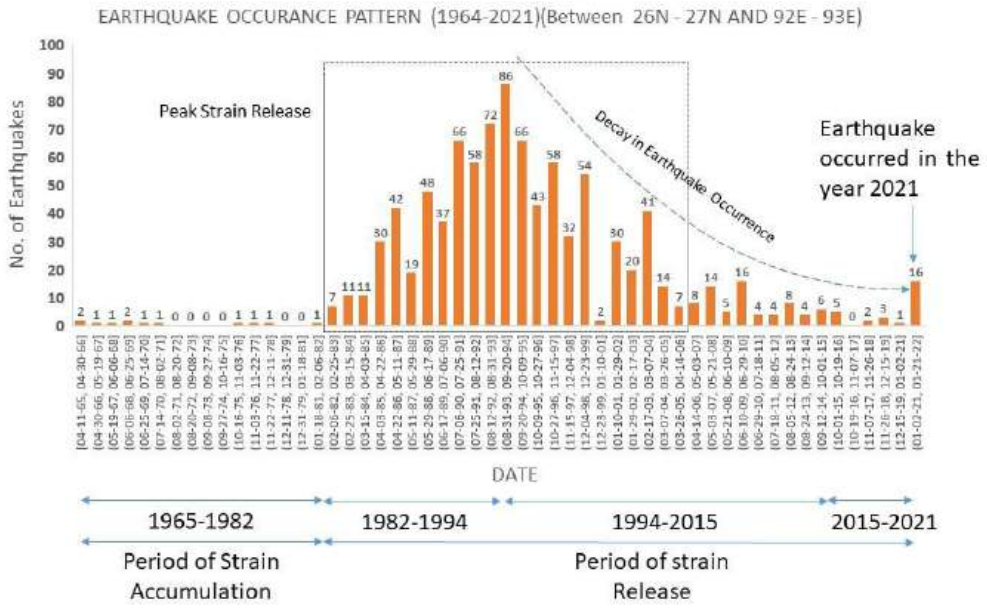


Fig.: Earthquake occurrence pattern from 1964 to 2021.

MATERIALS SCIENCES & TECHNOLOGY DIVISION

Materials Science and Technology Division (MSTD) comprises of 3 Groups Advanced Materials (AM) Group, Analytical Chemistry (AC) Group, and Polymer & Petroleum (PP) Group.

The Analytical Chemistry (AC) Group (GL: Dr. Prakash Jyoti Saikia) The Analytical Chemistry (AC) Group mainly supports the various sophisticated and high-end analytical equipment for services to different R&D projects of the institute, testing and analytical requirements of the various private and public organizations of the NE region in particular and country in general. Apart from analytical support activities, the group involves in the own generated R & D Projects.

Polymer & Petroleum (P&P) Group (GL: Dr. Manash R Das) is involved in various activities, which cater the need of Functional Materials, Catalysts, Monomers, and Polymer sector viz. clay minerals, biomass (cellulose, lignin etc.,) clay minerals, petroleum, polymers, etc.

The Advanced Materials (AM) Group (GL: Dr. Lakshi Saikia) is involved in the fields of nanocomposite materials, ores & minerals to value-added materials, metal organic frameworks, carbon based 2D nanomaterials & their composites, catalysis, small molecules activation and advanced materials for polymer & petroleum, water and gas purification, sensing application etc. The group has been providing testing & evaluation of building materials like cement, brick, soil, aggregates etc. to different government & private agencies in the NE region.

Ongoing Projects

In-house, Grant in aid & Consultancy Projects

Project Title: **Sustainable Advanced Materials and Polymer Processes for Environment, Energy and Industry**
Project No: **OLP-2078**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Manash Ranjan Das, Dr Lakshi Saikia (Co-PI), Dr Prakash Jyoti Saikia, Dr Hemant Sankar Dutta, Dr Sandeep Kumar Dey, Dr Sandeep Kumar Dey, Dr Rituparna Duarah, Dr Rituparna Duarah, Dr. Ankana Phukan, Mr Ramesh Chand Bohra Mrs Dipa Rajbongshi, Dr. Kongkona Gogoi, Mr. Abhisekh Borbora, Mr. Bhargab Das, Mr. Hrishikesh Sarmah, Dr. Koushik Dutta, Mr. Priyam Jyoti Bora, Dr. Paran Jyoti Kalita, Mr Jayanta Madhab Boruah, Mr Krishna Prasad Sharma, Mr Debajit Sarmah
Objectives:

- Eco-sustainable Packaging based on Bio-Polymer Nanomaterials and Industry Production.
- New catalytic methods for the development of green new biopolymers, and cost-effective bio-products.
- Synthesis of catalysts for producing oxygen/hydrogen from water and carbon dioxide fixation for sustainable environment.

- To develop new advanced functional materials based on carbon nanostructures for detecting environmental contaminants, biomolecules, and electrocatalytic oxygen reduction.
- Synthesis of advanced materials based ordered nanostructures, MOFs, heterojunction for energy production, biomass conversion and environmental application including sensing gas molecules, enrichment removal of food contaminants, fuels and chemicals.
- Development of the 2D nanocomposites and their heterostructures as artificial nanozymes based on their peroxidase-like activity, and fabrication of the inexpensive, simple paper-based nanosensor analytical devices (μPADs) for the colorimetric detection of hazards contaminates in water and food products.
- Removal of perfluoroalkyl substances (PFAS), pharmaceuticals, and personal care product chemicals from a competitive aqueous environment by porous organic and inorganic materials
- Analytical services to the internal and external parties through different analytical approaches and R & D input to the ongoing institutional projects
- Process development for realizing affordable analytical platforms targeting bioanalyte detection

Salient Achievements:

- The sustainable, biodegradable materials from renewable sources, emphasizing eco-friendly chemical use and polymer production practices is developed. Advanced analytical services supported institutional R&D projects, while modernized facilities ensure precise testing.

  Facile, cost-effective and eco-friendly synthesis of N-doped ZnO@g-C3N4 and S-doped ZnO@g-C3N4 photocatalysts towards efficient degradation of environmental pollutants was achieved. Highly luminescent Eu3+-Incorporated Zr-MOFs as fluorescence sensors was developed for detection of hazardous organic compounds in water and fruit samples. Further, a ferrocene functionalized 2-phenylpyridine iridium(III) pentamethylcyclopentadienyl complex has been synthesized and probed towards oxygen evolution from water at room temperature in the presence of sacrificial oxidant ceric ammonium nitrate.

Project Title: **Polymers, their Composites and Polymeric Membranes for Sustainable Development of Petroleum Industries**

Project No: **GPP-373 (WP-03)**

Funding Agency: Ministry of Chemicals & Fertilizers, Department of Chemicals & Petrochemicals, New Delhi,

PI & Members: Dr Swapnali Hazarika (PI), Dr Prakash Jyoti Saikia (Co-PI)

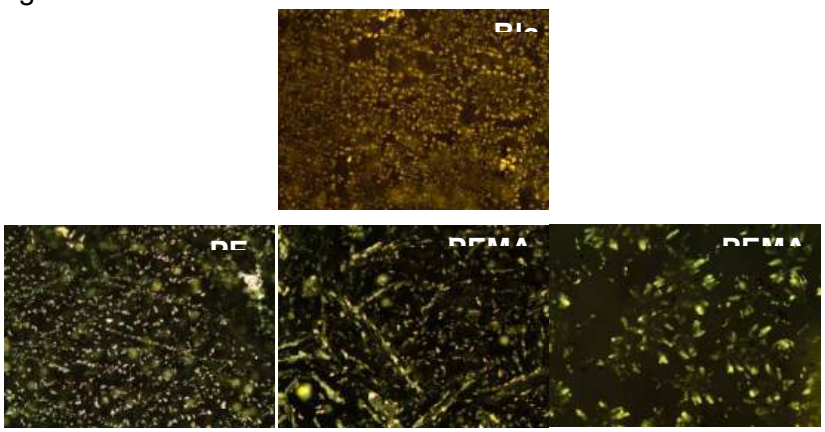
Objectives:

- Development of Flow Improver for NE Indian Waxy Crude.

Salient Achievements:

Poly(eicosyl methacrylate) (PEMA) and its copolymers with styrene (Sty) and vinyl acetate (VA) were synthesized by varying different monomer ratios and then explored as a polymeric additive for waxy crude, in terms of rheological parameters, such as gelation point and

apparent viscosity. With the addition of PEMA, the maximum reduction in gelation was observed to be 8.6 °C while for copolymer of EMA with styrene, maximum reduction in gelation point 3.9 °C was observed with monomer ratio 3:2 and for copolymers of EMA with VA, maximum reduction in gelation point was observed to be 2.7 °C with at 3000 ppm concentration. The influence of synthesized polymeric additives on the apparent viscosities of crude oil at temperatures above and below the gelation point has been studied and it is observed that, as the temperature increases the extent of decrease in apparent viscosity becomes less significant.



Polarizing optical micrographs of crude oil influenced by polymeric additive PEMA, PEMA-Sty and PEMA-VA at concentration of 1000 ppm.

Project Title: **Development of Microfluidic Paper Based ELISA Method for Rapid Detection of Aflatoxin B1 in Medicinal Herbs and Herbal Products**

Project No: **GPP-380**

Funding Agency: ICMR-DHR, Govt. of India

PI & Members: Dr Hemant Sankar Dutta (PI), Dr Manash Ranjan Das (Co-PI), Dr Dipankar Neog (Co-PI), Dr Jyoti Lakshmi H Boruah (Co-PI)

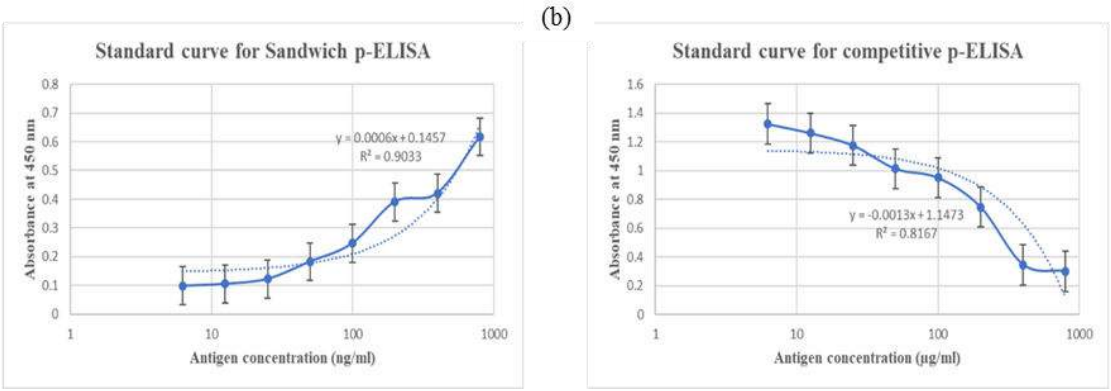
Objectives:

- Developing process for fabricating 96-microzone plates in paper substrates.
- Developing process for specific colorimetric detection of Aflatoxin B1 in real samples.

Salient Achievements:

- In this reported period, work has been carried out to fabricate and characterize microtiter paper plates for conducting various colorimetric assays. The fabricated plates have been tested for biologically significant molecules such as BSA, glucose and phosphate using absorbance as well as reflectance measurements. Both the techniques have been compared and evaluated for their individual detection. Apart from this, investigations on carrying out ELISA tests on the fabricated devices have also been carried out. Commercial kits have been also adapted to test the functionality of the platform. Investigations are ongoing to evaluate the diagnostic performance for AFB1 detection.

(a) (b)



Standard curves for (a) Sandwich p-ELISA (b) Competitive p-ELISA

Project Title: **Carbonaceous Nanomaterials from Graphite Sources of Arunachal Pradesh for Electrochemical Energy Storage and Sensor Applications**

Project No: **GPP-398**

Funding Agency: Ministry of Mines, New Delhi

PI & Members: Dr Manash Ranjan Das (PI), Dr Binoy Kumar Saikia (Co-PI), Dr Lakshi Saikia (Co-PI), Dr Dipankar Neog, Dr Chandan Tamuly, Dr Manoj Kumar Phukan

Objectives:

- Mining and collection of Graphite samples from Subansiri, Siang and Lohit districts of Arunachal Pradesh and their characterization.
- Scale up of beneficiation of raw graphite samples. Scale: 10 kg level batch size of raw graphite sample.
- Production of the grapheme based nanomaterials from the low carbon content natural graphite. The high purity grapheme, grapheme/silica nanocomposite and grapheme quantum dots from the natural resources of Graphite sample of Arunachal Pradesh will be attempted.
- Evaluation of the electrochemical energy storage properties of the derived grapheme based nanomaterials.
- Evaluation of sensing properties of the derived graphene based nanomaterials.

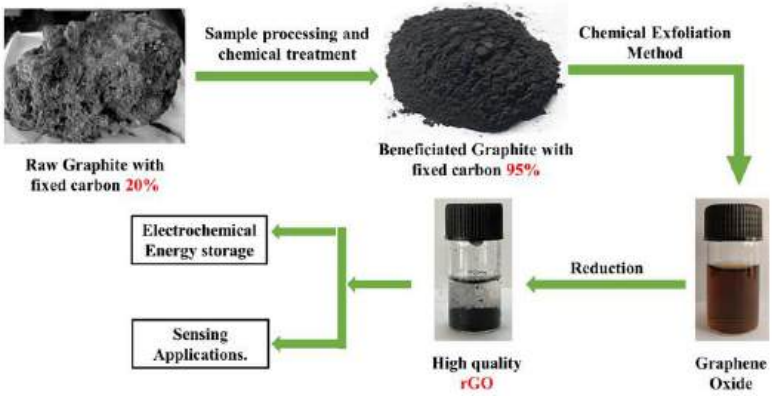
Salient Achievements:

- Graphite, being one of the important non-ferrous minerals and having applications in various important industries will find increased consumption in the coming years. India has a large deposition of graphite out of which about 36% are found in Arunachal Pradesh. However, compared to the rest of the country, the North-East region and particularly Arunachal Pradesh has not attracted attention till date for the detail investigation for characterization, beneficiation, prospecting or exploitation of the mineral resources including graphite. Due to presence high silica amount, the raw graphite is not useful for practical applications. To meet the country's demand for high purity graphite an efficient beneficiation method for the raw graphite's of Arunachal Pradesh is the foremost requirement.

  We have developed an efficient chemical beneficiation method for the up gradation of the percentage of fixed carbon and the effective removal of the impurities from the raw graphite with ~20% carbon content. After beneficiation the fixed carbon the raw

graphite has reached more than 95%. Also, the ash content of the beneficiated graphite substantially decreased to ~1.2% which was initially 73.68% in the raw samples.

Reduced graphene oxide (rGO) nanomaterial was synthesized through a chemical exfoliation method using beneficiated natural graphite sourced from Arunachal Pradesh. A comparison was made between the synthesized rGO and rGO obtained from commercial high-purity graphite. Characterization results indicate that our synthesized product matches the properties of the commercially available rGO. The schematic representation is given below for the synthesis of the rGO nanosheets. The current TRL of the work is 3 and planned to achieved TRL 6.



Synthesis of high-quality reduced graphene oxide (rGO) from the natural graphite of Arunachal Pradesh

Project Title: **Design and synthesis of new indigenous catalysts for oxygen production from water: a lifesaving approach for oxygen scared terrain**

Project No: **GPP-432**

Funding Agency: DRDO

PI & Members: Dr Biswajit Saha (PI)

Objectives:

- Design and synthesis of new catalysts for effective oxygen generation from water
- Characterization of the catalysts
- Evaluation of oxygen production from water by newly synthesized catalysts

Salient Achievements:

Project Title: **Designing Electrocatalysts to Efficiently Reduce Abundant CO_2 Emission**

Project No: **GAP-0826**

Funding Agency: SERB-DST (NPDF)

PI & Members: Dr Jyotirmoy Deb, NPDF fellow, Dr Lakshi Saikia

Objectives:

- Screening of 2D materials as potential catalyst for CO_2 reduction and validation of descriptors for them

- ❖ Designing Machine Learning algorithm and performing for selection of best electrocatalyst and their validation

Salient Achievements:

The project has been started from 25 March, 2024

- ❖ Selection of 2 D metal carbides, nitrides etc. are in progress for the study

BRANCH LABORATORY IMPHAL & BRANCH LABORATORY ITANAGAR

The CSIR-NEIST Branch Laboratory Imphal was established in the year 1973 with the aim to undergo research and development related to oil yielding plants. After renaming the RRL to NEIST, the Substation has been upgraded to the status of Branch Laboratory, Imphal in the year 2012 with many more activities and research areas such as Biodiversity, Bioprospection, Biochemistry, Designing and development of products based on ethnic designs and materials, Seismic observatory, Weather monitoring station, etc. The Branch Laboratory will be focusing more on motivation and transfer of technology of CSIR to society through NGOs, Organizations and Entrepreneurs.

The Branch Laboratory Itanagar was established in the year of 1981 ad started functioning from the year 1983. The objectives of the branch Laboratory is to promote advances to medicinal, aromatic, economic plants, metabolic engineering and translation research for the benefit of the people of Arunachal Pradesh in particular and to the country in general. The branches will be accomplish this through research educational and societal activities like cultivation mushroom and production of vermicompost that foster a multi-disciplinary interchange idea, S&T consciousness to the students, entrepreneurs, NGO, SHG, farmers etc. The activities of the branch laboratory Itanagar will contribute to the basic science, translational research for application of health care and environment, agriculture and sustainable development and livelihood income generation for the people of Arunachal Pradesh.

Ongoing Projects

FTT and FBR Projects

Project Title: **Laboratory Scale production and evaluation of nutritionally enriched indigenous fruit peel waste composite as aquaculture feed in Arunachal Pradesh**
Project No: **FTT-020509**
Funding Agency: CSIR-Fast Track Translation
PI & Members: Dr Natarajan Velmurugan
Objectives:

1. **CSIR-Fast Track Translation** The main purpose of this project was to formulate, standardize and understanding microbial adaptation in nutritionally enriched indigenous fruit peel waste composite.
2. We are scaling-up the production into laboratory level (5 kg) of nutritionally enriched feed material in solid state fermentation conditions.
3. We will be evaluating the growth and economic performance of indigenously developed feed material using biofloc-based farming system in Arunachal Pradesh. .

Salient Achievements:

- Filled patent applications the United States of America (USA) and India. The details are as follows:

  USA Patent Application No.: 18/504, 260

  - Patent Invertors: N Velmurugan, DK Saikia, C Chikkaputtaiah

- Title of Patent: Fruit peel wastes-based composite and a process for its preparation thereof.
- Year of Filing: 2023

India Patent Application No.: 202311058900

- Patent Invertors: N Velmurugan, DK Saikia, C Chikkaputtaiah
- Title of Patent: Fruit peel wastes-based composite and a process for its preparation thereof.
- Year of Filing: 2023

Project Title: **Deciphering the mechanism(s) of host-endophytes coevolution, enhanced secondary metabolite production and crop productivity**
Project No: **MLP-0048**
Funding Agency: CSIR-Focused Basic Research (CSIR-FBR)
PI & Members: Dr Natarajan Velmurugan
Objectives:

- The main purpose of this project was to isolate, screen and select potential endophytic candidates from the endangered medicinal plants specific to Arunachal Pradesh, with emphasis on plant growth promoting activities and functional metabolites production.
- The Branch Laboratory is characterizing and determining metabolic pathways and elite genes in selective endophytes responsible for plant growth promoting activities and functional metabolites production.

Salient Achievements:

- The main purpose of this project was to isolate, screen and select potential endophytic candidates from the endangered medicinal plants specific to Arunachal Pradesh, with emphasis on plant growth promoting activities and functional metabolites production. Further, we have characterized and determined metabolic pathways and elite genes in selective endophytes responsible for plant growth promoting activities and functional metabolites production. In this project, we have successfully isolated and characterized endophytic bacterial isolates from the endangered medicinal plants *Paris polyphylla* and *Aconitum heterophyllum*. The isolates endophytes were characterized at phenotype level with emphasis on their role in plant growth promotion and functional metabolites production. We have successfully demonstrated a proof-of-concept flow cytometry analysis that explains effects of endophytes in photosynthesis regulation and metabolites production in green microalgae in synthetic co-culture systems. Further, the metabolic stability of bacterial endophytes were demonstrated for an extended period of time. We have also characterized genomes and studied implications to metabolic activities in selected endophytic candidates with emphasis on PGP activities and metabolites transportation.

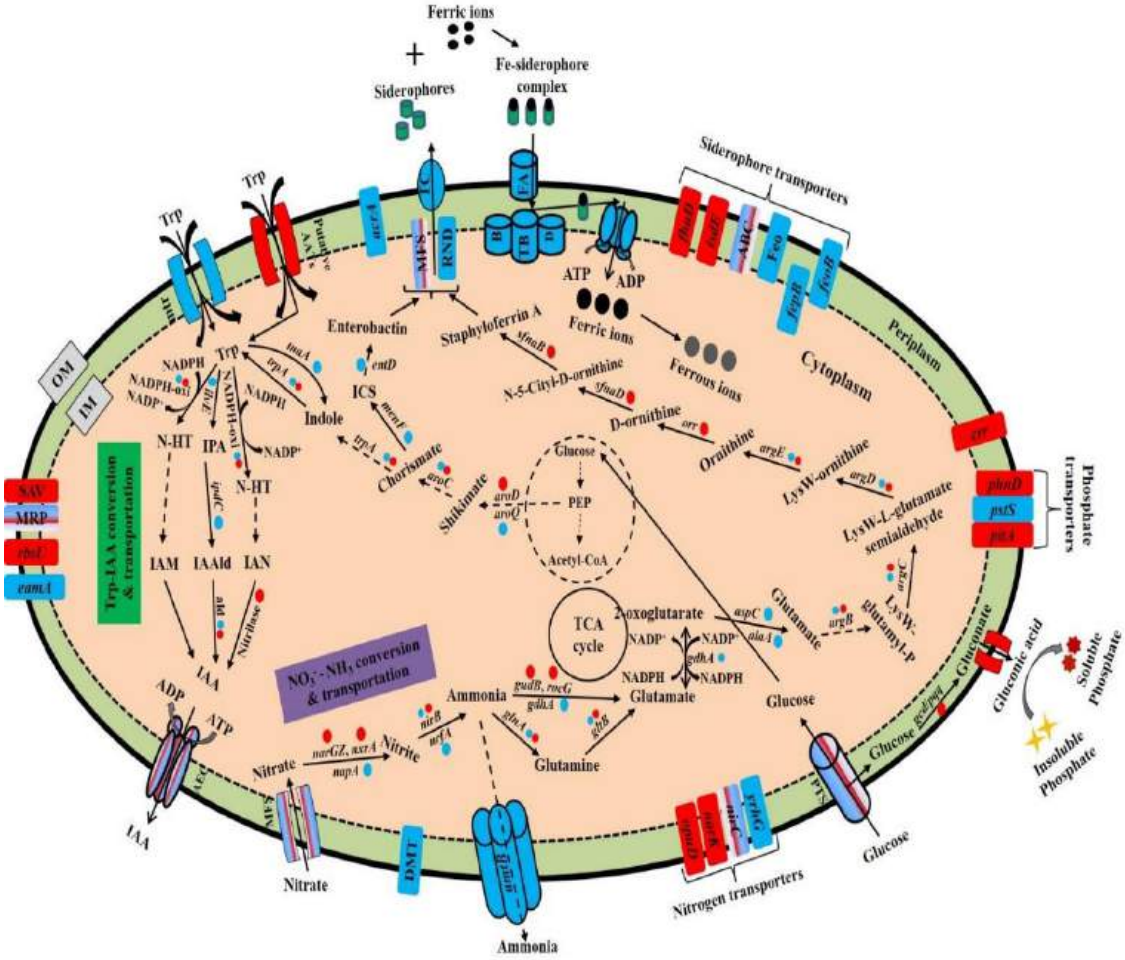


Fig. Schematic representation and overview of findings of plant growth-promotion related metabolisms and transport systems in Himalayan endophytic bacteria. The presence of genes in selected Himalayan endophytic bacterial strains is indicated by the colour combination of red and blue. Figure adapted from Sonowal et al. (2022).

In-house, Grant in aid & Consultancy Projects

Project Title: **Augmentation of local Bioresources for knowledge empowerment, product formation and entrepreneurship venture**

Project No: **OLP-2085**

Funding Agency: CSIR, New Delhi

PI & Members: Dr H B Singh (PI), Dr P Yuvaraj, Ms N Abem Devi, Mr Somananda Thokchom

Objectives:

- Survey, identification, documentation and germplasm collection of traditionally and economically important bioresources.
- Phytochemicalprofiling of some selected plants with special reference to two Manipuri ethnomedicinal plants namely, *Allium odorum* L, &*Allium hookeri*Thw.
- Development of few usable products based on bioresources.
- Transfer of technology to entrepreneurs.

Salient Achievements:

- Survey, plant sample collection, identification, documentation, cultivation of plants and established a herbal or botanic garden as germplasm collection inside the campus of the Branch Lab, Imphal (BLIM) where more than 130 species of medicinal, aromatic, economically important, rare and religiously significant plants are planted and maintained including leveling of scientific information.
- Identified 27 species of traditional spices plants and 33 species of wild tree vegetables used by ethnic people of Manipur. Most of the species are collected and planted in the garden of the BLIM.
- Technique has been developed to extract fiber from the leaf of pineapple by using banana fiber extractor.
- Established an orchidarium at the campus of the BLIM where more than 16 species of indigenous orchid species are collected and preserved as a germplasm bank.
- Formulated Spice Mixture based on 16 locally used spice / aromatic plants of Manipur. Nutrient & toxicity analysis have been completed.
- Formulated two green-tea by using local herbs of Manipur. Phytochemical profiling work is being carried out.
- The religiously associated Manipuri "Kombirei" plant has been identified as *Iris laevigata* Fisch which is a new addition to the Flora of India. The research paper is published in CSIR-NIScPR *Indian Journal of Traditional Knowledge* and the photo of the article is published in the cover of the journal.

Project Title: **Extension Activities in Arunachal Pradesh: Utilization of Medicinal, Aromatic and Economic Plant (MAP) for Socio-Economic Benefit in Rural Sector of Arunachal Pradesh**

Project No: **OLP-2086**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Chandan Tamuly (PI), Dr Natarajan Velmurugan, Ms Moushumi Hazarika, Ms Priyanka Kakoti, Mr Sandeep Kalita, Mr Tame Rajen

Objectives:

- Exploration and chemical investigation of selective medicinal, aromatic and economic plant of Arunachal Pradesh emphasis on bioactive constituents of specific medicinal plants.
- To socio economic uplift in the rural sector through utilization of low cost rural technologies like cultivation of mushroom, production of vermicompost and characterization of mushroom species.

Salient Achievements:

- Public Goods:
  - Scientific papers/patent: 8
- Societal Goods
  - Generate employment opportunities and income through cultivation of mushroom, medicinal and aromatic plants, production of vermicompost, and other rural technologies.
  - Value added products: 1

- Organized 15 nos of training programme on cultivation of mushroom different part of Arunachal Pradesh and NEIST Branch lab Itanagar.
- Several SHG and individual have produced mushroom and selling in local market and earned about 4-5 lakh rupees during the period.
- Organised 10 nos programme on Production of vermicompost in different location of Arunachal Pradesh. About 50 employments were generated through cultivation of vermicompost during the period.
- Organized entrepreneur meet, outreach programme, science motivational programme for benefit the students of school and colleges of the state time to time.

Project Title: **Empowerment of Apatani tribe of Arunachal Pradesh through value addition of ethnic food items**
Project No: **GPP-374**
Funding Agency: SEED Division, Department of Science and Technology (DST), New Delhi
PI & Members: Dr Chandan Tamuly (PI), Moushumi Hazarika (Co-PI)
Objectives:

- To explore, prioritization and utilization of natural resources used by Apatani tribe of Arunachal Pradesh for preparation of ethnic foods (Pila, Tapyo, Peru-yaan etc).
- Scientific validation and standardization of nutritional value, mineral content, evaluation of bioactive constituent's, energy value, antioxidant properties of the selected ethnic food for value addition.
- Awareness programme and demonstration of developed technology/process for promotion, sustainable utilization of value added products and socio-economic development of the tribal people for maximum income generation through market linkage.

Salient Achievements:

- **Awareness programme**: Total 4 nos of awareness and training programme at different villages of Lower Subansiri dist. have been organized. Total about 150 nos. of participated in three programmes.
- 5 nos of value added product has developed.
- 5 nos of paper have been published under the project.

Project Title: **Livelihood enhancement of the Monpa Tribe of Arunachal Pradesh through scientific and technological interventions on ethnic food items**
Project No: **GPP-418**
Funding Agency: SEED Division, DST, New Delhi
PI & Members: Dr Chandan Tamuly (PI), Dr Dipankar Neog (Co-PI)
Objectives:

- To analyzed, explore, and utilize natural resources used by Monpa tribe of Arunachal Pradesh for the preparation of ethnic foods (Brem/Gichin, Phuk, Sheyin, Aakmar etc).

- Scientific validation and evaluation of nutritional value, mineral content, evaluation of bioactive constituents, energy value, antioxidant properties of the selected ethnic food for value addition.
- To develop technology/process for the preparation of specific ethnic food items with emphasis on Brem/Gichin, Phuk, Sheyin etc. using natural resources for sustainable income generation.
- To organize awareness program and demonstration of developed technology/process for promotion, utilization of value-added products and socio-economic development of the people for maximum income generation through market linkage.

Salient Achievements:

- **Awareness programme**: Total 6 nos of awareness and training programme at different villages (Namet, Teli, Pamaghar) of Tawang dist. have been organized. Total about 150 nos. of participated in three programmes.
- Two nos of value added product has developed
- 2 nos of paper have been published under the project
- Installed three set of machinery in each villages of Arunachal Pradesh

Project Title: **Evaluation of metabolically stable bacterial endophytes for improving the medicinal plants and crop productivity in net house conditions in different altitudes of Arunachal Pradesh**

Project No: **GPP-419**

Funding Agency: SHRDI-Govt. of Arunachal Pradesh

PI & Members: Dr Natarajan Velmurugan

Objectives:

- Taking the major leads from earlier findings on medicinal plants-associated bacteria, the main purpose of this project is to carry out Inplanta validation that aims to improve the commodity crop and medicinal plants productivity in net house conditions in different altitudes of Arunachal Pradesh.
- As North East Indian region especially Arunachal Pradesh promotes organic farming, artificial symbiotic system composed of different plant growth promoting microbes can be an alternative, sustainable and eco-friendly material for improving medicinal plants and crops productivity, and could be of great significance.

Salient Achievements:

- The field experiments were initiated in net house conditions at Basar (Lapa Rada District) and Naharlagun (Papum Para District) with the help of State Horticulture Research and Development Institute.
- We have started experiments with evaluating the endophytes of *Paris polyphylla* and *Aconitum heterophyllum* for their plant growth promoting activities in two different crops tomato and chilli. Flower pots were used for Inplanta validation experiments in net house condition with model crops tomato and chilli for growth promoting activity treated with bacterial endophytes.

R & D CENTRES AND THIER ACTIVITIES

CENTRE FOR INFECTIOUS DISEASES

The Centre for Infectious Diseases Division (CID) undertakes identification and scientific understanding of pathophysiology of the prevalent and unknown infectious diseases of the region, and capacity building for bringing translational interventions for the society in terms of surveillance, diagnostics, therapeutics and other solutions. R&D focus areas include surveillance and diversity of bacterial and viral, infectious diseases in NE India, epidemiological and genomics studies of pathogens and host factors, exploration and validation of the traditional food and medicine systems of through multidisciplinary approach, developing formulations for preventive therapy, developing novel diagnostic platforms, developing computational tools and predictive models for forecasting disease incidences and outcomes.

Ongoing Projects

Mission Mode Projects

Project Title: **Phenome India-CSIR Health Cohort Knowledgebase (PI-CHeCK)**
Project No: HCP-047
Funding Agency: CSIR, New Delhi
PI & Members: Dr Jatin Kalita (Co-ordinator), Dr Prasenjit Manna (Co-PI), Dr Romi Wahengbam (Co-PI), Dr Tridip Phukan (Co-PI), Dr Pankaj Bharali (Co-PI)
Objectives:

- Develop a prospective longitudinal cohort of CSIR employees and their family
- To develop clinically useful personalized risk prediction score for complex metabolic disorders
- Creation of a biorepository

Salient Achievements:

- The initial phase of sample collection was completed during 24 January to 01 February, 2024 in CSIR-NEIST. A comprehensive cohort of 415 individuals from CSIR-NEIST participated in the program. Anthropometric data, Phlebotomy, Liver scan, ECG, Oscillometry, Spirometry, dynamometry, Skin Tests were performed. Subsequently, the results were promptly disseminated to all 415 participants as personalized health scores, thereby furnishing them with essential insights regarding their physiological and clinical state. The collected blood and stool samples were archived in the repository for subsequent metabolomics, proteomics and metagenomics study.

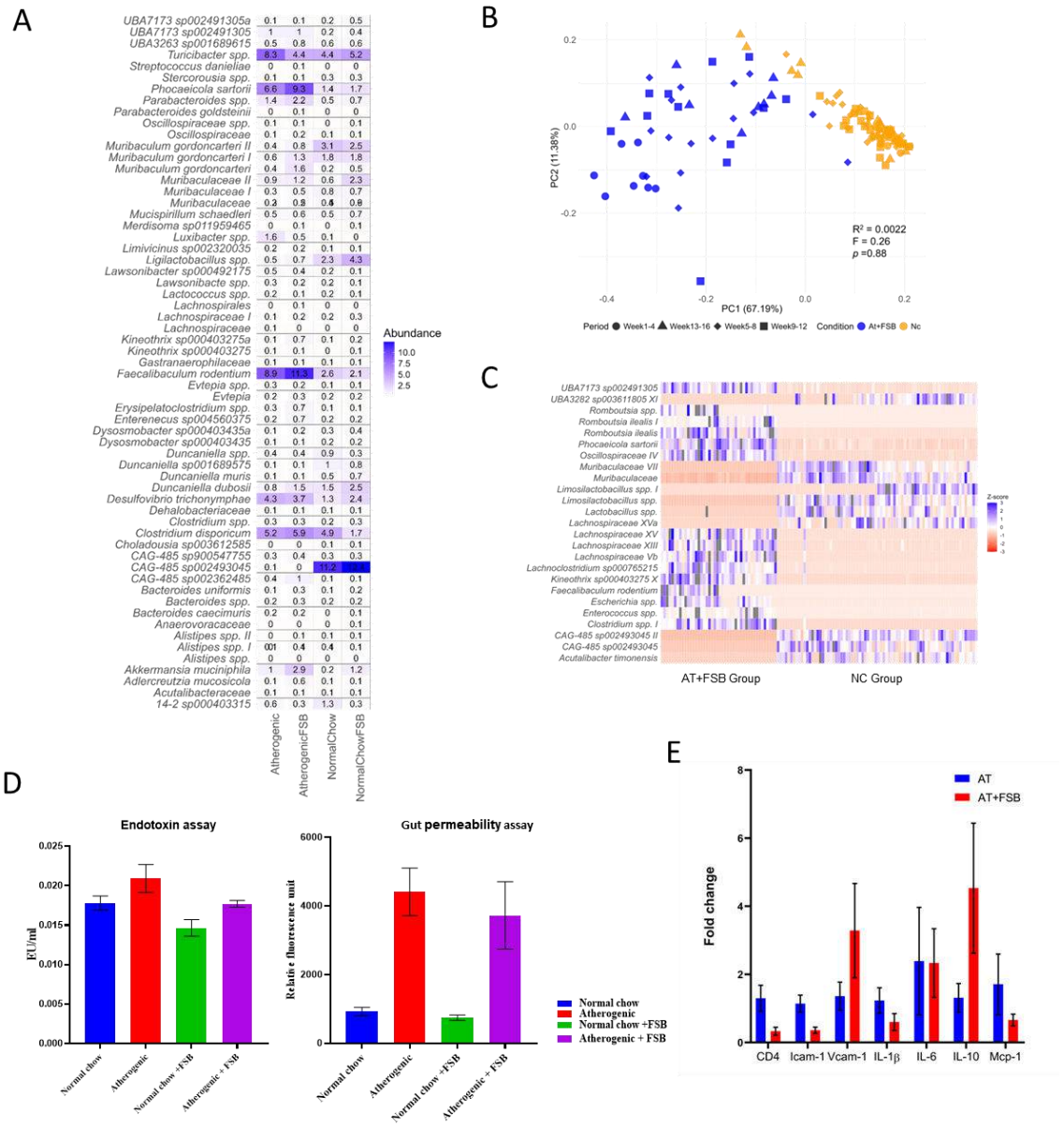


Fig. FSB supplementation reorients dysbiosis associated with atherogenic diet toward a gut microbiota composition resembling that of the normal diet. (A) Common core gut microbiome of the C57BL/6 mice fed with atherogenic, normal chow, atherogenic+FSB, and normal chow+FSB diets. (B) Weighted UniFrac multivariate PCoA β-diversity analysis between normal chow and atherogenic+FSB group. (C) Heat-map of top 25 significant species of normal chow and atherogenic+FSB group obtained from DeSeq2 analysis. (D) Endotoxin and gut permeability assays of the four diet groups. (E) Comparative analysis of qRT-PCR of atherosclerosis-associated genes between atherogenic and atherogenic+FSB groups.

Project Title: **Millet - Sustaining Health through Research and Innovation by Analysis of Nutrients and Nutraceuticals to Achieve Global Awareness (SHRI ANNA)**
Project No: **HCP-0052**
Funding Agency: CSIR, New Delhi
PI, Co-PI & Members: Dr Pankaj Bharali (PI)
Objective:

- ❖ Nutritional profiling (micro and macro) and proximate analysis of traditional, released, and bio-fortified millet varieties of North East India
- ❖ Documentation of the different millet-based traditional food products of North East India

Salient Achievements:

- ❖ 30 different Millet verities have been collected from Assam, Arunachal Pradesh, Meghalaya and Nagaland and analyzed the nutritional parameters (micro and macro) and proximate compositions.
- ❖ Millet based traditional foods and the beverages have been documented for the remote areas of Arunachal Pradesh and the samples have been prepared for further analysis (Figure below).
- ❖ DNA Barcoding has been carried out for the proper identification of the indigenous millet varieties.
- ❖ A field survey was conducted in Meghalaya, specifically targeting the endemic millets grown in the South West Garo hills, South West Garo hills, East Garo hills and East Khasi hills, where various samples were collected for further analysis. The most common millets grown in these region includes foxtail and Finger millets, commonly known as 'MISI' and 'Krai' in Garo and Khasi languages respectively.

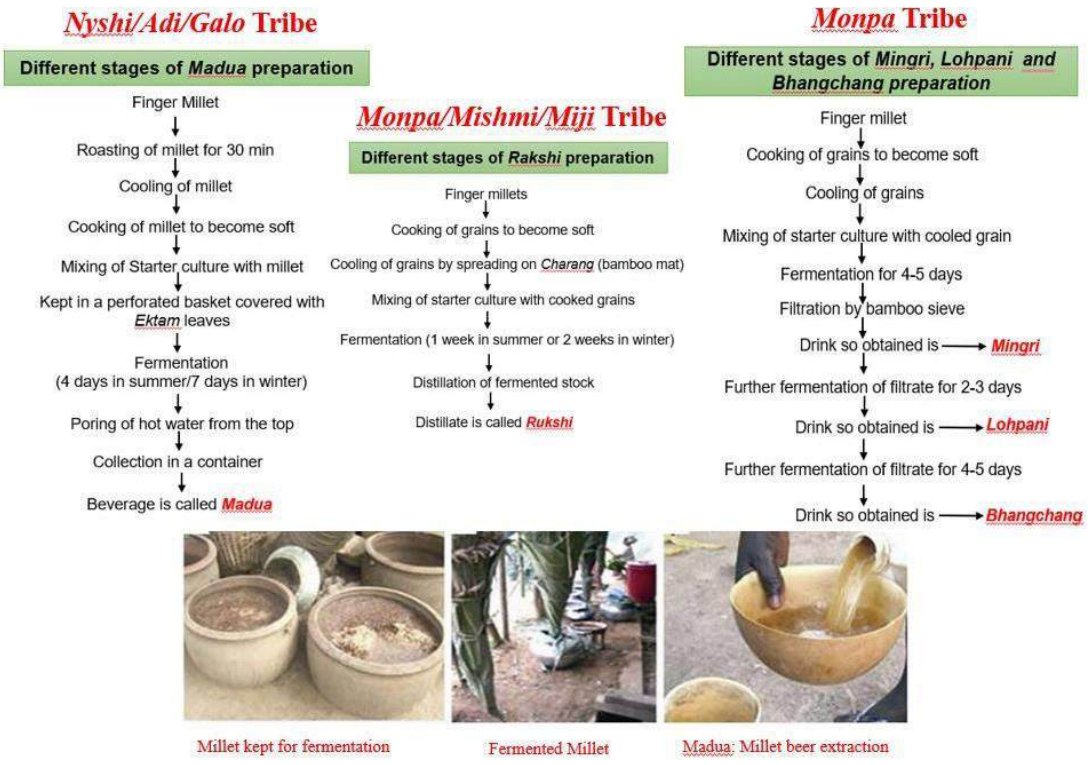


Fig. Different traditional practices for preparation of local beverages from Millets

Project Title: **CSIR-NEIST - Jigyasa 2.0 Program: Promoting Scientific Temper & curiosity amongst Students in the NE Region of India**

Project No: HCP-0101

Funding Agency: CSIR, New Delhi

PI & Members: Dr Jatin Kalita (Nodal PI), Dr Dipankar Neog (Co-Nodal PI), Dr Mantu Bhuyan, Dr Swapnali Hazarika, Dr Lakshi Saikia, Mr Jibon Jyoti Mahanta, Dr Ravindra K.

Rawal, Dr Pranjal Gogoi, Dr Santanu Baruah, Dr S. Nagamani, Dr Hriday Jyoti Mahanta, Dr Jayashree C. Phukon, Dr Biswajit Gogoi, Dr Chinmoy Rajkonwar, Dr Monti Gogoi, Mr. Ravi Kumar Sahu, Ms. Lisamoni Kalita

Objectives:

- To expose the young students and the teachers to the activities and achievements in the world of science.
- To inculcate scientific temper by demystifying science among students.
- To instil the sense of pride on the achievements of Indian science into the young minds,
- To motivate the students to take up science as career by exposing them to career opportunities in the areas of S&T.

Salient Achievements:

- School Visits: Under the leadership of Dr. G. Narahari Sastry, Director and guidance of Dr Jatin Kalita, Principal Scientist & HoD, CID, CSIR-NEIST, Jigyasa team has conducted 8 outreach programs, visiting 9 schools (which also include ATL schools) of Assam, Nagaland and Arunachal Pradesh in last 6 months. The team interacted with the school students followed by some popular science talks by various scientists. During the visit, some laboratory apparatus has been distributed for the up-gradation of the basic infrastructure of the schools.
- Lab Visit Programs: In the span of 6 months, the CSIR-NEIST Jigyasa team invited more than 2500 students from 13 different schools and colleges namely to visit the laboratories of CSIR-NEIST and to interact with the scientists as well as to understand the basic R&Ds of the laboratory. The main motive is to generate curiosity among the students and to make them understand science in a better and more effective way

Lab Visit Program: Students invited to CSIR-NEIST.

- **Teacher's Training Program**: During 7-8 February 2024 in collaboration with Royal Society of Chemistry, CSIR-NEIST, Jigyasa team successfully conducted a 2 days Teachers training program at STINER HUB Hall, CSIR-NEIST. More than 50 teachers

from 18 different schools of Jorhat took part in the program and were trained by speaker from RSC.


Teachers from various schools doing Hands on experiments at CSIR-NEIST.

- **One Week One Lab:** During 19-20 March 2023, CSIR-NEIST jigyasa team conducted various competitions and student-scientists connect program in the occasion of One Week One Lab Program. More than 500 students were invited to visit the CSIR-NEIST lab to interact with Scientists. They participated in various events like Quiz, Essay Writing, Art, Science model etc. organized by CSIR-NEIST Jigyasa team.


Students participating in various programs and attending Science based lectures.

- **Citizen Science Program:** On 23 May 2023, CSIR-NEIST Jigyasa team organised a Citizen Science Program under CSIR- Jigyasa initiative where a total of 19 girls from Dohotia High Secondary School, Jorhat, Assam participated in two groups, completed the project and submitted the final Citizen Science Project report based on the theme, "Medicinal Plants available in your locality and their traditional uses". Popular Science Talk programs were also organized by various Scientists of CSIR-NEIST and lastly Dr G Narahari Sastry, Director, CSIR-NEIST interacted with the students and encouraged them for their future endeavour.


Students participating in various programs and attending Science based lectures.

- **Workshop of Waste-to-Value**: A 3-days workshop has been conducted from 5th to 7th of July 2023, at Balya Bhawan School, Jorhat, Assam, by CSIR-NEIST Jigyasa team, based on the theme Waste-to-Value. More than 200 students from Class 5 to 10 participated and developed various products from waste like Broom from plastic waste bottles, Table lamp from scratch, bio fertilizers, vaccum cleaner using plastic jars etc.. The team assist them in developing the products as well as created awareness on plastic pollution. The program was concluded with remarks from Dr Dipankar Neog, Principal Scientist, CSIR-NEIST. He encouraged the students and explained the importance of science in nation building.
- **AI-Based Activities:** On 10 July 2023 and 18 August 2023, CSIR-NEIST Jigyasa CSIR-NEIST organised an AI based popular talk program under CSIR-JIGYASA initiative to create awareness and dissemination about AI to school students, under this year's Jigyasa theme, "Artificial Intelligence". Science enthusiastic students from Axel Public School, Guwahati, Assam,(10/07/23) and Modern Public School, Guwahati, Assam (18/08/23) were invited where a total of more than 80 students from Class 9 , 10 and 11 participated along with a total of 6 faculty members from both the schools respectively. The program was started with an introductory speech by Dr Jatin Kalita, followed by various lectures on Artificial Intelligence by Scientists and technical officers from ACDS Division of this institute.

In-house, Grant in aid & Consultancy Projects

Project Title: **Holistic Approach to Investigate Regional Priority Communicable Diseases for their Mitigation through Traditional Bioresources of North East India**
Project No: **OLP-2083**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Jatin Kalita (PI), Dr Prasenjit Manna, Dr. Jayashree C. Phukon, Dr Romi Wahengbam, Dr Pankaj Bharali, Dr Sridhar Shivakumar Hiremath, Mr Nayan Jyoti Borah, Ms. Babli Borah

Objectives:

- Genomic surveillance strategy for pathogens with epidemic/pandemic potential in North-Eastern region of India.

- ❖ Genomics, transcriptomics, metagenomics, proteomics and metabolomics of host–pathogen interactions.
- ❖ Exploration, documentation and validation of the traditional bioresources for mitigation of communicable diseases.

Salient Achievements:

- ❖ **Genomic surveillance strategy for pathogens with epidemic/pandemic potential in North-Eastern region of India:** Thirty-seven SARS-CoV-2 whole genomes from sixty COVID-19-positive samples obtained from Jorhat, Kamrup Metro, and Karbi Anglong districts were sequenced and assembled, analyzed, and deposited to GISAID and IBDC databases. Eleven variants were identified, dominated by the prevalence of recombinant variants such as XBB and JN.1 (**Fig.**). Results were reported to the state IDSP and district surveillance units for informed policy and decision-making.

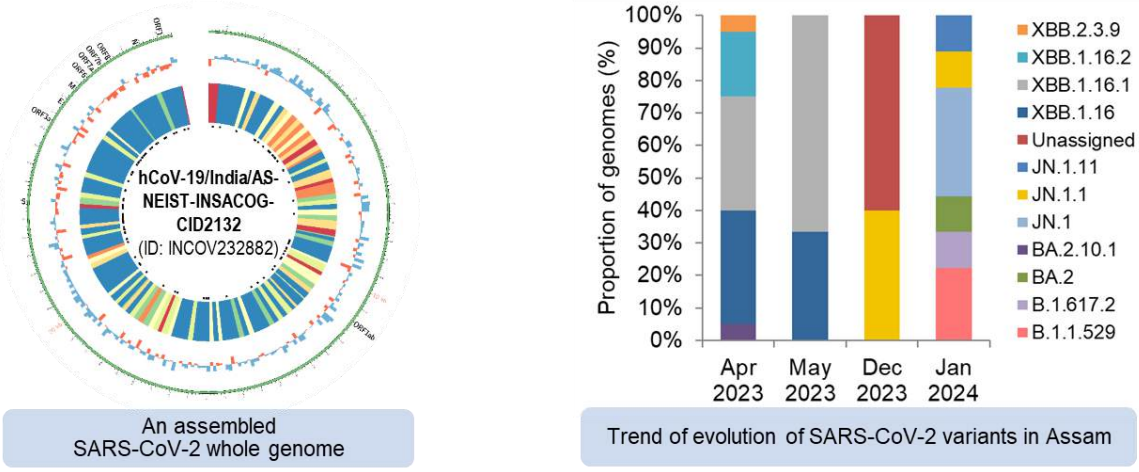


Fig. SARS-CoV-2 variants identified in clinical samples through whole genome sequencing during April 2023 to March 2024.

- ❖ **Genomics, transcriptomics, metagenomics, proteomics and metabolomics of host–pathogen interactions:** The team retrospectively investigate the relationship between upper respiratory tract microbiome and SARS-CoV-2 variants and viral load. Targeted 16S-metagenomic investigation revealed a significant presence and good recovery of upper respiratory tract microbiota from the biobanked naso-oropharyngeal swab samples of the SARS-CoV-2 positive and negative patients. The microbiome library showed visible differences between SARS-CoV-2 positive and negative patients. The microbiome recovery was significant up to 100x-dilution of the SARS-CoV-2 genomes from the samples.
- ❖ **Exploration and documentation of Alpine Biodiversity of Arunachal Pradesh:** The study of Alpine flora in Arunachal Pradesh holds paramount importance due to its contributions to biodiversity conservation, understanding climate change impacts, and preserving traditional knowledge. This research aids in identifying and conserving rare and endangered species, understanding the effects of climate change on these fragile environments, and documenting traditional uses of plants by local communities. The knowledge gained contributes to sustainable resource management, ecosystem resilience, and informed conservation strategies, making the study of Alpine flora in Arunachal Pradesh essential for both scientific understanding and effective environmental stewardship. Till now, we have discovered two species as new to sciences, one new record for India, and three

species are communicated as discoveries to science. For the genus *Berberis*, a new rank and combination, *Berberis setifolia* (Ahrendt) Bharali, B.Hajong & Harber is proposed for *B. macrosepala* var. setifolia Ahrendt, based on a morphological examination of herbarium specimens from Me La, NE Bhutan and Se La, Arunachal Pradesh, India and living plants from Se La (**Fig.**). Another interesting species *Begonia narahari* was discovered from the Lohit district of Arunachal Pradesh which shows a unique characteristic - a bright blue iridescence when exposed to direct light - that aids in its identification. The new plant species is named *Begonia narahari* in honour of Prof Garikapati Narahari Sastry, who played a key role in establishing the Germplasm Conservation Centre for Northeast India's bio- resources (**Fig.**).

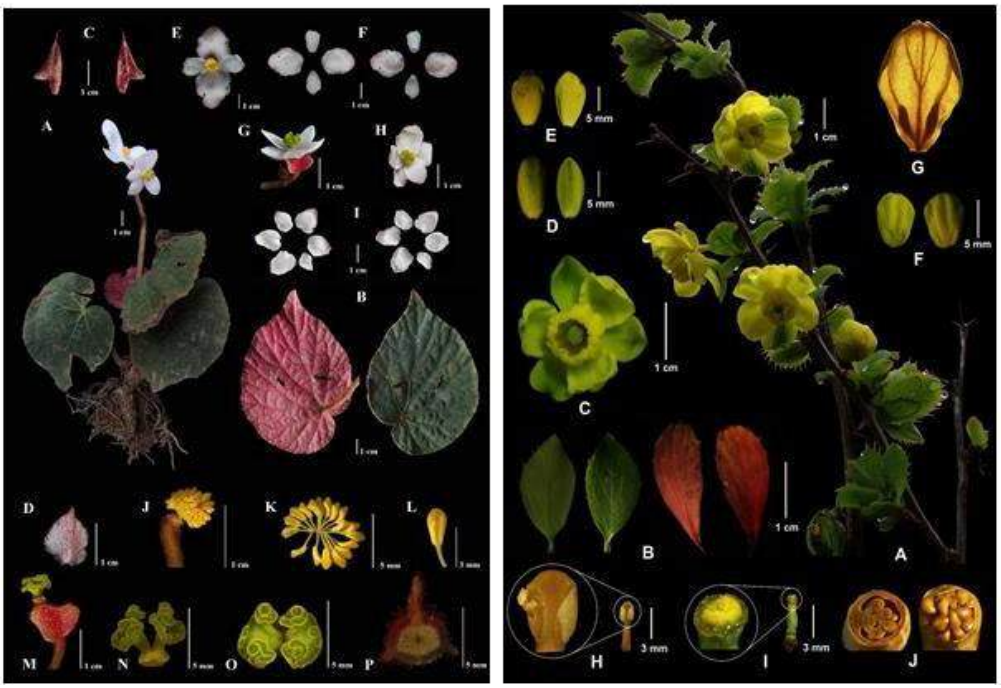


Fig. (*Left*) *Begonia narahari* A. Habit, B. Adaxial and abaxial surfaces of leaf, C. Adaxial and abaxial surfaces of Stipule, D. Bract, E. Front view staminate flower, F. Adaxial and abaxial surfaces of tepals of staminate flower, G. Side view of pistillate flower, H. Front view of pistillate flower, I. Adaxial and abaxial surfaces of pistillate flower, J. Side view of androecium, K. Front view of androecium, L. Stamen, M. Gynoecium, N. Side view of stigma, O. front view of stigma, P. Transverse section of ovary. (*Right*) *Berberis setifolia*. A. Flowering twig B. Abaxial and adaxial surface of leaf C. Front view of flower. D. Abaxial and adaxial view of outer sepal E. Abaxial and adaxial view of inner sepal. F. Abaxial and adaxial view of petal. G. Venation and nectary glands of petal. H. Stamen and close view of anther. I. Pistil and close view of stigma. J. Placentation and ovules.

- **Exploration, documentation and validation of the traditional bioresources for mitigation of communicable diseases:** During the above mentioned period, we have examined the efficacy of the hydroalcoholic extracts of selected *Allium* species (*Allium hookeri*) of North East India on the inhibition between SARS-CoV-2 spike protein and ACE2 receptor. HEK293T cells were transfected with pTwist-EF1alpha-SARS-CoV-2-S-2xStrep plasmid encoding SARS-CoV-2 spike protein and pLVX-EF1alpha-eGFP-2xStrep-IRES-Puroas a control (kindly gifted by Prof. NevanJ. Krogan, University of California, San Francisco, USA). After reaching confluency, pTwist-EF1alpha-SARS-CoV-2-S-2xStrep transfected cells were treated with *Allium*

hookeri leaf methanolic extract (AHME) or N-acetyl cysteine (NAC). (**Fig. A**) demonstrated the positive transfection of both pLVX-EF1alpha-eGFP-2xStrep-IRES-Puro and pTwist-EF1alpha-SARS-CoV-2-S-2xStrep plasmids in HEK293T cells. It has been observed that treatment with different concentrations of MEAH or NAC caused a decrease in the secretion of pro-inflammatory cytokines (TNF-α and IL-6) compared to those seen in cells transfected with plasmid containing S protein backbone (**Fig. B**). Interestingly, transfection with S protein backbone containing plasmid caused a decrease in the protein expression of the signaling molecules involved in GSH biosynthesis (GCLC and GR) and that was prevented by the treatment with AHME or NAC (**Fig. B**). This study suggested the beneficial role of the *Allium hookeri* leaf methanolic extract in upregulating the GSH biosynthesis and decreasing the secretion of pro-inflammatory cytokines in pTwist-EF1alpha-SARS-CoV-2-S-2xStrep transfected cells.

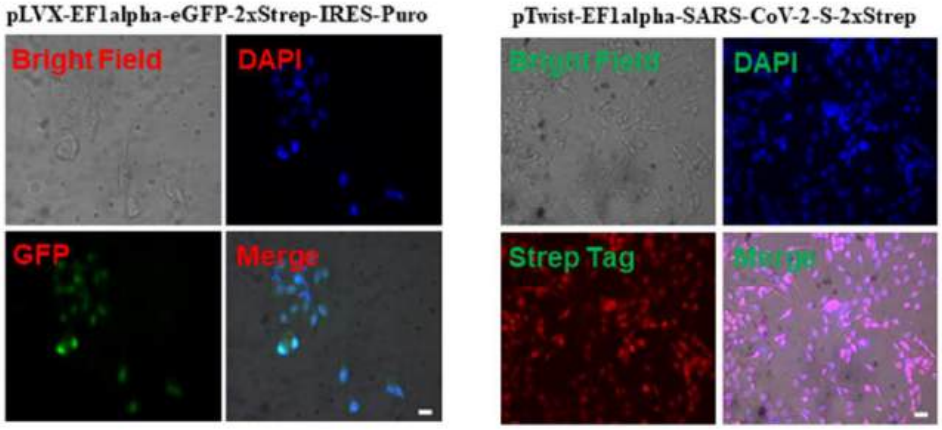


Fig. A. HEK293T cells transfected with pLVX-EF1alpha-eGFP-2xStrep-IRES-Puro (left) or pTwist-EF1alpha-SARS-CoV-2-S-2xStrep (right) plasmid using Lipofectamin 3000 transfection reagent

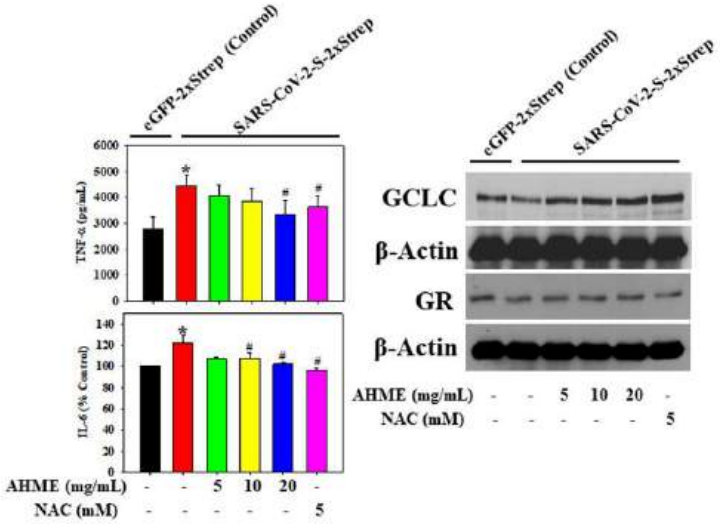


Fig. B. Effect of *Allium hookerii* leaf methanolic extract (AHME) or N-acetyl cysteine (NAC) on the secretion of pro-inflammatory cytokines (TNF-a and IL-6) and the signaling molecules (GCLC and GR) responsible for GSH biosynthesis in SARS-CoV-2 Spike protein transfected cells. Cells transfected with pLVX-EF1alpha-eGFP-2xStrep-IRES-Puro was used as control. Values are mean ± SD (n=3). "*" denotes significant difference from eGFP-2xStrep

transfected cells (Control) ($p<0.05$); "#" denotes significant difference from SARS-CoV-2-S-2xStrep transfected cells without treated with AHME or NAC ($p<0.05$).

Inflammation is a systemic autoimmune syndrome that responds to injury and infection. The conventional treatment for inflammation, like non-steroidal anti-inflammatory drugs (NSAIDs), has been associated with numerous adverse effects. *Piper betleoides* C. DC., also called "Jangli Paan," is one of the popular ethnomedicinal plants belonging to the family of Piperaceae widely grown in the North Eastern region of India as well as the Eastern foothills of the Himalayas. During the above-mentioned period, we investigated the anti-inflammatory potential of *Piper betleoides* (PBt) by using LPS-induced cell culture (RAW 264.7, macrophage) and an animal model (rat) of inflammation. Treatment with PBt extract dose-dependently decreased pro-inflammatory cytokines (TNF-α, IL-6, and MCP-1) and increased anti-inflammatory cytokines (IL-4 and IL-10) secretion in LPS-treated cells. Similarly, PBt extract also prevented the alternation in mRNA expression of inflammatory markers (TNF-α, CCL-2, IL-6, and IL-10) in LPS-treated cells. Treatment with PBt extract further reduced the production of intracellular ROS and increased the phagocytosis efficacies in LPS-treated cells. *In vivo* studies showed that treatment with PBt extract prevented the dysregulation in the secretion of inflammatory cytokines (TNF-α, IL-4, IL-6, and IL-10) against LPS exposure. The outcome of the study will be helpful for the development of anti-inflammatory herbal formulations.

- **Development of plant extractive-based nutraceuticals for immunomodulation and hepatoprotection:** Phytochemical investigation of leaves and fruits powders of three traditionally important medicinal plant species (*Pyrus pashisa*, *Piper mullesua* and *Illicium griffithii*), which are used as an immune-boosting herbal infusion in the high altitude of Arunachal Pradesh, revealed that they contain Gallic Acid, 3-4 Dihydroxybenzoic acid, Chlorogenic Acid, Caffeic Acid, Syringic acid, Sinapic Acid, Rutin, Quercetin and Pyrocatechol, which are the reported marker molecules for immunomodulation and hepatoprotection. The selected plant materials were rich in micro and macro elements. Following the CTC tea production procedure, a process was standardized to develop a fine product in the form of "CTC TISANE" from the young buds of *P. pashia* leaves as a good source of immunomodulation and hepatoprotection **(Fig.)**.

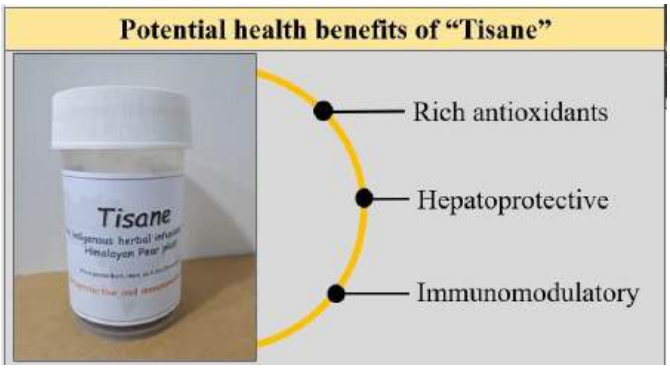


Fig. The developed CTC TISANE

- **Surveillance of pathogens in drinking water:** As a part of the surveillance of pathogens, drinking water surveillance was initiated. Water samples were collected from 15 different sites within the Jorhat district and two sites within the CSIR-NEIST campus to test the presence of zoonotic bacteria and parasites and their

physiochemical parameters. Some potential bacteria (**Fig. A**) and parasites (**Fig. B**) are detected. Detailed analysis of the organisms is going on.

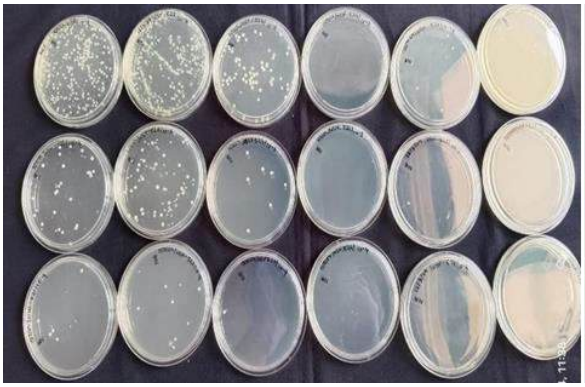


Fig. A. Growth on NA media

Fig. B. Eggs of *Oxocara* sp.

Project Title: **Profiling of Immunomodulatory Potential and Development of Herbal Product (as per AYUSH and FSSAI Standard) Based upon Traditional Medicines from Eastern and Western Himalaya with Special Reference to Assam, Arunachal Pradesh, and Manipur**

Project No: GPP-391

Funding Agency: Department of Biotechnology (DBT), Govt. of India

PI & Members: Dr Prasenjit Manna (Co-PI)

Objectives:

- To develop herbal nutraceuticals and therapeutics with immunomodulatory and anti-inflammatory properties (as per AYUSH and FSSAI standards)

Salient Achievements:

- This study investigates the immunomodulatory effects of *Piper mullesua* Buch. -Ham. ex D. Don, known as "Hill Pepper," an important ethnomedicinal plant utilized for treating colds and coughs among ethnic groups in Arunachal Pradesh and Manipur, India. Lipopolysaccharide (LPS) (50 ng/mL) treatment resulted in increased ROS production, secretion of pro-inflammatory cytokines (TNF-α, MCP-1, IL-6), reduced anti-inflammatory cytokines (IL-4, IL-10), and diminished phagocytosis as compared to untreated group. The plant extract mitigated these effects in a dose-dependent manner, closely matching the anti-inflammatory efficacy of diclofenac in LPS-exposed cells (positive control). The plant also contains significant levels of essential micronutrients (Zn, Fe, Cu, Cr, Mg, Mn, Se) relative to FSSAI's daily allowance guidelines. GC-MS analysis identified bioactive compounds such as piperine, caryophyllene, phytol, palmitic acid, spathualenon, limonen-6-ol, pivalate, elemol and heptacosane, contributing to its immunomodulatory properties. These findings underscore the "Hill Pepper" as a promising candidate for developing anti-inflammatory herbal treatments.

Project Title: Varietal Improvement and Value Addition of Large Cardamom (*Ammomum Subulatum* L.) and Turmeric (Curcuma Sp.) of Arunachal Pradesh through Integrated Approach

Project No: GPP-395

Funding Agency: Department of Science and Technology, Govt of Arunachal Pradesh

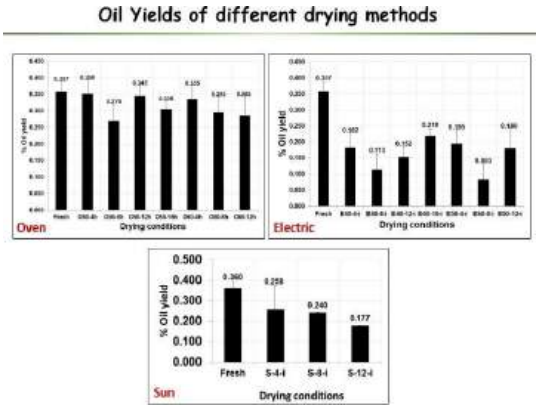
PI & Members: Dr Pankaj Bharali (PI)

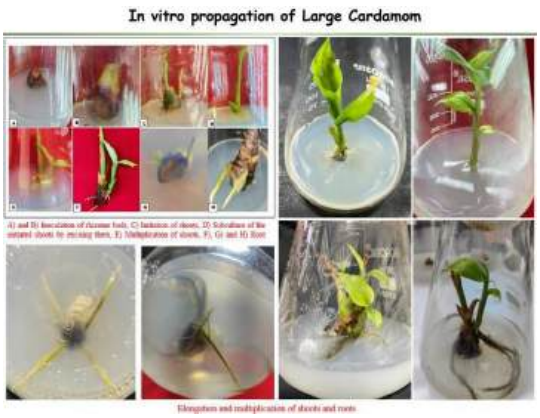
Objectives:

- Collection and conservation of germplasm of large cardamom and turmeric.
- Selection and development of superior variety and quality planting material.
- Multi locational field trials for the mass cultivation in the different agro-climatic conditions across the state.
- Post-harvest processing for development of quality dried large cardamom and turmeric.
- Development of the value-added products of leaves, rhizome of turmeric and the capsule of large cardamom.

Salient Achievements:

- The collected samples were planted in CSIR-NEIST campus and also processed for the investigation of the phytochemicals to investigate the curcumin contents along with other marker molecules. Rhizome and rhizospheres soil of both (large cardamom and turmeric) are processed for microbial isolation. Among all the isolates, most of the endophytes belonged to the genera *Fusarium*, *Aspergillus*, and *Bacillus*. Tissue culture protocol has been standardized for both turmeric and cardamom for mass propagation, quality planting materials for field trial. Rhizomes of large cardamom (*Amomum subulatum*) were employed as explants for the *in vitro* micropropagation of healthy and diseased-free plants. Surface sterilized rhizome buds were inoculated into MS basal medium fortified with different plant growth regulators (PGRs).





Project Title: **Spatiotemporal Dynamics of SARS-Cov-2 Variants in Wastewater Systems in North East India through Genomic Surveillance and Epidemiology for Forecasting its Spread and Health Outcomes**

Project No: **GPP-397**

Funding Agency: SERB, Govt. of India

PI & Members: Dr Pankaj Bharali (PI), Dr Romi Wahengbam (Co-PI), Dr Anil Kr. Singh (Co-PI)

Objectives:

- Detection and quantification of SARS-CoV-2 variants in sewage, medical and domestic wastewater and their whole genome sequencing to understand spatiotemporal distribution.
- Computational modelling using AI and machine learning for comprehensive mapping of SARS-CoV-2 in wastewater sources of NE India.

Salient Achievements:

- Eight distinct lineages were identified, namely XAA, XAB, XAC, BA.2.38.2, BA.2.66, B, XBB.1 and XAJ. Among them, lineages XAA, XAB, and XAJ have not been detected in routine epidemiological studies in India. However, through our analysis, these lineages could be detected in the wastewater samples for the very first time in India from urban areas of Jorhat. Regarding this work, the manuscript entitled “On the occurrence of SARS- CoV-2 in wastewater bodies of Jorhat district of Assam, India” has been submitted, and it was accepted.
- We have used an unsupervised learning approach to cluster the sample sites with SARS-CoV-2 as dependent factors and wastewater-based epidemiology parameters as independent factors. The study revealed distinct patterns in formation of the clusters such that, the cluster with highest viral positivity rate, particularly during the rainy season, characterized by unique water quality parameters. On the other hand, another cluster exhibited the lowest viral positivity rate, notably during the dry season, and showcased its own set of distinctive water quality characteristics. This further corroborated with well identified patterns in cluster combinations in sample sites, emphasizing the role of environmental factors in shaping SARS-CoV-2 prevalence.

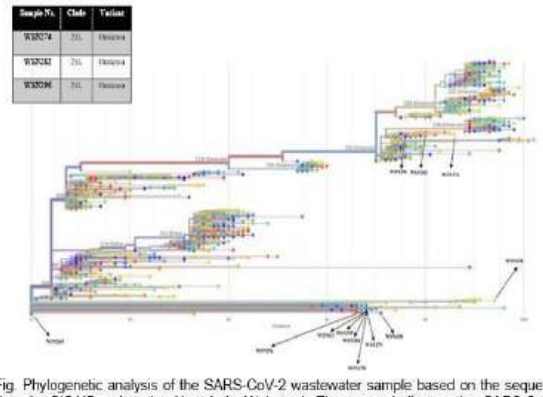


Fig. Phylogenetic analysis of the SARS-CoV-2 wastewater sample based on the sequence data in GISAID using the Nextclade Web tool. The arrow indicates the SARS-CoV-2 wastewater sample from Jorhat.

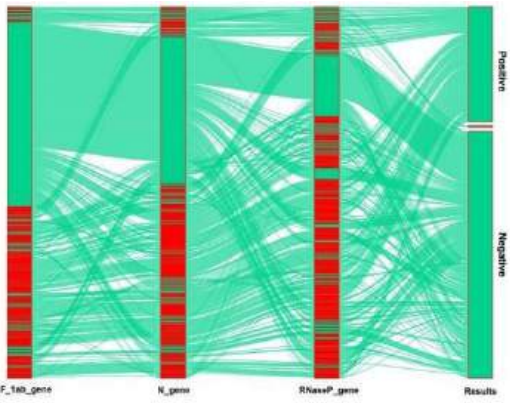


Fig. The alluvial plot provides a visual representation of the distribution of SARS-CoV-2 ORF 1ab, N, and RNAseP genes, along with the corresponding results (positive and negative) observed in wastewater samples. The red blocks depict the Cycle Threshold (Ct) values for each gene in the samples, while the green blocks indicate the absence of a Ct value (ND - No Detection) in the three genes.

Project Title: **Ethnomedicinal North-Eastern Spice (Allium spp.) against Respiratory Viral Infections: Efficacy, Bioactives, and Mechanistic Insight**

Project No: GPP-417

Funding Agency: SERB Department of Science and Technology, Govt. of India

PI & Members: Dr Prasenjit Manna (PI)

Objectives:

- To investigate the efficacy of selected sulfureous *Allium* plant extracts against respiratory viral infections *in vitro* and *in vivo*.
- Phytochemical profiling and standardization of the effective plant extract(s).
- To evaluate the role of active extract(s) for stimulating glutathione biosynthesis and modulating immune response against respiratory viral infections *in vitro* and *in vivo*.

Salient Achievements:

- This study explored the anti-viral properties of *Allium* spp. from North East India against respiratory viral infections, particularly focusing on SARS-CoV-2. Plant materials were collected across the region, authenticated by taxonomist Dr. Dipanwita Banik, Principal Scientist, CSIR-NEIST, and subjected to hydroalcoholic extraction via maceration using methanol. The extracts' efficacy was evaluated using cell-free (ELISA) and cell culture techniques (confocal microscopy and flow cytometry studies), revealing a dose-dependent inhibition of SARS-CoV-2 spike protein and ACE2 receptor interaction, as well as reduced cellular infection by SARS-CoV-2 pseudoviral particles. These findings suggest potential therapeutic applications of *Allium* spp. extracts in treating SARS-CoV-2 infections.

Project Title: Role of Gut Microbiota in the Pathogenesis of Atherosclerosis in Relation with Dietary Habits

Project No: GAP-0797

Funding Agency: ICMR, Govt. of India

PI, Co-PI & Members: Dr Romi Wahengbam (PI), Mr Moirangthem Goutam Singh, JRF-ICMR (Member)

Objective:

- Collection of fermented food samples, profiling of nutrients, microbes and metabolites.
- Assessment of atherosclerosis-linked gut microbiota and host metabolome in context to supplementation of fermented food in mice model.
- Elucidate mechanism of gut microbiota amelioration of atherosclerosis.

Salient Achievements:

- Core gut microbiome analysis of C57BL/6 mice revealed that long-term dietary supplementation with fermented soybean (FSB) increased the relative abundance of *Parabacteroides* spp. *Phocaeicola sartorii*, *Muribaculum gordoncarteri*, *Muribaculaceae* family, *Ligilactobacillus* spp., *Duncaniella dubosii*, *Akkermensia muciniphila* and *Bacteroides uniformis*. The majority of these bacteria are known for their ability to produce SCFAs. No significant difference (p=0.88) in β-diversity was observed between the normal diet (Nc) and atherogenic+FSB diet (AtFSB) groups, suggesting a substantial reorientation of the gut microbial dysbiosis, typically associated with an atherogenic diet, toward a composition resembling that of the normal diet group, following the introduction of FSB supplementation. Significant differential abundance of gut bacteria was observed between the Nc and AtFSB

groups. FSB supplementation also maintained the integrity of the gut lining, subsequently lowering the gut permeability and endotoxin levels in the blood. FSB also reduced the expression of atherosclerosis-associated genes such as CD4, ICAM, Mcp-1 and IL-1β.

Project Title: **Unravelling the Chilli Plant Viruses through High Throughput Sequencing and Development of Rapid Diagnostics**
Project No: **IHP240002**
Funding Agency: CSIR, New Delhi
PI, Co-PI & Members: Dr Shridhar Shivakumar Hiremath (PI)
Objective:

- Survey and collection of infected plant samples and identification of known and novel viruses through high throughput sequencing (HTS)
- Development of diagnostic tools such as multiplex PCR, Recombinase Polymerase Amplification (RPA), Loop-Mediated Isothermal Amplification (LAMP) and other field deployable tools for accurately detecting identified viruses.

Salient Achievements:

- Chilli (Bhut Jolokia) infected leaf samples have been collected from plants grown at the CSIR-NEIST farm. Initially, the presence of a DNA virus, specifically the chilli leaf curl virus, was detected, identified as the "tomato leaf curl Joydebpur virus" (ToLCJoV).
- The full-length genome of the ToLCJoV, approximately 2.7 kb, has been amplified through rolling circle amplification. Along with the DNA-A genome segment, an associated satellite was detected, confirming the virus as a monopartite begomovirus. Both the amplified DNA-A and the betasatellite have been sequenced.
- The full-length genome has been cloned to generate an infectious clone for further research. Work is ongoing to detect other known and novel viruses infecting chilli. Diverse samples will soon be collected, and diagnostic kits will be developed for the identified viruses.

Project Title: **Non-Dairy Origin Probiotics from Actively Fermenting Microbiota of Ethnic Fermented Foods and Beverages of North Eastern India (NDP-AFM)**
Project No: **IHP240008**
Funding Agency: CSIR, New Delhi
PI, Co-PI & Members: Dr Romi Wahengbam (PI)
Objective:

- Documentation of traditional non-dairy fermented foods and beverages of NER India and collection of actively fermenting samples.
- Isolation, identification and probiotic characterization of actively fermenting microbes evolved during the traditional fermentation.
- Preclinical investigation of single bacterium or combinatorial probiotic formulation as probiotic health supplement.

Salient Achievements:

- Identified five major ethnic NDFFBs through literature mining that are produced and consumed by different communities of the eight North Eastern states of Eastern Himalaya region as a part of their food habit and dietary culture.
- Field survey and documentation of these identified major NDFFBs have been initiated to identify and select traditional production sites/locations for the study.

Sampling of time-series fermentation samples of *Khorisa* (fermented bamboo shoot of Assam) were also initiated for isolation and identification of actively fermenting microbiota.

- Developed a method for cultivable-fraction enrichment of active and viable anaerobic microbiota, coupled with multiplex, targeted-metagenomic sequencing for rapid species-level identification of the enriched cultured microbial community.
- Analysis of active fermentation samples of *Khorisa* revealed a dynamic lactic acid bacteria-dominated culturable anaerobic microbial community characterized by known and unknown species of the genera *Lactiplantibacillus*, *Levilactobacillus*, *Limosilactobacillus*, *Companilactobacillus*, and *Lactobacillus* (**Fig**). Isolation of purified strains of these species is in progress.

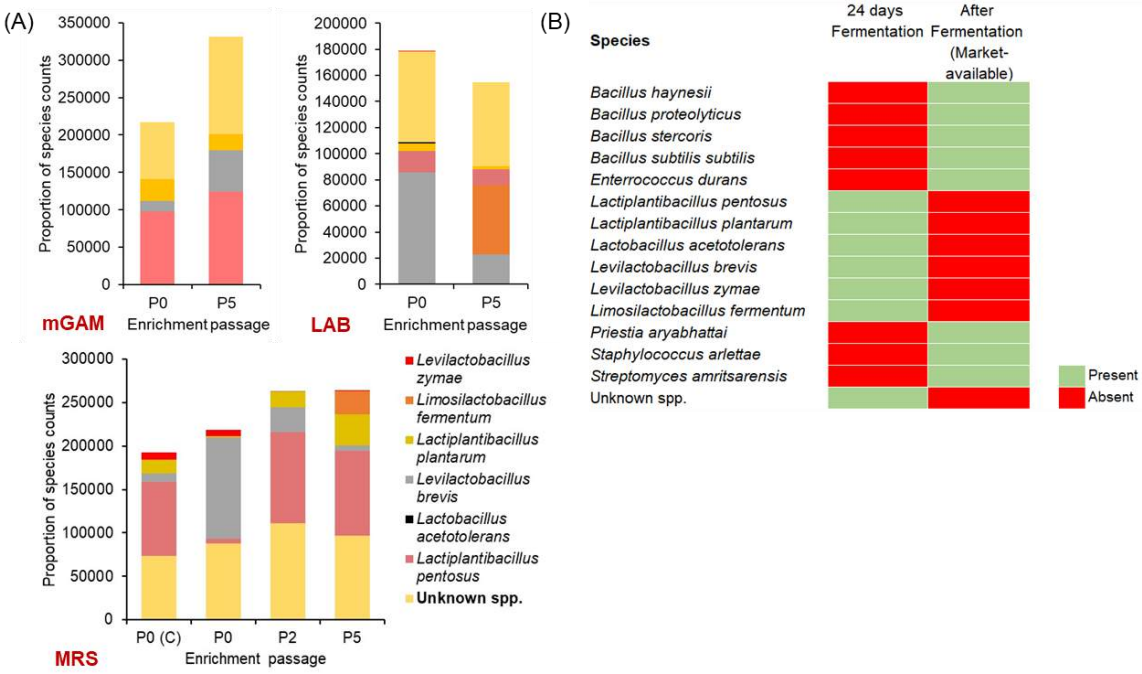


Fig: Enrichment of cultivable-fraction of anaerobic lactic acid bacteria community in *Khorisa* present on its 24th day of fermentation following different passages (A), and comparison of the enriched lactic acid bacteria community with the microbial community in market-available fermented product determined by (B).

CENTRE FOR PETROLEUM RESEARCH

Centre for Petroleum Research, CSIR NEIST, was established in the year 2019 under the leadership of Dr G Narahari Sastry, Director, CSIR NEIST to carry out research in the areas of high relevance and importance to solve contemporary problems encountered in petroleum research and oil industries. Due to the unique location of CSIR-NEIST in an area with high representation of many oil companies such as OIL, ONGCL, IOCL, APL, BCPL and NRL, etc. many have shown keen interest to work along with CSIR-NEIST. As a result, CSIR NEIST has signed MoU with NRL, BCPL, OIL, APL etc. Other additional MoU's with ONGC, IOCL, etc. are also on advanced stages. Current focus of the centre is to actively engage CSIR-NEIST and other laboratories of CSIR such as IIP-Dehradun, NEERI-Nagpur and IICT-Hyderabad to work closely with the oil and petrochemical industries. The expertise of the faculties in the Centre spans in different areas of research such as Crude Oil Research, Waste to Wealth, Green and Sustainable Process for Value Addition, Membranes for Petroleum Research, Effluent Treatment, Petrochemicals and Characterization of Petroleum Product etc.

The Centre has about 25 scientists including 40 nos. of research staff working in different areas like Crude Oil Research, Waste to Wealth, Green and Sustainable Process for Value Addition, Polymer engineering for sustainable development, Membranes for Petroleum Research, Effluent Treatment and Characterization of Petroleum Product etc.

CSIR-NEIST Centre for Petroleum Research

In March 2021, Ministry of Chemicals and Fertilizers, Department of Chemicals and Petrochemicals has sponsored a program for setting up a Centre of Excellence (CoEs) at CSIR NEIST for the project titled "Polymers, their composites and polymeric membranes for sustainable development of Petroleum industries". The work is designed specifically with four work elements which are linked for different activities, primarily **1**. Development of polymeric products for packaging applications, **2**. Development of polymeric membrane for waste water treatment leading to environmental protection including recirculation, **3**.

Development of polymer additives for improving the flow of the crude and **4**. Seismic hazard assessment and disaster management for OIL and Petrochemical industries. Towards the sustainable development in the petroleum industry, the product which will be developed under the project will have long term impacts on the Oil and Petrochemical Industries for their techno economic growth.

"Centre of Excellence" for Petroleum Research

Ongoing Projects

Inhouse, Grant in aid & Consultancy Projects

Project Title: "Emerging R&D for Sustainable Future of Petroleum Industry"
Project No: GPP-373
Funding Agency: Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers
PI & Members: Dr Swapnali Hazarika (PI), Dr P J Saikia, Dr Bipul Das, Dr Ashutosh Namdeo, Mr Ravi Kr Lingam, Dr P G Ingole, Dr J S Verma, Dr Hridoy Jyoti Mahanta, Dr S Nagamoni, Mr Tobiul Hussain Ahmed, Mr Ramesh Bohra, Dr Rajiv Goswami, Dr Monti Gogoi, Mr Lachit Phukan
Salient Achievements:

- Established the process for oil recovery from refinery sludge which is a combined process of extractive separation and nanofiltration. More than 98% oil has been recovered from oily sludge.
- Optimized the procedure for diesel-methanol blending in collaboration with Numaligarh Refinery Limited.
- Submitted proposal to NRL for setting up a R&D Centre at CSIR-NEIST for Petroleum Research which has been approved by NRL of project cost 89.76 crore (excluding GST). Signed Memorandum of Agreement with NRL for implementation of the project.
- **Thin Film Nanocomposite Membranes for Multifaceted Separation Applications:** Thin film nanocomposite (TFN) membranes were developed for gas

separation, heavy metal ion removal, and the elimination of micropollutants from water. The membranes were fabricated using interfacial polymerization methods. After development, a comprehensive study was conducted to evaluate their performance in the specified applications. Nanoparticles were incorporated on the membrane making them suitable for various industrial uses, including gas separation and the removal of heavy metal ions and micropollutants removal. The membranes are antifouling and cost-effective also.

Project Title: "**Centre of Excellence" on "Polymers, their Composites and Polymeric Membranes for Sustainable Development of Petroleum Industries"**

Project No: GPP-373

Funding Agency: Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers

PI & Members: Dr Swapnali Hazarika (PI), Dr Sangeeta Sharma (Co-PI), Dr Prakash Jyoti Saikia (Co-PI), Dr S Nagamani (Co-PI)

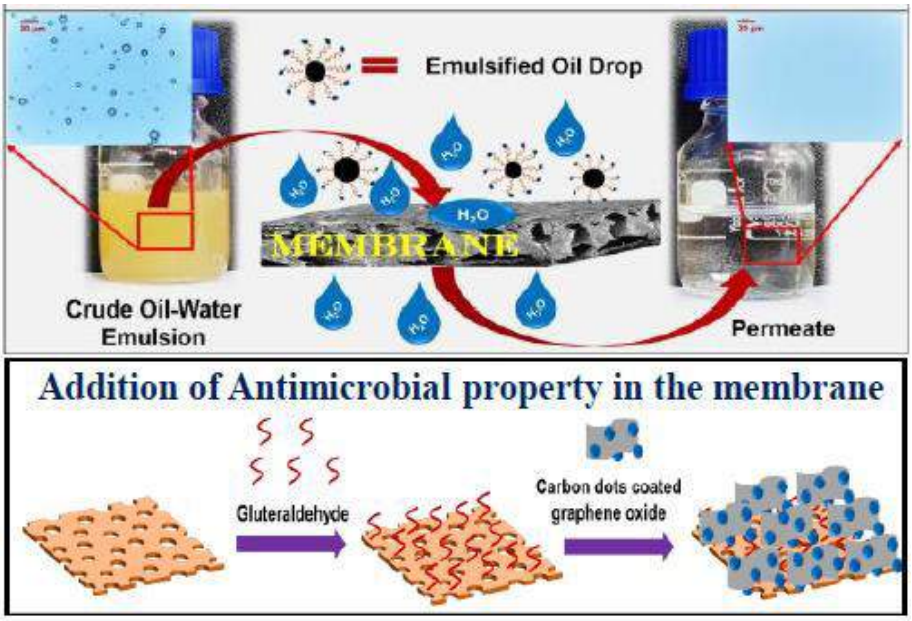
Objectives:

- Design and development of composite polymeric materials (based on synthetic and bio based polymers) for packaging applications.
- Recycling of polymer waste viz. PET, PP, PE, PS, etc. to produce non-woven fabric / fibre for PPE/green applications
- Development of Carbon nanomaterial such as carbon nanotube, Grapheneoxide, Cellulose nanocrystals based engineered membranes for treatment of waste water of Oil and Petrochemical industries.
- Pilot tests of developed membranes for technology demonstration and to gather technical data for process scale up
- Development of polymers with controlled architecture and desired properties as flow improver for NE Indian waxy crude.
- To study the influence of resultant polymers on the flow behaviour of waxy crude and to understand the interaction mechanisms between polymer additives and wax crystals.
- Monitoring of land subsidence in and around oil field, crude pipelines and petroleum industries.
- Assessment of state of health oil installations so far as earthquake response is concerned.
- Seismic hazard assessment of Petrochemical industries and subsequent mitigation measures.

Salient Achievements:

- ***Designing of superhydrophilic and organic solvent resistant membrane from waste materials for treatment of petroleum industry wastewater:*** The wastewater generated by petroleum industry could be a fatal issue for the environmental sustainability when disposed untreated. In this work we have developed a superhydrophilic and organic solvent resistant nanocomposite membrane using waste bottles made of poly(ethylene terephthalate) (PET) and cellulosic papers have been established in this work. Using *in-situ* synthesized

cellulose nanofibers we have successfully fabricated porous membranes which is not possible for bare PET matrix using water as nonsolvent. The designed membrane was successfully used for separation of oil and water from synthetic crude oil-water emulsion. The membrane showed permeability up to 98 Lm-2h-1 applying pressure of 1.5 bar. The membrane also achieved removal of more than 97% of organic substances from a crude oil-water emulsion system. The mechanism behind the separation is size exclusion principle or sieving mechanism and have been well established by analysing the pore structure of the designed membrane. The optimum membrane also showed good thermal stability with initial degradation temperature ~350oC and good tensile strength of 0.86 MPa. The antimicrobial property of the nanocomposite membranes was achieved by coating its surface with carbon dots rooted graphene oxide. Addition of antimicrobial activity minimizes the possible biofouling due to microbial attack. Therefore, the designed membrane can be a good option for treatment of petroleum industry wastewater with its high durable performance. Our work is also an endeavor to develop high quality products from waste plastic materials to minimize the pollution caused by the plastic waste materials.

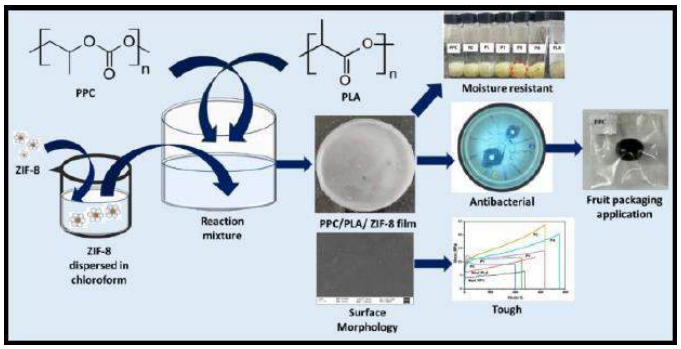


- ***Developed Cellulose nanofiber mediated natural dye based biodegradable bag with freshness indicator for packaging of meat and fish:*** In this work, we aimed to design a biodegradable fish and meat packaging bag that can detect the freshness of the product within the packaging environment. A nanocomposite film was made with cellulose acetate and nanofibres, and dye was then added to enable the film to fucction as as sensor. The nanocomposite film could be used as a sensor for ammonia vapor detection, which is formed when meat and fish are packaged in a packaging environment for a long time. The colour-changing properties of the films were measured using a CR-400 Konica Minolta Chroma-Meter and recorded using the CIE L*, a*, and b* colour coordinate systems. The membrane surface was subjected to contact angle analysis, which is a method for measuring a substrate's

surface attributes such as hydrophilicity or hydrophobicity. We analysed UV-Vis spectra of nanocomposite and dye coated films to determine transparency and visible colour. The nanocomposite films showed low absorption and high transmittance, while the dye coated films showed higher absorption and lower transmittance. We studied the mechanical properties of films using a universal testing machine, finding good tensile strength for bare cellulose acetate film (CA) at ~62 MPa. However, incorporation of cellulose nanofiber decreased tensile strength, possibly due to increased fibrous nature and lower cellulose properties. The cellulose acetate film exhibits high thermal stability, with initial degradation starting at 325°C, while the cellulose-containing film shows initial degradation at 280°C. We examined the impact of cellulose nanofibers on the biodegradability of cellulose acetate films through a composting experiment, observing significant changes in morphology and mechanical properties. The film showed a tensile strength of ~29 MPa and thermal stability ~288 oC. By using cellulose acetate's thermoplastic properties, these films could be readily transformed into packaging bags through heat sealing.

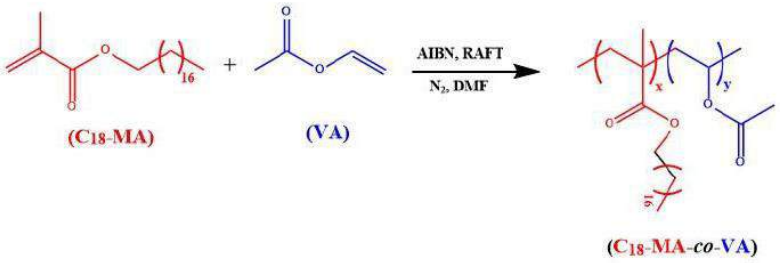
- ***Developed eco-friendly and durable composites materials of polypropylene carbonate (PPC)-polylactic acid (PLA)/ZIF-8 for packaging applications:*** The rising issue of food waste has significantly contributed to climate change, a problem further aggravated by the detrimental environmental impact of conventional plastics used in food packaging. To address these challenges, we have developed nanocomposite films composed of polypropylene carbonate (PPC) and polylactic acid (PLA), incorporating varying weight percentage (0.5, 1.1.5 ans 2 wt%) of zeolite imidazole framework (ZIF-8) through a solution casting method. The ZIF-8 was synthesized using an eco-friendly solvothermal approach. The structural characteristics of the synthesized ZIF-8 and its nanocomposites were analyzed using techniques such as FTIR, XRD, EDX, SEM, as well as mechanical and thermal testing. The addition of ZIF-8 notably improved the tensile strength, with the nanocomposite containing 1.5 wt% ZIF-8 exhibiting the highest tensile strength of 23±0.9 MPa, a substantial increase compared to the 7.17±0.4 MPa of pure PPC. Additionally, the thermal stability of the nanocomposites was enhanced, as evidenced by the maximum degradation temperature of 276.70°C for the 1.5 wt% ZIF-8 composite, surpassing that of neat PPC. The nanocomposites also displayed strong antimicrobial activity against Bacillus subtilis, with the composite containing the highest ZIF-8 content showing an inhibition zone radius of 20 mm. Furthermore, the nanocomposites were non-toxic to HEK293 cells and demonstrated exceptional

effectiveness in extending the shelf life of black grapes. Overall, these findings indicate that the developed nanocomposites have significant potential for use in the packaging industry.

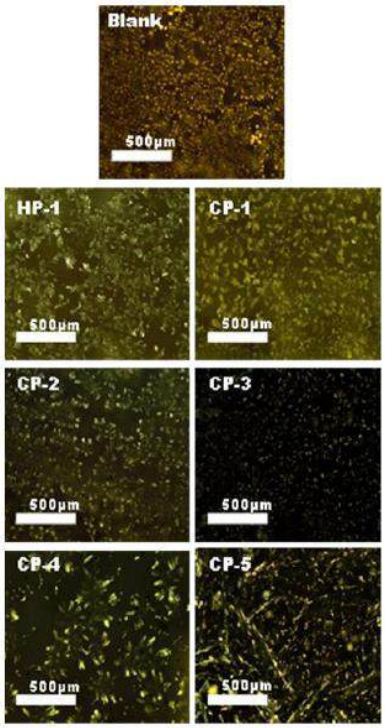


- ***Designing of Gemini basic ionic liquid and functionalized cellulose nanocrystal based mixed matrix membrane for CO2/N2 separation:*** Owing to the adverse environmental impacts, carbon capture and separation have gained tremendous interest throughout the globe. An urgent and efficient way to capture the carbon before environmental contact has become a burning topic of consideration. In concern to this matter, we have developed a mixed matrix membrane containing amine functionalized cellulose nanocrystal (CNC-NH2) and Gemini basic ionic liquid (IL) which exhibited highest CO2 permeance of 21033 GPU and CO2/N2 selectivity of 21.3. The mechanism followed by the gas flow is a combination of both solution-diffusion and facilitated transport. The interaction of CO2 with IL and CNC-NH2 results in the formation of reversible intermediate complex bicarbonate and carbamate ions respectively which facilitates the solubilisation and transport of CO2 on and through membrane. In case of N2, no such facilitated interaction takes place which leads to slow diffusion-based transport. Thus, a considerable difference in the respective permeance values of CO2 and N2 results, giving high selectivity. The specific affinity of CO2 towards CNC-NH2 and IL in comparison to N2 has been established via experimental as well as theoretical studies. This study provides a durable, thermally and mechanically stable membrane with high CO2 permeance and moderate CO2/N2 selectivity. This work offers tremendous possibilities of tailoring the Gemini IL structure and the choice of nanomaterial for membrane gas application with improved performance.

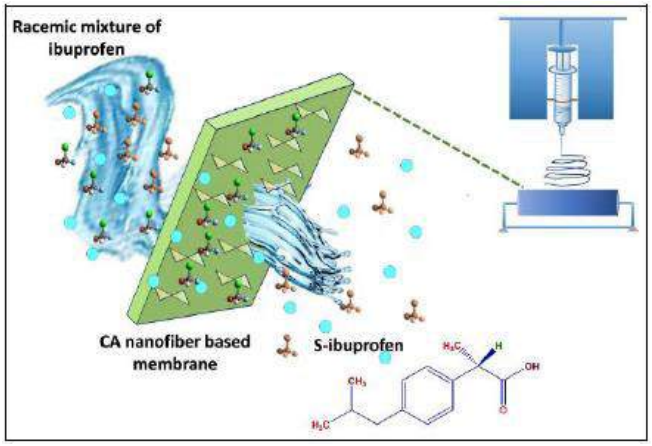
- ***Evaluation of C18-Methacrylate(MA)-co-Vinyl Acetate (VA) Copolymer as Flow Improver for Waxy Crude:*** Synthesized comb-shaped polymer C18-methacrylate (MA)-*co*-vinyl acetate (VA) *via* RAFT polymerization technique and the influence of various reaction parameters such as monomer, RAFT, initiator concentration and polymerization temperature on the molecular weight of synthesized polymer has been studied. Under optimized reaction condition, the influence of monomer ratio on Mn and Đ for synthesized polymer was investigated. Copolymers (CP-1 to CP-5) with varying ratio of C18-MA and VA along with a homopolymer of C18-MA (HP-1) is prepared and then explored for its application as a polymeric additive for waxy crude, in terms of rheological parameters, such as gelation point and apparent viscosity. Gelation point values of blank crude oil as well as crude oil treated with synthesized polymeric additives, C18-MA-co-VA, at various concentrations are reported.



Microscopic images of blank crude oil as well as crude oil treated with synthesized polymeric additives are shown in **Fig.** The figure shows that, the blank crude contains a large number of small wax crystals, dispersed in oil medium. After the addition of polymeric additives, the crystallization behaviour shows noticeable changes. The thickness of wax crystals and the degree of crystal stacking notably reduced in the treated oils, Addition of CP-3 at 4000 ppm concentration.



- ***Integrating amine functionalized chiral graphene oxide nanosheet onto cellulose acetate electrospun nanofiber membrane for enantioselective separation of ibuprofen:*** The separation of isomers from racemic mixtures is a critical process in the pharmaceutical industry, as the presence of both enantiomers can significantly influence the efficacy and safety of drugs. The challenge lies in the fact that enantiomers, while chemically identical, can have vastly different biological effects. This necessitates the development of advanced materials capable of distinguishing between these mirror-image molecules. In this study, we present a novel chiral electrospun nanofiber membrane specifically engineered for the enantioselective separation of racemic ibuprofen, a common nonsteroidal anti-inflammatory drug (NSAID) that exists in both R- and S- forms. The membrane is fabricated using cellulose acetate (CA) as the primary material, chosen for its excellent film-forming properties, biocompatibility, and ease of processing. To enhance its chiral recognition capabilities, the CA membrane is coated with graphene oxide (GO) that has been functionalized with a chiral amine, (R)-(+)-1-(1-Naphthyl)ethylamine. This functionalization process imparts the graphene oxide with the unique ability to selectively interact with one enantiomer over the other. Enantioselective separation tests demonstrate the membrane's exceptional performance, achieving an enantiomeric excess (ee%) of 96.53% for S-ibuprofen over R-ibuprofen. This high level of selectivity is attributed to the specific interactions between the chiral molecules and AFGO. This study, therefore, represents a significant advancement in the field of chiral separation technologies, offering a promising tool for the development of safer and more effective pharmaceuticals and other enantiomerically enriched products.



Project Title: **Membrane Based Process for Treatment of Wastewater from Assam And Assam Arakan Basin, Jorhat Workcentre and Recycling Of Water**
Project No: **GPP-412**
Funding Agency: ONGC, Assam and Assam Arakan Basin
PI & Members: Dr Swapnali Hazarika (PI), Dr Pravin G Ingole (Co-PI), Er Ravi Kumar Lingam (Co-PI), Dr Rajiv Goswami (Co-PI), Dr Monti Gogoi, Er Tobiul Hussain Ahmed, Mr Lachit Phukan

Objectives:

- To develop suitable electrospun nanofiber membrane for treatment of oil industry process wastewater, Assam and Assam Arakan Basin, Jorhat Workcentre.
- To develop membrane and combo process for treatment of wastewater and recycling of water for reuse.

Salient Achievements:

- Cellulose acetate based electrospun membrane embedded with novel nanomaterials has been prepared for treatment of oily wastewater collected from oil field. The performance of the membrane has been studied for removal of oil and certain inorganic contaminants present in the oily wastewater.

Project Title: **Removal of Phenol from Sour/Stripped Water, It's Value Addition and Recycling of Water**

Project No: **CLP-289**

Funding Agency: Numaligarh Refinery Limited, Golaghat, Assam

PI & Members: Dr Swapnali Hazarika (PI), Dr Pravin G Ingole (Co-PI), Er Ravi Kumar Lingam (Co-PI), Dr Ravindra Kumar Rawal, Er Partha Majumder, Er Tobiul Hussain Ahmed, Dr Monti Gogoi, Dr Rajiv Goswami, Mr Lachit Phukan

Objectives:

- To develop a suitable process for treatment of phenolic waste water generated from Sour water section of Sulphur recovery block of NRL and recycling of treated water.

Salient Achievements:

- Work on removal of phenol has been done using membrane-based combo process. Prototype for complete process has been designed and fabricated for a 100 lit batch process. The treated water has been used for recycling as process water. The prototype has been successfully installed and commissioned in NRL premises.

CENTRE FOR PRE-CLINICAL STUDIES

Centre for Pre-clinical Studies (CPS) division is dedicated to the exploration of natural/synthetic agents of NER origin for potential clinical application. The group is actively engaged in establishment of panel of *in vitro* and *in vivo* pharmacological analytical techniques for screening, characterization and validation of potential candidates of CSIR-NEIST.

Main Work of the division is:

- To provide analysis facilities for both internal and external samples using sophisticated analytical instruments.
- To train technicians for maintenance and operation of sophisticated instruments.

Ongoing Projects

Inhouse, Grant in aid & Consultancy Projects

Project Title: **Preclinical Exploration and Validation of Compounds, Extracts, Formulations, Advanced Materials of Synthetic or Natural Origin towards Industrial Applications**

Project No: **OLP-2092**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Rituraj Konwar, Dr Himangsu Kousik Bora, Dr Rinku Baishya, Dr Saikat Haldar

Objectives:

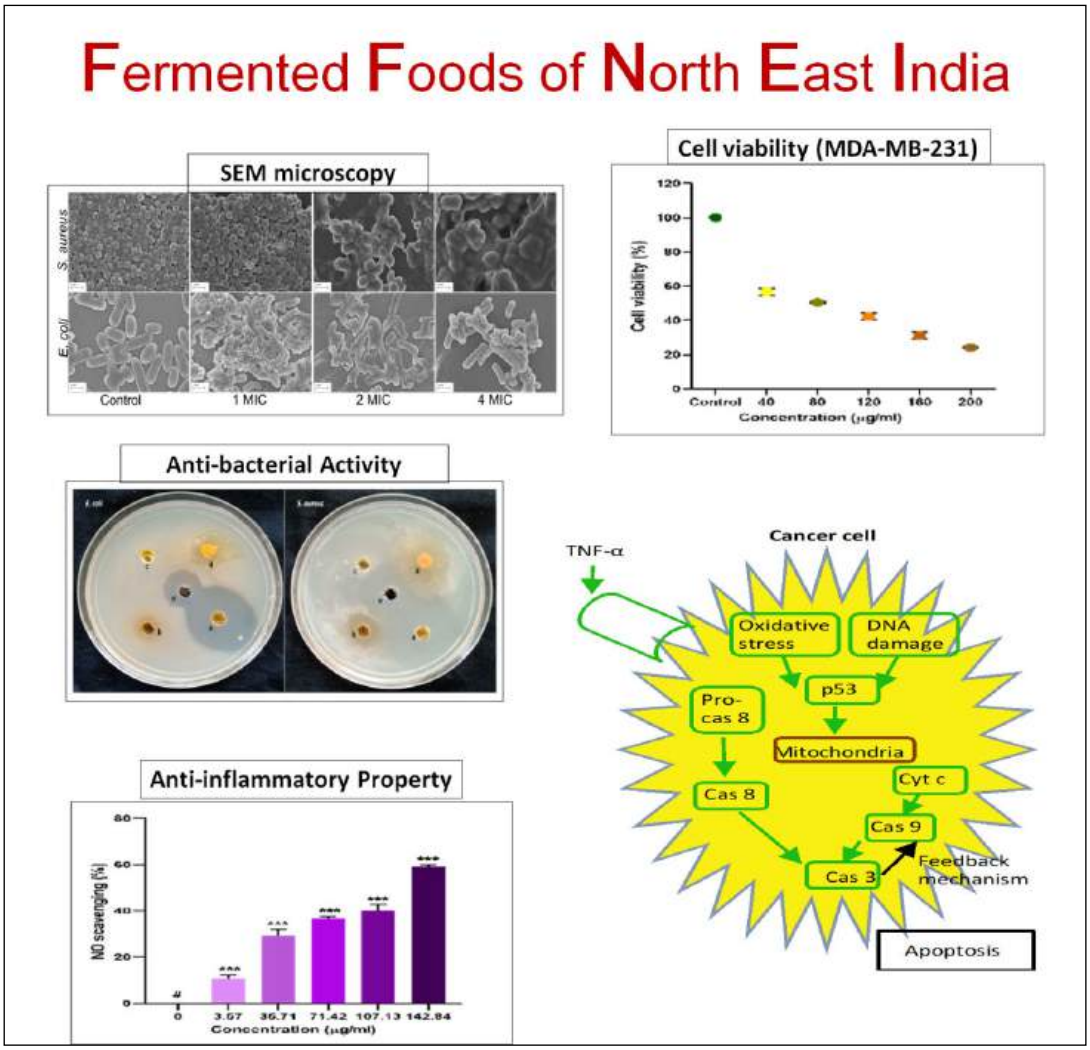
- Exploration of natural/synthetic agents of NER origin for potential clinical application.
- Establishment of panel of *in silico*, *in vitro*, *in vivo* pharmacological analytical techniques for screening, characterization and validation of potential candidates of CSIR-NEIST.
- Comprehensive *in vitro* profiling and mechanistic studies of in house candidate lead agents.
- *In vivo* validation of efficacy, toxicity, safety, pharmacokinetic properties of in house candidate lead agents.
- Identification of edible biocatalyst(s) capable of altering the sensory properties of the commercially and economically viable essential oil(s), understanding the molecular basis of the biocatalyst mediated sensory alteration of the essential oil(s), scale-up of the efficient biocatalytic process(es) and to explore the scope of lyophilisate (of the biocatalyst) as a ready to use storable catalyst

Salient Achievements:

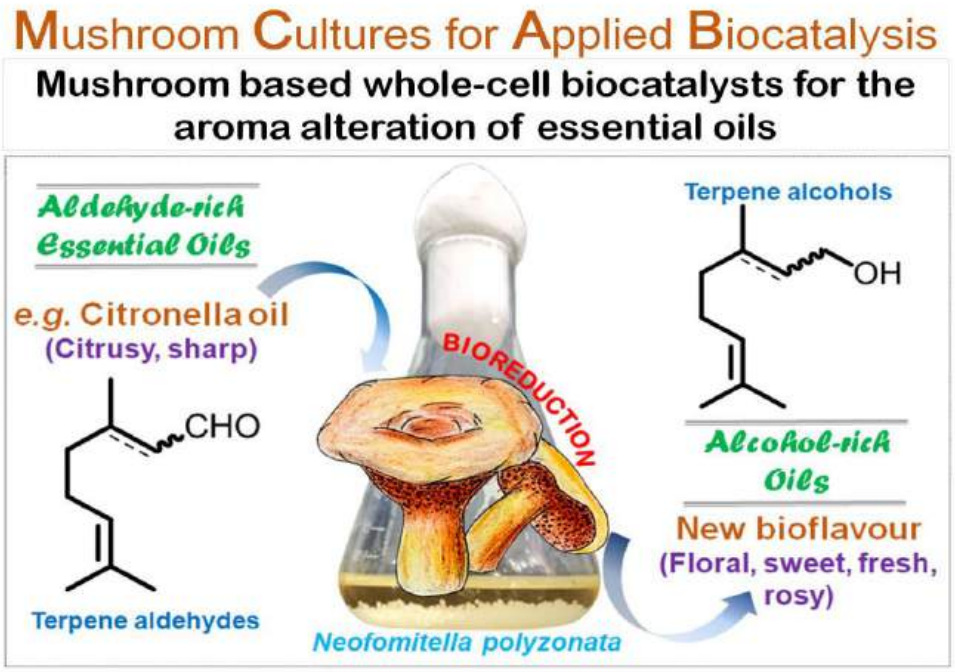
- ***In vitro & in vivo toxicology studies of environmental sample***: CPS conducts a wide range of *in vitro* and *in vivo* animal testing for efficacy and toxicity of newly developed products as well as other samples of clinical concern. In a study, common black crusts formed on historical monuments were studied as possible risk factor for

health hazard. Overall, it was observed that black crust deposited on historical monuments could be a niche for deposition of health hazard owing to the atmospheric pollution of the surroundings. However, it may be noted that black crust and its components have relatively low possibility of health implication unless they are handled without standard care (*J Hazard Mater. 2024 Feb 15;464:132939*).

- ***In vitro toxicity and bioactivity studies of nanofertilizer product****:* Recently, fluorescent carbon quantum dots were efficiently fabricated with high quantum yield from petroleum coke and kitchen tea residues through an environmentally friendly process. This product showed anti-bacterial activity and act as fertilizer in Stevia rebaudiana plants. In CPS, we undertook the *in vitro* cell-biology studies to assess their biocompatibility which showed lack of cytotoxicity without any reactive oxygen species (ROS) generation capacity and genetic material degradation property. While some degree of free radical scavenging activity observed representing the presence of antioxidant properties in the waste-derived CQDs. In addition, KTR-CQDs possess excellent antibacterial properties against different bacterial strains. Further, the phytological investigation with *Stevia rebaudiana* plants demonstrates the promising potential of waste-derived CQDs to serve as a nanofertilizer, thereby enhancing plant growth. This study opens up a new avenue for gainful and sustainable utilization of industrial waste (*J Environmental Chem Engineering 2023 December; 11 (6), 111344*).
- ***Pharmacological exploration of traditional fermented products of northeast India****:* Majority of tribes of North-East India have traditional practice of preparation of alcoholic beverages using indigenous ingredients and medicinal plants which have religious-cultural and health benefit beliefs. Systematic microbiological, chemical and pharmacological profiling of traditional beverages and constituents is very limited. We have recently explored three traditional alcoholic beverages and fermented food of northeast India, namely *noggin-apong*, *poro-apong* and *Akhuni.* Microbiological studies identified 10 different isolates of yeast where *Saccharomyces cerevisiae* as dominant species. Further LC-MS studies identified presence of several bioactive small molecules in the extracts of *noggin-apong* and *poro-apong*e. Both the extracts showed significant radical scavenging activity and anti-cancer activity. *Akhuni* was studied for their anti-inflammatory activity in rat model. These bioprospection of traditional fermented products for pharmacological activity is expected to help in identifying new lead molecules or technologies against complex diseases and support value addition of traditional practices.



- ***Development of process for biocatalysis of citronella****:* A mushroom (Neofomitella polyzonata) mediated whole-cell biocatalytic process was developed that converted citronella oil into citronellol and geraniol rich rose-like, sweet, fresh and floral bioflavour. The fermented product had best compositional similarity with Damask or Turkish rose oils and may be attractive to the food, beverage, fragrance and cosmetic industries. The process was successfully scaled-up to 1.5 L medium capacity in 5 L shake flask. It is currently in the Technology Readiness Level (TRL) of 4. (MLP 1017)



- ***Developing ready-to-use biocatalyst for dimerization of eugenol***: In other whole-cell biocatalytic transformation, Ganoderma sessile, belonging to 'Reishi' group of medicinal mushrooms dimerized eugenol in clove oil into dehydrodieugenol, thus increasing its sweet note while reducing clove-like spicy odour. Besides, the lyophilisate of culture broth containing active extracellular enzyme(s) was shown to be promising storable ready-to-use biocatalyst for the conversion of eugenol to dehydrodieugenol. (MLP 1017)
- ***Chemical QA & QC of ginger product****: Ginger* (Zingiber officinale) is one of the major spice crops in northeast India. Cold press ginger juice is a valuable nutraceutical commodity in the present time. Fresh ginger rhizome is subjected to cold press juicer yielding ginger juice and pulp. The distribution of aromatic flavours and bioactive phytochemicals is not known in the literature. In this context, we worked on the quantification of aroma molecules (essential oil constituents) and bioactive gingerols and related chemicals (solvent extract constituents) in its juice and pulp.
- ***MRI contrast, toxicity and therapeutic studies of multifunctional iron-platinum nanoparticle composite***. A new prototype multifunctional positive contrast agent for MRI was synthesized using iron-platinum nanoparticles by capping FePt nanoparticles with biocompatible ascorbic and citric acids. These new agent was evaluated for anti-cancer therapeutic efficacy, toxicity, contrast behavior.

R&D MANAGEMENT

RESEARCH PLANNING & BUSINESS DEVELOPMENT DIVISION

Earlier, Management Sciences consisted of three major divisions namely, Human Resource Development Division, Information & Business Development Division and Planning & Project Monitoring Division. Each division had individual core activities to support the R&D fraternity of the Institute as well as to support the Director and Administration. Later, the three divisions were merged to form a new division named, Research Planning & Business Development Division (RPBD) with an aim to bring synergism in overall activities and objectives of the division. The divisional activities are being streamlined to ensure better performance with optimum use of resources.

RPBD will continue to work in areas focused at developing business of the Institute, human resources, planning & allocation of resources and evaluation of outcomes of R&D projects. The division will continue to serve as a window to the outside world and maintain liaison with public, industrial houses, government & private agencies, entrepreneurs, etc.

In addition to that the Knowledge Resource Centre (KRC) and Information Communication technology division also provide significant and regular support to the Director and administration.

Information and Business Development Activities

RPBD division continued to serve as the front office of the Institute to the outside world and coordinated the overall business development activities. The group discharged the dual responsibility of maintaining liaison activities with industrial houses, entrepreneurs, govt. departments, private and public sector institutes etc., on the one side and disseminating the Institute's services, expertise and capabilities for economic and societal benefits of clients, customers and users on the other side. The group also made efforts to consolidate the gains of Institute's R&D in order to meet the needs and requirements of the entrepreneurs/users/clients who seek assistance from the Institute from time to time.

Exhibitions/workshop organised:

The division disseminated information regarding institutional technologies by its products display & posters, banners etc on different exhibitions and invitation by the entrepreneurs on various occasions. The group also organized workshops/seminar etc. During the year 2023-24, the group organized/participated in various exhibitions different occasions.

Publications:

During the period the division brought out the following regular and need based publications on different occasions.

- ***Annual Report of CSIR NEIST*** - Annual Report of the institute was brought out and released on the CSIR Foundation Day celebration on 18 March, 2024.

CSIR-NEIST Publications at a glance

Filing Patent Application:
The division is responsible for processing of the Institute's patent application for filing in India and abroad and for this is continuously coordinating with IPU, CSIR, New Delhi.

Technology Transfer:
The division is also responsible for licensing of the technologies developed by the institute. It is responsible for drafting of technology/knowhow transfer agreement and acts as bridge between the clients and the technology teams responsible for demonstrating the knowhow package. Four (4) nos of technologies were transferred to 3 Parties/Entrepreneurs during the year.

Testing & Analysis:
The division is also responsible for processing of samples received by the Institute for testing and analysis. On completion of the analysis, the reports are issued by the group to the respective parties.

MoU/Agreement:
The division processed and executed the MoU/Agreements with various organization/universities on different occasions as given below:

MoU/Agreement signed during the year 2023-2024

Sl.No	MoU/MoA/ Agreement	Party	Purpose/Technology
1	MoU	State Institute of Rural Development (SIRD), Meghalaya Nongsder, Ri-Bhoi District, Meghalaya	For propagating Biofertilizer technology of CSIR-NEIST by establishing a Bioreactor (only) for Biofertilizer production, providing training/ demonstration, develop farmer clusters and create entrepreneurship in the Meghalaya state.
2	MoU	Nagaland University, Lumani, Nagaland	Academic research collaboration
3	MoU cum	M/s Chayi Trails Pvt Ltd, House	Incubation Agreement for availing

	Rental Agreement	No-7, Chandra Teron Path, Kahilipara, Narakasur, Guwahati, Kamrup(Metro), Assam	BioNEST bioincubator facilities of CSIR-NEIST, Jorhat
4	MoU cum Rental Agreement	Mr Sayed Zahid Mustabin, S/o Syed Abu Arif MD. Musaddique Chaneki Path, Naharani, Dergaon, Golaghat, Assam,-	Incubation Agreement for availing BioNEST bioincubator facilities of CSIR-NEIST, Jorhat
5	MoA	Organic Krishi Sewa Gut (Self-Help Group), Vill & P.S. Ghilamara, Lakhimpur, Assam-	For propagating Biofertilizer technology of CSIR-NEIST by establishing a Bioreactor (only) for Biofertilizer production, providing training/ demonstration, develop farmer clusters and create entrepreneurship in the Assam state.
6	MoU Agreement	M/s Swasti Veda Private, Second floor, Office no. 214, Ravi Bhawan, Jaistamh Chowk, Raipur, Chhattisgarh	Collaboration between the Parties in the interest of producing quality planting material of medicinal plants and herbs. Exchange in information, translation of medicinal plants research outcomes to benefit the medicinal plant cultivators, gatherers and local communities in order to help in sustainable supply chain to AYUSH Industry as well as to increase the income of the farmers, healers, gatherers and Tribal communities.
7	MoA	State Institute of Rural Development and Panchayati Raj (SIRDPR), Karfectar, South Sikkim, Sikkim	For propagating Biofertilizer technology of CSIR-NEIST by establishing a Bioreactor (only) for Biofertilizer production, providing training/ demonstration, develop farmer clusters and create entrepreneurship in the Sikkim state.
8	MoA	Numaligarh Refinery Ltd (NRL)	For setting up NRL-NEIST research & Developmend centre
9	MoU	Innotech Interventions Pvt Ltd House No 56, SOS Road, Borjhar, Guwahati, Assam,	As IIPL has developed certain technologies for application in upstream hydrocarbon sector and would like to field implement those with the support of CSIR-NEIST and in the process, develop those processes further.

10	MoU	Central Council for Research in Unani Medicine (CCRUM), under Ministry of Ayush, Govt of India (situated at 61-65, Institutional Area, Opp. D-Block, Janakpuri, New Delhi	The purpose of this MOU is to foster collaboration between CCRUM and CSIR-NEIST and to provide mutually beneficial working opportunity to develop and validate the Unani formulation(s) with the view to help in solving challenges associated with production of genuine herbal based Unani drugs and related areas.
11	Technology Transfer Agreement	Shri Raju Tayeng Roing, Dist Dibang Valley, Arunachal Pradesh	For technology transfer of Lemongrass variety, Jor Lab L-8
12	Technology Transfer Agreement	M/s Anvaya Innovations, JEC Road, Jorhat-785007, Assam	For technology transfer of technology on "hybridized coal based supercapacitor and Li-ion Battery for e rickshaw application"
13	Technology Transfer Agreement	The Director Directorate of Cinchona and Other Medicinal Plants Mungpoo. Darjeeling Govt of West Bengal	For technology transfer of Lemongrass variety, Jor Lab L-9 and Lemongrass variety, Jor Lab L-14
14	Technology Transfer Agreement	Dean, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh	For technology transfer of Lemongrass variety, Jor Lab L-9, Citronella variety, Jor Lab C-5 and patchouli Variety P-1

Human Resource Development Activities

RPBD division **provides** human resources and knowledge management solutions of the institute to realize the R&D output. To enhance the competencies of existing human resources of the institute the **group** imparts the training in and outside the country, organizes workshops / lecture seminars, etc. The g**roup** imparts training and motivates students of the NE region in particular and the country in general. The g**roup** undertakes extensive recordkeeping of the employee and researchers, competency development through need based training, strive for collaborative projects, etc.

Research Workers / Project Fellow:

The division encourages young talent for joining in the fellowships under various national and international schemes of CSIR and other funding bodies to carry out basic research in frontier areas of science from the country and from abroad. Presently, a few of them are working in various capacity under such schemes viz., Women Scientist Scheme (WSS) of DST, Senior Research Fellow and Junior Research Fellow of CSIR, UGC and other funding bodies, DST Inspire faculty, CSIR-TWAS Fellow, DBT Ramalingaswami Re-entry fellow, DST Ramanujan fellow and NPDF. The group also arranges to engage a few lecturers / teachers of nearby colleges and other Institutes as Guest Workers for their research work

leading to PhD. The number of such research workers under various capacity during the periods are enlisted viz., 34 SRF, 66 JRF, 02 Women Scientist Scheme (WSS), 01 DST-NPDF, 03 DBT-RA and 223 project fellow. Based on review of their progress of research work a few of them were registered to pursue Ph D degree from Dibrugarh University, Gauhati University, Assam University and our own Academy of Scientific and Innovative Research (AcSIR).

Students' Visits Organised:

During the year about 5000 students along with 400 teacher guides from different Universities, Colleges, Technical Institutes & Schools of North Eastern Region visited CSIR-NEIST as a part of their educational tour and various govt schemes such as Assam Chief Minister's flagship Gyanjyoti Program, CSIR JIGYASA Program, Rashtriya Madhyamik Siksha Abhiyan, Rastruya Aviskar Mission etc.


Mr Partha Paul, Senior Scientist, interacting with students and guide teachers during Gyanjyoti program

Database Management:

The division maintains different databases on manpower of the institute viz., research workers, Ph D recipients, manpower, apprentice trainees, etc. The group provides information of Group IV scientist to RAB, to CSIR, visits of scientist abroad to ISTAD, CSIR.

Infrastructure Management:

The division manages different activities of the Boys' hostels of the institute.

Project/dissertation to students:

The division arranges facilities for multi-theme and multi-level training programme viz., summer training, industrial training, practical training, dissertation, etc. for the selected students from different universities, colleges and institutes of the country up to a maximum period of six months. During this period 191 Student Trainee (summer & winter season) completed their training in different division.

Apprenticeship Training Programme:

The division provides training programme for Graduate degree holders (Chemical & Mechanical), Laboratory Assistant (Chemical Plant) and ITI trade certificate holders in different trades like Fitter, Welder, Plumber, Draughtsman (Mechanical), Electrician and COPA. During this period 20 Student Trainee completed their training as apprentice in different division.

Planning and Project Monitoring

Planning and Project Monitoring (PPM) group involves in the R&D management in terms of planning and allocation of resources and monitoring the outcomes of R&D projects. The Planning and Project Monitoring (PPM) group serve as the main centre for appropriate dissemination of information regarding FTT projects (MLP), Mission Mode Projects (HCP), CSIR-integrated Skill Development Program (NWP) and In-house projects (OLPs) as well as the other externally funded projects like (GAP, CNP, CLP and SSP) to the management and as well as the concerned scientists. The group provides proper logistic support to the management in respect of successful implementation and completion of the projects which reflects in the growth of the institute. The group also prepares the annual performance target of the projects and the laboratory as a whole by focusing the R&D thrust areas which are in accordance with the CSIR vision and National mission. The group also acts as a link between CSIR HQ and the Institute with respect to formulation of Planned Projects & their execution & regular monitoring and reporting of progress. The group is also entrusted with preparation of various documents such as Man-month distribution of projects, Task Assignment of staff, Manpower Profile, etc. The group updates the information of various projects and reports are prepared regularly for management support and other purposes. Processing of purchase indents and maintenance of Lab Notebooks are other activities of Planning and Project Monitoring (PPM) group.

Planning and Project Monitoring (PPM) group is actively involved on the following activities:

External Cash Flow (ECF): The Institute undertakes projects funded by various external agencies. The details of funds received from these agencies were regularly recorded and monitored. Monthly statements of department wise ECF positions of the institute were prepared highlighting receipts from Govt Departments, Public and Private Organizations. Total ECF generated during 2023-24 was 1153.731 lakhs which comprised receipts from Govt. Deptts/Ministries, Public Sector Industries and Private Sector organizations to the extent of **87.98%, 8.9% and 3.12%** respectively. ECF of the institute from different projects and services are shown below:

EXTERNAL CASH FLOW (ECF) FOR THE YEAR 2023 - 2024
(Rs in lakh)

Sl No	Category	Govt	Indian Industry	*CPSE	**SPSE	Foreign Company	Foreign Agency	Others	Total 01/04/2023 To 31/03/2024
1	Collaborative	0.000	0.000	10.176	0.000	0.000	0.000	0.000	10.176
2	R&D Consultancy	0.000	1.252	0.000	0.000	0.000	0.000	0.000	1.252
3	Grant-in-aid	939.612	4.845	22.997	0.000	0.000	0.000	0.000	967.454
4	Premia	1.120	0.000	0.000	0.000	0.000	0.000	0.000	1.120
5	Sponsored R&D	45.478	0.000	0.000	0.000	0.000	0.000	0.000	45.478
6	Technical Service	28.841	29.868	55.812	13.730	0.000	0.000	0.000	128.251
	Total:	1015.051	35.965	88.985	13.730	0.000	0.000	0.000	1153.731

* CPSE : Central Public Sector Enterprise
**SPSE : State Public Sector Enterprise

The Division wise ECF are as follows:

Division	ECF(Rs. in Lakh)
Advanced Computation and Data Sciences Division (ACDSD)	12.71
Agrotechnology and Rural Development Division (ARDD)	217.96
Biological Sciences and Technology Division (BSTD)	158.28
Extension Centres (Branch Laboratory Itanagar & Branch Laboratory Imphal)	55.23
Centre for Infectious Diseases (CID)	112.14
Centre for Preclinical Studies (CPS)	33.41
Centre of Petroleum Research (CPR)	153.66
Chemical Sciences and Technology Division (CSTD)	43.82
Coal and Energy Division (C&ED)	189.51
Engineering Sciences and Technology Division (ESTD)	97.59
Geo-Sciences and Technology Division (GSTD)	1.13
HRD	0.41
Materials Science and Technology Division (MSTD)	57.18
Sophisticated Analytical Instruments & Facility (SAIF)	20.7
Total	**1153.73**

Expenditure Monitoring: The expenditure of all the projects were monitored as per the budget allocation and uploaded the details of receipt & expenditure in PPM portal so that the fund position of a given project is readily accessible by concerned PI and management for effective management. Planning and Project Monitoring (PPM) group facilitates in preparing Utilization Certificate and Statement of Expenditure of the externally funded projects.

Goods & Services Tax (GST): The Planning and Project Monitoring (PPM) group regularly carries out activities for the payment of GST accrued from the various scientific and technical services rendered by the institute on monthly basis. Total GST realized during the year 2023-24 is Rs**. 21.43** Lakhs.

Project Status: Status of Project Contracted and Completed during 2022-23 are as follows:

Sl No.	Sources	Project Contracted		Project Completed	
	Project	Contract Value (Rs. in Lakh)	No. of Projects	Contract Value (Rs. in Lakh)	No. of Projects
1	Grants-in-Aid	900.81	14	5372.38	10
2	Collaborative	NIL	NIL	NIL	NIL
3	Consultancy	NIL	NIL	17.05	2
4	Sponsored	82.63	1	NIL	NIL
Total		**983.43**	**15**	**5389.42**	**12**

Audit Queries: The group responds to various audit queries (ISO, CSIR HQ & CAG) and Parliament queries in relation to all type of projects.

Human Resource Portal: The PPM group also hosted and maintained a portal to keep track of the manpower position in order to facilitate the top management to formulate the policy on human resource.

Monthly/ Quarterly Performance Report: Monthly/ Quarterly Performance Report of NEIST contains information about the performance of the Institute on various parameters like papers, patents, development of technology, awards & appreciations received by scientists & staff members. Reports are regularly sent to CSIR HQ. These reports are also helping the management in reviewing its own performance as a monitoring tool.

Knowledge Resource Centre

KRC continued to provide library and information services to all R&D divisions of NEIST, Research Fellows, outside students and individuals such as from different universities of NE region and R&D institutes etc. Provided information and documents required by the users including purchasing of books, print journals, Access to different e-Resources including online journals, standards, databases etc. Provided plagiarism check service for the research papers to the NEIST users through using iThenticate anti plagiarism software. As a repository, KRC continued to maintain a database on publications by scientists and researchers of this institute. On the basis of this database, various information are provided to the Research Planning and Business Development Division (RPBDD) of NEIST for

analysis or to different Individuals when required. Time to time organized Library administration and procurement (LAP) committee meeting to monitor all the matters related to KRC.

संस्थान में राजभाषा गतिविधियां

RAJBHASHA HINDI ACTIVITIES IN THE INSTITUTE

हिन्दी दिवस समारोह का आयोजन

सचिव, भारत सरकार, गृह मंत्रालय, राजभाषा विभाग, नई दिल्ली के अनुसरण में इस वर्ष राष्ट्रीय स्तर पर समूहिक हिन्दी दिवस एवं तृतीय अखिल भारतीय राजभाषा सम्मेलन का आयोजन दिनांक 14 एवं 15 सितंबर 2023 को पुणे (महाराष्ट्र) में भारत सरकार के माननीय गृह राज्य मंत्री जी की अध्यक्षता में आयोजित किया गया । सीएसआईआर-उत्तर-पूर्व विज्ञान तथा प्रौद्योगिकी संस्थान, जोरहाट के प्रतिनिधि के रूप में श्री अजय कुमार, हिन्दी अधिकारी उपस्थित रहे । संस्थान में हिन्दी सप्ताह कार्यक्रम की रूपरेखा भी उसी प्रकार बनाया गया । हिन्दी प्रचार-प्रसार के लिए समर्पित संस्था "पूर्वाशा हिंदी अकादमी " जोरहाट के संयुक्त तत्वावधान में राजभाषा हिन्दी सप्ताह का आयोजन किया, जिसका समापन समारोह विगत 22 सितंबर को निस्ट सभागार में सम्पन्न हुआ । भारत सरकार की नीति "सबका साथ, सबका विकास, सबका प्रयास, सबका विश्वास" को दृष्टिगत करते हुए पिछले 3 वर्षों से पूर्वाशा के साथ संयुक्त रूप से इस प्रकार के आयोजन हो रहा है । इस अवसर पर पूर्वाशा ने अपनी गतिविधियों को प्रस्तुत किया एवं निस्ट के हिन्दी गतिविधि को रखा गया ।

सम्पूर्ण कार्यक्रम के सभापति मुख्य वैज्ञानिक श्री जयंत ज्योति बोरा एवं मुख्य अतिथि पूर्वाशा के संरक्षक श्री श्रीप्रकाश बरुआ थे । कार्यक्रम का संचालन निस्ट की ओर से नगर राजभाषा कार्यान्वयन समिति, जोरहाट के सदस्य सचिव एवं हिन्दी अधिकारी श्री अजय कुमार ने किया । जबकि पूर्वाशा की ओर से संस्थापिका अध्यक्षा डॉ (मानद) श्रीमति रूनु बरुआ एवं सचिव श्रीमति ज्योति शर्मा ने संचालित किया । कार्यक्रम में पूर्वाशा ने हिन्दी में उच्च अंक प्राप्त कॉलेज छात्रों को नगद पुरस्कार एवं प्रमाणपत्र से सम्मानित किया । साथ ही कई नयी योजनाओं की घोषणा की जिसके अंतर्गत जोरहाट ग्रामीण क्षेत्र में अवस्थित एक स्कूल में अपनी ओर से एक हिन्दी शिक्षक नियुक्त करना शामिल है । कार्यक्रम का मुख्य आकर्षण केंद्र रहा श्री सैनी बाबू द्वारा रचित उपन्यास "सती विशाखा" एवं डॉ रूनु बरुआ रचित "साहित्य सागर" पुस्तक का विमोचन ।

संस्थान में हिन्दी सप्ताह का शुभारंभ 14 सितम्बर को ही किया गया । राजभाषा सप्ताह के दौरान प्रतिदिन हिन्दी में कार्य करने के प्रति लगाव बढ़ाने के लिए कई प्रकार के प्रतियोगिताओं का आयोजन किया गया । नव-नियुक्त वैज्ञानिकों एवं अधिकारियों के लिए विशेष रूप से हिन्दी कार्यशाला आयोजित की गयी, जिसमें हिन्दी अधिकारी ने केंद्र सरकार के राजभाषा नियमों का विवरण प्रस्तुत करते हुए उन्हें अनुपालन के उत्तरदायित्व से अवगत कराया । भारत के चंद्रयान मिशन विषय पर हिन्दी में लेख लेखन प्रतियोगिता आयोजित कराया गया । हिन्दी क्विज किया गया जिसमें काफी संख्या में स्टाफ सदस्यों ने भाग लिया । श्रुत लेखन प्रतियोगिता के अंतर्गत सुनकर प्रतिभागियों ने लिखा । कार्यक्रम का शुभारंभ भारत सरकार के गृह मंत्री के हिन्दी दिवस संदेश पढ़कर किया गया एवं समारोह के सभी उपस्थित सदस्यों ने खड़े होकर राजभाषा प्रतिज्ञा को दोहराया । समारोह में प्रतियोगिता के विजेताओं को पुरस्कार वितरण करते हुए ई-प्रमाणपत्र जारी किया गया । सभापति के रूप में मुख्य वैज्ञानिक श्री बोरा ने भी हिन्दी के विकास हेतु प्रयोग पर बल दिया । कार्यक्रम के अंत में पूर्वाशा के सचिव श्रीमति शर्मा ने धन्यवाद ज्ञपित किया ।

हिन्दी सप्ताह के दौरान आयोजित प्रतियोगिता के विजेताओं एवं "पूर्वाशा हिंदी अकादमी " जोरहाट के सदस्यों के साथ कार्यक्रम की एक झलक

संस्थान में राजभाषा हिंदी सप्ताह का आयोजन

हिन्दी सप्ताह के दौरान अधिकारियों/ कर्मचारियों के प्रोत्साहन हेतु प्रत्येक कार्यदिवस में निम्नलिखित प्रतियोगिताएं एवं कार्यशालाएँ आदि आयोजित की गयी ताकि उनमें एक प्रेरणा और उत्साह की उत्पत्ति किया जा सके :

18/9/2023 : प्रथम सत्र में हिन्दी सप्ताह का शुभारंभ कार्यक्रम आयोजित हुआ जिसमें संस्थान के सभी स्टाफ सदस्य, विशेष रूप से नव नियुक्त वैज्ञानिक, तकनीकी अधिकारी एवं प्रशासन, वित्त,क्रय कनिष्ठ सचिवालय सहायक ने भाग लिया । प्रथम सत्र में "राजभाषा नीति एवं कार्यालय में प्रयोग" एवं द्वितीय सत्र में "कंप्यूटर पर हिंदी यूनिकोड एवं गूगल हिंदी का प्रयोग" विषय पर श्री अजय कुमार, हिन्दी अधिकारी ने अपनी प्रस्तुति दी एवं अभ्यास कराया गया ।

19/9/2023: "भारत का चंद्रयान मिशन" विषय पर हिन्दी लेख लेखन प्रतियोगिता आयोजित किया गया । निर्णायक के रूप में आमंत्रित अतिथि श्री अमरदीप कुमार , प्रबन्धक (राजभाषा} यूको बैंक, जोरहाट द्वारा यह आयोजन किया गया ।

20/9/2023 : हिन्दी श्रुतलेखन प्रतियोगिता आयोजित किया गया । अतिथि निर्णायक एवं संचालक की भूमिका श्री अमरदीप कुलश्रेष्ठ, मुख्य प्रबंधक (राजभाषा) यूको बैंक, आंचलिक कार्यालय, जोरहाट ने निभाया । काफी प्रतभागियों ने भाग लिया ।

21/9/2023 : हिन्दी भाषा से संबन्धित ज्ञान को केन्द्रित करते हुए हिन्दी क्विज (प्रश्नोत्तरी) प्रतियोगिता आयोजित की गयी । रुचिपूर्ण एवं ज्ञानवर्धक कार्यक्रम होने के कारण इसमें काफी प्रतिभागियों ने भाग लिया । वर्षा वन अनुसंधान संस्थान, जोरहाट से आमंत्रित अतिथि**,** अनुवाद अधिकारी एवं प्रभारी राजभाषा हिन्दी श्री शंकर शॉ ने क्विज तैयार एवं संचालन किया । प्रतिभागियों ने खूब आनंद उठाया ।

22/9/2023 : "पूर्वाशा हिन्दी अकादमी" जोरहाट के संयुक्त तत्त्वावधान में हिंदी सप्ताह समापन एवं पुरस्कार वितरण कार्यक्रम आयोजित किया गया ।

संस्थान में हिंदी कार्यशालाओं का नियमित आयोजन

राजभाषा नियम एवं सीएसआईआर मुख्यालय के दिशानिर्देश में संस्थान के वैज्ञानिकों, तकनीकी अधिकारियों, तकनीशियनों, प्रशासन के अधिकारियों एवं कर्मचारियों के लिए तिमाही हिंदी कार्यशाला का आयोजन किया जाता है । प्रभावी कार्यान्वयन की दृष्टि से समय – समय पर कार्य एवं पद की एकरूपता को ध्यान में रखकर समूह बनाकर कार्यशाला में प्रशिक्षण दिया जाता है । वर्ष के दौरान नियमित रूप से अर्थात चार बार एक एवं दो दिवसीय कार्याशालाओं का आयोजन किया गया । कार्याशालाओं में मुख्य विषय राजभाषा हिंदी का महत्व, कार्यालय में कार्यान्वयन एवं कंप्यूटर पर यूनिकोड हिंदी अनुकूलता एवं गूगल हिंदी का प्रयोग आदि प्रमुखता से सिखाया गया एवं कंप्यूटर पर सरलता से हिन्दी में कार्य करने की विधि वर्किंग टेबल पर अभ्यास के रूप में कराया गया ।

व्याख्यान/ संगोष्ठी में सहभागिता, अन्य संस्थाओं/ कार्यालयों के हिन्दी कार्यशाला/ कार्यक्रम में विशेषज्ञ के तौर पर योगदान :

श्री अजय कुमार, हिन्दी अधिकारी एवं सचिव, नगर राजभाषा कार्यान्वयन समिति, जोरहाट को निम्नलिखित केंद्र सरकार के कार्यालयों में राजभाषा हिन्दी के विशेषज्ञ/ संकाय सदस्य/ मुख्य अतिथि के रूप में उल्लेखित तिथि को आमंत्रित किया गया एवं उन्होने तदनुसार प्रस्तुति दी :

ऑयल एवं नेचुरल गैस कारपोरेशन लि., असम एवं असम अराकान बेसिन, जोरहाट : 12 जनवरी 2024 को आयोजित तकनीकी संगोष्ठी के मुख्य अतिथि एवं तकनीकी सत्र के दौरान पूर्वोत्तर के ओ एन जी सी स्टाफ द्वारा तकनीकी विषय की हिन्दी में प्रस्तुति के निर्णायक के रूप में आमंत्रित किया गया ।

यूको बैंक, अंचल कार्यालय, जोरहाट : 28 जून 2023; 22 दिसंबर 2023 एवं 27 मार्च 2024 को बैंक के नव नियुक्त प्रशिक्षु अधिकारियों के लिए "राजभाषा अधिनियम और नियम" विषय पर केन्द्रित हिन्दी भाषा के सहजता पर व्याख्यान हेतु आमंत्रित किया ।

भारत सरकार का उपक्रम, नुमालीगढ़ रिफाइनरी लिमिटेड, गोलाघाट : 25 अप्रैल 2023 को आयोजित हिन्दी कार्यशाला में अधिकारियों के लिए "हिन्दी भाषा पाठ्यक्रमों का सरल एवं सहज अध्यन-व्यावहारिक प्रयोग " विषय पर केन्द्रित व्याख्यान हेतु आमंत्रित किया । पुनः 11 अगस्त 2023 को आयोजित हिन्दी कार्यशाला में अधिकारियों के लिए "हिन्दी में आम बातचीत " विषय पर केन्द्रित हिन्दी भाषा के सहजता एवं सरलता पर व्याख्यान हेतु आमंत्रित किया ।

केंद्रीय मुगा एरी अनुसंधान एवं प्रशिक्षण सस्थान, केंद्रीय रेशम बोर्ड, वस्त्र मंत्रालय भारत सरकार : 22 जुलाई 2023 एवं 30 मार्च 2024 को आयोजित हिन्दी कार्यशाला के मुख्य अतिथि एवं व्याख्याता के रूप में "हिन्दी भाषा में लिंग की समस्या एवं समाधान" विषय पर व्याख्यान हेतु आमंत्रित किया, तदनुसार सफल प्रस्तुति दी ।

हिंदी शिक्षण योजना द्वारा हिंदी भाषा प्रशिक्षण पाठ्यक्रम केंद्र का संचालन

हिंदीतर भाषी अधिकारियों एवं कर्मचारियों के लिए निर्धारित स्तर के हिंदी भाषा पाठ्यक्रम प्रबोध/ प्रवीण / प्राज्ञ परीक्षा पास करना अनिवार्य होता है । जबकि कार्यसाधक ज्ञान प्राप्त कर्मी पारंगत परीक्षा में बैठ सकते है । संस्थान में उक्त पाठ्यक्रम के प्रशिक्षण के लिए वर्ष 1997 में भारत सरकार, गृह मंत्रालय, राजभाषा विभाग, हिंदी शिक्षण योजना द्वारा संस्थान प्रबंधन के अधीन अंशकालिक हिंदी भाषा प्रशिक्षण केंद्र स्थापित किया । विभाग द्वारा यह केंद्र स्थानीय सभी केंद्र सरकार के कार्यालयों के प्रशिक्षण हेतु भी संचालित किया गया । तदनुसार यह केंद्र सरकार के कार्यालय, स्वायत्तशासी संस्थानों, राष्ट्रीयकृत बैंकों द्वारा नामित अधिकारियों / कर्मचारियों को वर्ष में दो सत्र के अंतर्गत नियमित /प्राइवेट तौर पर प्रशिक्षण हेतु नामांकित करते हैं । प्रशिक्षण के साथ–साथ

उप-निदेशक (परीक्षा), नई दिल्ली के नियंत्रण में उक्त पाठ्यक्रमों के परीक्षा को भी संस्थान द्वारा संचालित किया जाता है ।

जनवरी 2023 सत्र : 15 से 19 मई 2023 के दौरान की परीक्षाएँ केंद्रीय हिन्दी प्रशिक्षण संस्थान, नई दिल्ली के दिशानिर्देश में आयोजित की गयी ।

जुलाई 2023 सत्र : 18 से 27 नवंबर के दौरान की परीक्षाएँ दिशानिर्देश में आयोजित की गयी । हमारे संस्थान के नव-नियुक्त वैज्ञानिकों/ कर्मचारियों ने भाग लिया जिन्हें परिवीक्षा अवधि के अंदर ही यह हिन्दी परीक्षा पास करना अनिवार्य होता है । अन्य कार्यालय यथा राष्ट्रीय डिजाइन संस्थान असम , जोरहाट, ओएनजीसी लिमिटेड, जोरहाट, वर्षा वन अनुसंधान संस्थान, जोरहाट , भारतीय स्टेट बैंक एवं यूको बैंक, जोरहाट से प्रशिक्षण हेतु नियमित / प्राईवेट नामित किए गए कुल प्रशिक्षित आकड़े दर्शाए गए हैं ।

	परीक्षा फॉर्म भरे	परीक्षा में बैठे	परीक्षा में उत्तीर्ण	पुरूस्कृत परीक्षार्थी
प्रबोध	9	04	04	04
प्रवीण	40	19	19	17
प्राज्ञ	30	15	15	13
पारंगत	39	23	23	20

निस्ट, जोरहाट में गठित राजभाषा कार्यान्वयन समिति (राकास) की बैठकें :

प्रावधान के अनुसार संस्थान में प्रभावी राजभाषा कार्यान्वयन के लिए राजभाषा कार्यान्वयन समिति गठित है । नियमानुसार प्रत्येक तीन माह में बैठक आयोजित की जाती है एवं कार्यान्वयन की मोनिट्रिंग भी की जाती है । इस वित्तीय वर्ष में प्रटेक तिमाही के दौरान एक बैठक अर्थात चार बैठकें आयोजित की गई एवं महत्वपूर्ण निर्णय लिए गए ।

नगर राजभाषा कार्यान्वयन समिति (नराकास), जोरहाट अध्यक्ष कार्यालय के तौर पर आयोजित बैठकें :

नगर राजभाषा कार्यान्वयन समिति (नराकास), जोरहाट भारत सरकार, गृह मंत्रालय, राजभाषा विभाग, नई दिल्ली द्वारा बड़े बड़े शहरों में अवस्थित केंद्र सरकार के कार्यालयों में राजभाषा हिंदी के प्रयोग को सुनिश्चित करने के उद्येश्य नगर राजभाषा कार्यान्वयन समिति की स्थापना की जाती है । बड़े एवं सक्षम कार्यालय के प्रधान को अध्यक्ष नामित किया जाता है । स्थानीय सभी केंद्रीय कार्यालय इसके सदस्य होते हैं एवं प्रत्येक वर्ष इसकी बैठक आयोजित की जाती है । वर्ष 2009 में भारत सरकार ने नगर राजभाषा कार्यान्वयन समिति, जोरहाट का कार्यभार निदेशक, निस्ट, जोरहाट को सौंपा तथा सचिवीय कार्य हेतु श्री अजय कुमार, हिन्दी अधिकारी,निस्ट, जोरहाट को नामित किया । स्थानीय केंद्रीय कार्यालय, सैन्य संगठन, वायु सेना, राष्ट्रीयकृत बैंक, स्वायत्तसेवी संस्थान, प्रतिष्ठान, परिषद समिति के सदस्य हैं जो नियमित आयोजित बैठक में राजभाषा हिंदी पर चर्चा के लिए भाग लेते हैं ।

समिति की 40वीं बैठक : 40वीं अर्धवार्षिक बैठक दिनांक 30अगस्त) ,202 ,बुधवार (को अपराह्न 03.00 बजे उत्तरजोरहाट के सेंटर फॉर पेट्रोलियम रिसर्च भवन स्थित एम एस अयंगर ,पूर्व विज्ञान तथा प्रौद्योगिकी संस्थान- ,गृह मंत्रालय ,सेमिनार हॉल में आयोजित किया गया। बैठक में भारत सरकारराजभाषा विभागक्षेत्रीय ,

गुवाहाटी के परामर्शदाता श्री बदरी यादव मुख्य अतिथि के रूप में उपस्थित रहें। (पूर्वोत्तर) कार्यान्वयन कार्यालय केंद्रीय सरकार के कार्यालयों के प्रधान एवं उनके ,उपक्रम ,जोरहाट शहर में स्थित सभी नराकास सदस्य बैंक कार्यालय में राजभकार्य करने वाले अधिकारीअपने-कर्मचारी ने सहभागिता की। सभी कार्यालयों के द्वारा अपने/ कार्यालयों में राजभाषा कार्यान्वयन के अंतर्गत हो रही विभिन्न गतिविधियों पर रिपोर्ट प्रस्तुत किया। नराकास नोटिंग आ/पत्राचार/सदस्य कार्यालयों से प्राप्त तिमाही प्रगति रिपोर्टदि की समीक्षा की गई तथा सदस्य कार्यालयों में राजभाषा कार्यान्वयन में मजबूती लाने के लिए महत्वपूर्ण निर्णय लिये गए।

नगर राजभाषा कार्यान्वयन समिति 23-2022 जोरहाट के सदस्य कार्यालयों के बीच वर्ष ,के दौरान राजभाषा हिन्दी के उत्कृष्ट कार्यान्वयन हेतु केंद्रीय मूगा एरी अनुसंधान एवं शिक्षा संस्थान ,जोरहाट को प्रथम पुरस्कार प्रदान किया गया, पुरस्कार संस्थान के वैज्ञानिक डॉ .धर्मेन्द्र कुमार जिज्ञासु ने ग्रहण किया ; द्वितीय पुरस्कार 10 विंग वायु सेना जोरहाट के ,वरिष्ठ अनुवाद अधिकारी श्रीमती प्रीति कलिता को प्रदान किया गया तथा तृतीय पुरस्कार राष्ट्रीय डिजाइन संस्थान ,जोरहाट को प्रदान किया गया। भारत सरकारराजभाषा विभाग ,गृह मंत्रालय , प्रदान किया गया। (पुरस्कार) के परामर्शदाता श्री बदरी यादव के कर कमलों से प्रमाणपत्र एवं शील्ड

बैठक की एक झलक (दायें) श्री बदरी यादव के कर कमल से केंद्रीय मूगा एरी अनुसंधान एवं शिक्षा संस्थान के वैज्ञानिक डॉ. धर्मेन्द्र कुमार जिज्ञासु प्रथम पुरस्कार प्राप्त करते हुए

भारतीय जीवन बीमा निगम, जोरहाट के वरिष्ठ मण्डल प्रबन्धक श्री असीम कुमार; केंद्रीय विद्यालय वायु सेना स्थल, जोरहाट के प्राचार्य श्री बृजेन्द्र कुमार तिवारी; भारतीय स्टेट बैंक, प्रशासनिक कार्यालय, जोरहाट के मुख्य प्रबंधक)मानव संसाधन (श्री शांतनु नंदी; जवाहर नवोदय विद्यालय, टीटाबार, जोरहाट के प्रधानाचार्य श्री मनोहर सिंह नेगी; ओ.एन.जी.सी., जोरहाट के श्री चन्द्रशेखर बहुगुणा; यूनियन बैंक ऑफ इंडिया, क्षेत्रीय कार्यालय, जोरहाट के क्षेत्र-प्रमुख श्री भास्कर मंडल; जोरहाट हवाई अड्डा, जोरहाट के बिमानपत्तन निदेशक श्री हिमांशु सिंह; कैनेरा बैंक, गर-अली शाखा, जोरहाट के मुख्य प्रबंधक रीतू कछारी; पंजाब नैशनल बैंक, मंडल कार्यालय, जोरहाट के मंडल-प्रमुख श्री सुमन कुमार सिंह; आकाशवाणी, जोरहाट के कार्यक्रम कार्यकारी श्री बिश्वजीत दास; यूको बैंक, जोरहाट के सहायक महाप्रबंधक/अंचल प्रबंधक श्री आलोक; भारतीय खाद्य निगम, मंडल कार्यालय के प्रबंधक श्री निर्मल कुमार सिंह; ऑयल इंडिया लिमिटेड, जोरहाट के महाप्रबंधक श्री पीवीआर मूर्ति; तथा रबड़ बोर्ड, प्रादेशिक कार्यालय, जोरहाट; मुख्यालय 41सब एरिया; न 3-.मैन्टैंस भाग, असम राइफल्स, जोरहाट; केंद्रीय रिजर्व पुलिस बल; उपायुक्त कार्यालय, केंद्रीय वस्तु एवं सेवा कर, जोरहाट; बैंक ऑफ बड़ौदा, क्षेत्रीय कार्यालय, जोरहाट; पावरग्रिड, मरयानी उपकेंद्र, जोरहाट; केन्द्रीय विद्यालय, आर.आर.एल., जोरहाट; न्यू इंडिया इंश्यूरेंश कम्पनी लिमिटेड, जोरहाट के प्रतिनिधियों ने भाग लिया एवं अपने कार्यालय के राजभाषा हिन्दी प्रगति को प्रस्तुत किया।

श्री बदरी यादव ,परामर्शदाता एवं कार्यालय प्रमुख ने सभी को संबोधित किया। उन्होंने सभी सदस्य कार्यालयों के राजभाषा हिन्दी के कामकाज से संबंधित प्रगति की सराहना किया। उन्होंने जोरहाट शहर के भारत सरकार की लगभग 30से भी अधिक बड़े-छोटे कार्यालय को एक जगह एकत्र करने के प्रयास स्वरूप नराकास ,जोरहाट के आयोजन की विशेष सराहना किया। साथ ही ,उन्होंने सभी सदस्य कार्यालयों को एक बड़े स्तर पर तकनीकी संगोष्ठी आयोजित करने के महत्व पर भी जोर दिया।अध्यक्षनराकास ने अपने अध्यक्षीय भाषण में सभी सदस्य , कार्यालयों का उत्साहवर्धनकिया। उन्होंने अपने संबोधन में राजभाषा हिन्दी के विकास के लिए प्रेरणा ,प्रोत्साहन

एवं सद्भवना को एक मजबूत आधार बताया। उन्होंने विभिन्न कार्यालयों से उपस्थित सभी अधिकारियों एवं कर्मचारियों को हिन्दी भाषा सीखने पर जोर दिया और बताया कि राजभाषा हिन्दी में काम-काज करना उनके अभिरुचि का विषय होना ही चाहिए।

कार्यक्रम का सफल संचालन श्री अजय कुमार-निस्ट ,जोरहाट एवं हिन्दी अधिकारी-नराकास ,सदस्य सचिव , ,श्री शंकर शॉ ,जोरहाट के मार्गदर्शन में आयोजित किया गया। अंत मेंभा.वा.अ.शि.प-.वर्षा वन अनुसंधान संस्थान ,जोरहाट द्वारा धन्यवाद ज्ञापन के पश्चात बैठक समाप्त हुई।

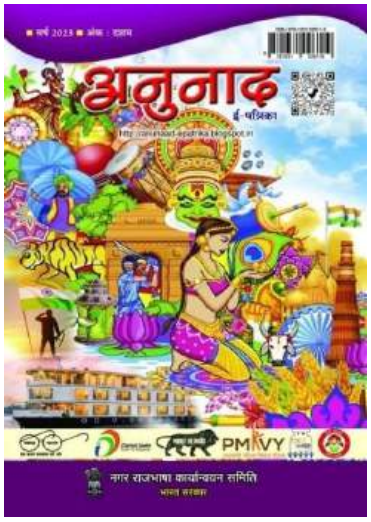
समिति की 40वीं बैठक : नगर राजभाषा कार्यान्वयन समिति 22 41वां अर्धवार्षिक बैठक दिनांक जोरहाट की , ,पूर्व विज्ञान तथा प्रौद्योगिकी संस्थान-उत्तर-बजे सीएसआईआर 03.00 को अपराह्न (गुरुवार) 2024 ,मार्च जोरहाट मेंआयोजित किया गया। बैठक में भारत सरकारक्षेत्रीय कार्यान्वयन ,राजभाषा विभाग ,गृह मंत्रालय , गुवाहाटी के परामर्शदाता श्री बदरी यादव मुख्य अतिथि के रूप में उपस्थित रहें। बैठक में (पूर्वोत्तर) कार्यालय केंद्रीय ,उपक्रम ,जोरहाट शहर में स्थित सभी नराकास सदस्य बैंक सरकार के कार्यालयों के प्रधान एवं उनके कार्यालय में राजभाषा कार्य करने वाले अधिकारीकर्मचारी ने सहभागिता की। बैठक में सभी कार्यालयों के द्वारा / अपने कार्यालयों में राजभाषा कार्यान्वयन के अंतर्गत हो रही विभिन्न गतिविधियों पर रिपोर्ट प्रस्तुत किया। -अपने सभीनराकास सदस्य कार्यालयों से प्राप्त तिमाही प्रगति रिपोर्टनोटिंग आदि की समीक्षा की गई तथा /पत्राचार/ ,सदस्य कार्यालयों में राजभाषा कार्यान्वयन में मजबूती लाने के लिए महत्वपूर्ण निर्णय लिये गए। इसके अलावा भारत सरकार द्वारा ,गृह मंत्रालय ,बैठक में राजभाषा विभाग जारी वार्षिक कार्यक्रम (25-2024 वित्तीय वर्ष)पर सभी सदस्य कार्यालयों के साथ राजभाषा लक्ष्यों पर चर्चा की गई।समिति द्वारा प्रकाशित हिन्दी पत्रिका 'अनुनाद' के दशम अंक का अनावरण किया गया ।

केंद्रीय मूगा एरी अनुसंधान एवं शिक्षा संस्थान जोरहाट ,लाहदोईगढ़ ,के सहायक निदेशक वाहेंबम (राजभाषा) मंलेम देवी; भाविश्वनाथ शर्मा .बी डॉ-जोरहाट के वैज्ञानिक ,वर्षा वन अनुसंधान संस्थान-.प.शि.अ.वा.; आकाशवाणीजोरहाट के कार्यक्रम प्रमुख श्री बिश्वजीत दास ,; राष्ट्रीय डिज़ाइन संस्थानजोरहाट के हिन्दी , अनुवादक सुश्री मृगाक्षी शर्मा; स्थानीय लेखा परीक्षा कार्यालय अभिजित खामरू .अ.ले.के स (वायु सेना); केंद्रीय औद्योगिक सुरक्षा बल इकाई ,.सी.जी.एन.ओ ,जोरहाट के उपनिरीक्षक श्री प्रमोद कुमार सिंह; असम राइफल्सगोगोई .एन.जोरहाट के एस ,; राष्ट्रीय मृदा सर्वेक्षण एवं भूमि उपयोग नियोजन ब्यूरो, जोरहाट के श्री अमिताभ बरुआ; एनजोरहाट के कनिष्ठ सांख्यिकीय अधिकारी श्री ,उपक्षेत्रीय कार्यालय (एफओडी) .ओ.एस.एस. हेमराज मीना; डाक अधीक्षक का कार्यालयजोरहाट के श्री आकाश कुमार गुप्ता ,; हस्तशिल्प सेवा केंद्रजोरहाट , श्री शशिकांत ग (हस्तशिल्प) के सहायक निदेशकुप्ता; प्रधान आयकर आयुक्त का कार्यालयजोरहाट के वरिष्ठ , निजी सचिव श्री सतीश चंद्र दास; कार्यालय पुलिस महानिरीक्षक जोरहाट के जगदानन्द ,सेक्टर (परिचालन) सरकार; भारतीय खाद्य निगमजोरहाट के मंडल प्रबंधक श्री अरविंद कुमार पाठक ,; पावरग्रिड,मरयानी उपकेंद्र , जोरहाट के मुख्य प्रबंधक श्री नवीन कुमार महतो; ओ ,.सी.जी.एन.जोरहाट के वरिष्ठ राजभाषा अधिकारी श्री संजय भट्ट; भारतीय जीवन बीमा निगमजोरहाट के श्री रथीनचंद्र पाल ,मंडल कार्यालय ,; न्यू इंडिया एश्योरिंस कं लिमिटेडजोरहाट के श्री अभिलेख हाजारिका ,; यूनाइटेड इंडिया इंश्यूरेंस कंपनी लिमिटेडजोरहाट के , प्रशासनिक अधिकारी श्री दीपक माइरेमबम; नेशनल इंश्योरेंस कंपनी लिमिटेडजोरहाट के ,मंडल कार्यालय , इसमोनि चलिहा; भारतीय स्टेट बैंकजोरहाट ,प्रशासनिक कार्यालय , के मुख्य प्रबंधक श्री रवि (मानव संसाधन) कांत भारती; कैनेरा बैंकजो ,रहाट के शाखा प्रबंधक श्री संजीव कुमार मिकिर; पंजाब नैशनल बैंक के राजभाषा अधिकारी श्री नितिश कुमार साव; बैंक ऑफ बड़ौदामुख्य प्रबंधक ,जोरहाट के सुश्री वंदना जैन ,; सेन्ट्रल बैंक ऑफ इंडियासुश्री तुलसी सहरिया (राजभाषा) जोरहाट के सहायक प्रबंधक ,; जवाहर नवोदय विद्यालय,टीटाबार , जोरहाट के प्रधानाचार्य श्री मनोहर सिंह नेगी; केन्द्रीय विद्यालय,.एल.आर.आर ,जोरहाट के पीश्री (हिन्दी).टी.जी. बाल मुकुन्द चौरसिया; केन्द्रीय विद्यालय ,.सी.जी.एन.ओ ,सिनामारा जोरहाट के प्राचार्य श्री लखबीर सिंह; पी .एम. श्री केंद्रीय विद्यालयजोरहाट के प्राचार्य श्री राहुल कुमार तथा अन्य कार्यालयों के ,1.वायुसेना स्थल क्र , प्रतिनिधियों ने भाग लिया एवं अपने कार्यालय के राजभाषा हिन्दी की प्रगति को प्रस्तुत किया।

श्री बदरी यादव ,परामर्शदाता ने सभी सदस्य कार्यालयों के राजभाषा हिन्दी के कामकाज से संबंधित प्रगति की सराहना किया। उन्होंने आयोजन की विशेष सराहना किया। साथ हीउन्होंने सभी सदस्य कार्यालयों को हिन्दी , जोरहाट को राजभाषा से ,कार्यशाला एवं विभागीय राजभाषा कार्यान्वयन की बैठकों का आयोजन तथा नराकास

संबंधित रिपोर्टों को निर्धारित व नियमित अंतराल पर प्रेषित करने का निर्देश भी दिया। उन्होंने सभी सदस्य कार्यालयों से भारत सरकार द्वारा निर्मित अनुवाद सॉफ्टवेयर "कंठस्थ 2.0" पर विशेष प्रशिक्षण कार्यशाला आयोजित करने का भी अनुरोध किया।

कार्यक्रम का सफल संचालन श्री अजय कुमारनरा ,सदस्य सचिव ,कास-निस्ट ,जोरहाट एवं हिन्दी अधिकारी-वर्षा -.प.शि.अ.वा.अनुवाद अधिकारी भा ,श्री शंकर शॉ ,जोरहाट के मार्गदर्शन में आयोजित किया गया। अंत में जोरहाट द्वारा धन्यवाद ज्ञापन के पश्चात बैठक समाप्त हुई। ,वन अनुसंधान संस्थान



नराकास, जोरहाट द्वारा तैयार "अनुनाद" ई-पत्रिका (दशम अंक) का प्रिंट वर्जन का लोकार्पण

INAUGURATION AND S&T FACILITIES INSTALLED

Inauguration of polyhouse

Under CSIR-Floriculture Mission, a polyhouse constructed at Pfutsero was inaugurated by the Director, CSIR-NEIST on 20 May 2023 and dedicated it to the Pfutsero Floriculture Cluster, leading by a young enthusiastic female entrepreneur, Ms Vasalu Puro for extension of floriculture activities.

Virtual innauguration of NRL-NEIST R&D Centre by DG, CSIR

Dr. N. Kalaiselvi, Director General, CSIR virtually inaugurated NRL-NEIST R&D Centre at CSIR-NEIST on January 8, 2024. Dr. N. Kalaiselvi also interacted with research teams of CSIR-NEIST. The team showcased the institute's latest innovations and ongoing projects, ensuring a comprehensive overview of CSIR-NEIST's contributions to scientific research and development.

“Rural Bioresources Centre” in Udalguri

CSIR-NEIST established a “Rural Bioresources Centre” in Udalguri, which is an Aspirational District in Assam with financial support from Department of Biotechnology, Govt. of India. The Bioresource Centre is mostly equipped with the technologies for making products (7 different products) from waste Banana pseudostem. The Centre was inaugurated on 06 March, 2024 by Shri Govinda Ch. Basumatary, MLA, Udalguri cum Deputy Chief of Bodoland Territorial Region in presence of representative from DBT, Dr Pulak Kumar Mukherjee, Director, IBSD and Dr Prabodh Borah, Director of Research (Vety) and Dr Jatin Kalita, Principal Coordinator of the project along with a host of scientist and staff from CSIR-NEIST.


Inauguration of Rural Bioresources Centre" by Shri Govinda Ch. Basumatary, MLA, Udalguri cum Deputy Chief of Bodoland Territorial Region in Udalguri

Installation of bioreactor for the multiplication/production of OP-12 Biofertilizer

Eight numbers of bioreactor for the multiplication/production of OP-12 Biofertilizer had already been supplied and installed in the all the states of North-East India. The hands-on training for OP-12 biofertilizer production was provided to- i.**SIRD-Meghalaya**on 15th - 16th May 2023,ii. **NEIST-Branch Laboratory-Itanagar**, on 5th- 6th June, 2023**,** iii. **Organic KrishiSewa Gut** (Self Help Group), Ghilamora, Lakhimpur, Assam,on 7th - 8th June, 2023, iv. **SIRD-Sikkim, Jorethang**on 21-22nd Nov., 2023**, v. SIRD, Kohima, Nagaland**on 10 -11th October, 2023**, vi. Department of Forestry & Biodiversity, Tripura University** on14–15thDec., 2023, iv.**M/S Amrit Organic, Duliajan, Assam**. Additionally, Biofertilizer application-cum- awareness programs were conducted at these sites. Biofertilizer packets (1.5 Kg/packet) were distributed to each of the participants which were produced in the training itself.

SIRD-Meghalaya (15-16 May, 2023) NEIST-BLIT, Itanagar (5-6 June, 2023)

Organic Krishi Sewa Gut (Farmer Cluster) Ghilamara, Assam (7- 8 June, 2023)


SIRD, Kohima,Nagaland (10 -11 Oct, 2023)


SIRD-Sikkim, Jorethang, (21-22 Nov,2023)


Department of Forestry & Biodiversity, Tripura University, Agartala (14–15 Dec, 2023)

Loading Frame Facility capacity of 3000 kN

A state-of-the-art Loading Frame Facility capacity of 3000 kN has been created at Applied Civil Engineering with the support of the Ministry of Housing & Urban Affairs, Govt. of India through Building Materials and Technology Promotion Council, New Delhi (BMTPC) under Affordable Sustainable Housing Accelerators-India Scheme (ASHA-India). The main objective of the facility is to test the structural behavior of normal and deep beams, steel and concrete columns, trusses, arches, bearing plates, girders, precast tunnel lining units, sleepers, rails, etc. This facility will be useful for testing the engineering materials used to construct infrastructure projects like bridges, dams, refinery units, and power sectors. Considering its importance, the facility will be of great benefit not only to the institute but also to the entire North East region.

Inauguration of Loading Frame Facility Capacity of 3000 kN by Dr. V M Tiwari, Director, CSIR-NEIST Jorhat

MAJOR TESTING FACILITIES/EQUIPMENTS INSTALLED

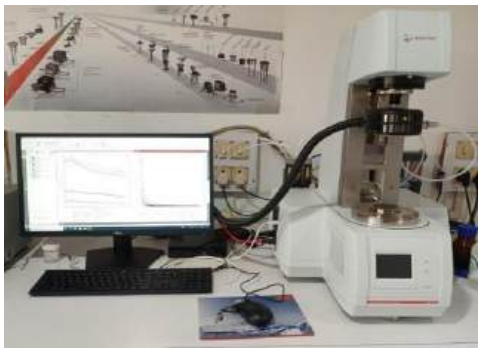
Universal Testing Machine (UTM)

Universal Testing Machine (UTM) is used to test the mechanical properties of membranes and films, such as tensile strength, compressive strength, and elasticity.

Cross-flow membrane testing unit

Cross-flow membrane testing unit is used to evaluate the performance of membranes in separating components from a liquid mixture. In this process, the feed flows tangentially across the membrane surface, allowing selective permeation of specific components, while the rest is retained and recirculated. This method is commonly used in filtration and purification applications.

Modular Compact Rheometer



Modular Compact Rheometer (MCR) is specific to measure the rheological properties of a material. To investigate the deformation and flow behavior of samples. Rheological parameters are calculated from the measured values torque, deflection angle, and speed.

Single Crystal X-Ray Diffractometer System (SC-XRD)

Single-crystal XRD (**SC-XRD)** allows for absolute structure determination. **SC-XRD** is the most powerful technique for the detailed structural analysis of crystalline solid materials. SC-XRD is performed by analyzing the pattern of X-rays diffracted by an ordered array of many identical molecules.

Microwave Assisted Automated Peptide Synthesizer

The Liberty Blue is an efficient microwave peptide synthesizer, delivering high-quality peptides with low waste generation and synthesis times.

It features a 4-minute cycle time along with a 90% solvent reduction based on High-Efficiency Solid Phase Peptide Synthesis (HE-SPPS) developed in 2013.

Fully automated Preparative HPLC System (WATERS)

Waters LC Prep AutoPurification System is a fully automated preparative system providing advanced functionality to satisfy all purification requirements. LC Prep Auto Purification System offers robust, scalable solutions for all purification requirements. It is capable of PDA-based fraction collection of a few dozen samples parallelly.

WORKSHOP/WEBINAR/SEMINAR/CONFERRENCE/MEETINGS ORGANIZED

Virtual seminar on “Chat-GPT: Unravelling the Conundrum”

A virtual seminar on “Chat-GPT: Unravelling the Conundrum” was organized by CSIR-North East Institute of Science and Technology under the leadership of Dr. G. Narahari Sastry, Director, and CSIR-NEIST. ChatGPT is currently discussed as the game changing technologies in the world. The Advanced Computation and Data Science Division members were given lecture on underlying principles, theory and applications of ChatGPT on 06 June, 2023.

Two Days IP Filing Review Meeting

The CSIR-North East Institute of Science and Technology (CSIR-NEIST), Jorhat, organized a 2-day IP Filing Review Meeting in association with CSIR–URDIP and CSIR–IPU during 19-20 June 2023. Dr Kishore Sreenivasan, Head, CSIR-URDIP along with his team visited CSIR-NEIST and conducted the program in 2 Break-out sessions. In the first sessions, patents and patentability report of the already received patents among the scientists of URDIP and IPU through one-on-one interaction with the lead inventor and his/her team wherein the patents were finalized on the spot for provisional filing. In the 2nd break-out

session, a one-on one discussion with NEIST scientists was organized and at the end of the interaction deliverables in terms of patent were finalized for the next 1 year.


Glimpses of the meeting

Seminar cum workshop on "Recent Trends on Natural Resources using Advanced Chromatographic and Mass Spectrometry Techniques

CSIR-North East Institute of Science & Technology Branch Itanagar jointly organized two days **seminar cum workshop on "Recent Trends on Natural Resources using Advanced Chromatographic and Mass Spectrometry Techniques"** in association with Spinco-Simadzu Team during 28-29 June, 2023 at Branch Lab Itangar premises at Naharlagun. The main purpose of the event was to create awareness on natural resources and bridging the gap with industry standard advanced analytical techniques About 100 nos of participants i.e. Scientists/Professors/PhD Research Scholars/Students from RGU, Doimukh, NERIST, Nirjuli, G.B. Pant Institute, Itanagar, Himalayan University, Itanagar, Arunachal Pradesh State Medicinal Board, Itanagar, DBT-APSCS&T, CoE for BSD, Kimin and CSIR-NEIST Jorhat, Assam. Dr Jatin Kalita, Head, RPBD Division, CSIR-NEIST Jorhat delivered the key note address and talked on “Bio-resources of North East India: The entire participant took hands on training the highly sophisticated analytical equipment like HPLC and GC-MS installed at the institute.

Participants during the event

National Intellectual Property Festival 2023

CSIR-NEIST organised an online awareness program on *"Promotion and Protection of Traditional Knowledge of NE India"* on 14 July, 2023 on the occasion of National Intellectual Property Festival 2023. More than 100 students from various institutions in NE region participated.

Awareness program on "Promotion and Protection of Traditional Knowledge of NE India" organised on 25 July, 2023 at The Assam Kaziranga University on the occasion of National Intellectual Property Festival 2023. More than 300 students from Kaziranga University actively participated in the program.

Seminar on 'Crosstalk between Animal Research & Alternatives (NSARA-2023)

CSIR-NEIST, Jorhat organized a seminar on 'Crosstalk between Animal Research & Alternatives (NSARA-2023)' during 7-9 September, 2023. This event is first of its kind in north east India in which 170 research scholars and students participated from different academic and research institutions of the region. The seminar included one-day workshop followed by scientific sessions on laboratory animal ethics and management, and also on alternative scopes to animal research. Renowned resource persons from premier research labs across the country such as CSIR, DRL Tezpur, NBRC Maneswar, IIT-Guwahati, NIPER Guwahati, JNU New Delhi, NCBS Bangalore, and Tezpur University etc graced the occasion.

Glimpses of the event

There were lectures and presentations on the layout and designing of animal experiments, animal housing and husbandry practices, animal handling and restraining, animal breeding, ethics and welfare in animal research and computational drug discovery platform as an alternative. Importantly, several basic techniques in animal research such as handling, restraining, sampling, administration, anesthesia, euthanasia and necropsy of mice were demonstrated in the experimental animal house of CSIR-NEIST, Jorhat. It was an informative and interactive workshop that benefitted the participants from different corners of North East as well as India to a great extent.

Sensitisation camp

On 31 October, 2023 Sensitisation camp on BUILD 2023 program was successfully held with the participation of approx. 70 students and faculties, startups, innovators from

different institutions and areas of Jorhat. Dr. Rajiv Kangabam, Manager-BRTC, KIIT TBI delivered the key session on BUILD where he touched upon various aspects of entrepreneurship, innovation, startup development, application procedure of BUILD 2023 etc.

National Seminar on Ethnopharmacology for Bio-Economy (EBNP-2023)

The 10th Convention of Society for Ethnopharmacology, India-cum-National Seminar on Ethnopharmacology for Bio-economy: The New Paradigm (EBNP-2023) was held at CSIR-NEIST Jorhat during 28-30 November 2023. The event was jointly organized by CSIR-NEIST, Jorhat with the Society for Ethnopharmacology, India and saw the conglomeration of a galaxy of eminent scientists and researchers from all across the country. Dr G. Narahari Sastry, Director CSIR-NEIST and Chief Patron of EBNP-2003 delivered the inaugural address. Dr Jatin Kalita, organizing secretary briefed about the seminar. Dr Madhu Dikshit, Former Director, CSIR-Central Drug Research Institute (CSIR-CDRI) delivered the keynote address on “Unlocking the Potential of Ashwagandha in Healthcare: Ethnopharmacology Insights and Opportunities.

Glimpses of the event

The event also witnessed the active participation of traditional healers, known as “bez” in assamese, in an exhibition adding a unique dimension to the conference’s overall purpose. The objective of the conference was to present and discuss scientific research in the context of traditional knowledge related to the use of locally available herbs and organisms for curing diseases. This knowledge has been practiced by tribal people and their forefathers for generations. The north-eastern region, known for its biodiversity, is a known for its biodiversity is a hotspot for traditional medicinal practices that are still trusted and in use.

One Day workshop cum training program on prototype/process, design & development

One Day workshop cum training program on prototype/process, design & development with special emphasis on essential oil distillation unit for locally available high value plants materials was organized under the DBT, Govt. of India funded project Design and Development of 500 Kg Capacity Solar-Biomass Hybrid Distillation unit with the Mobile Type Distillation Vessel and Its Field Demonstration for Entrepreneurship Development" at Jorhat Institute of Science and Technology, Jorhat Assam. The training program was organized in association with training and placement cell, JIST. Around 140 no of students and 20 no of faculties participated in the training program.

Students in the training program

EVENTS ORGANISED

National Technology Day Celebration

CSIR-NEIST celebrated National Technology Day on 11 May 2023. Padmashri, Padmabhusan and Padma Vibhushan Dr Raghunath A. Mashelkar, graced the occasion as Chief Guest and delivered National Technology Day Lecture. Dr. Sastry addressed the gathering in the J N Baruah Auditorium and highlighted the contribution of CSIR-NEIST in science and technology in several sectors like Agrotechnology, Biotechnology, Machine learning, IoT, Geosciences, Material Sciences, Chemical Sciences, Engineering Sciences, Petroleum Sciences etc.

Left: Padmashri, Padmabhusan and Padma Vibhushan Dr Raghunath A. Mashelkar delivering National Technology Day Lecture at CSIR-NEIST. Right: Prof. Dr Raghunath A. Mashelkar felicitated by Dr G Narahari Sastry, Director, CSIR-NEIST during the event.

World Environment Day 2023 celebrated at CSIR-NEIST

World Environment Day 2023 celebrated at CSIR-NEIST by planting 1000 numbers of saplings which include mainly Ayurvedic Medicinal, Fruits, Flowering and other plants like Amla, Baheda, Haritaki, Arjun, Giloy, Jamun, Jasmin, Litchi, Guava, etc in the CSIR-NEIST Campus by the employees of the institute on 06 June 2023. The campus plantation drive started with the speech of the Director, CSIR-NEIST in which he appealed everyone to use minimum plastic and make the campus greener and cooler by choosing the right plant and taking proper care of the plants.


Plantation drive at CSIR-NEIST campus

Shri. Temjenmemba, Hon'ble advisor to Chief Minister, Nagaland visited CSIR-NEIST

Shri. Temjenmemba, Hon'ble advisor to Chief Minister for Transport and Technical Education, Er. Vipulhou Lhoungu, Director of Technical Education and other senior officials from Directorate of Technical Education, Nagaland, and Kohima visited CSIR- NEIST. The Director CSIR-NEIST welcomed them and organised a meeting with a team of scientist to discuss about the scope of possible collaboration in policy formulation for the upliftment and growth of technical education in Nagaland state. Dr. Sastry introduced the areas of expertise CSIR-NEIST has and highlighted the contributions the institute is extending through its various activities i. e STINER, BIRAC-BIONEST, RCFC, Jigyasa, Aroma Mission, Floriculture Mission etc for the development of Nagaland.


Visit of Shri. Temjenmemba, Hon'ble advisor to Chief Minister Nagaland

CSIR-NEIST celebrated 77th Independence Day


CSIR-NEIST celebrated the 75rd Independence Day on 15 August 2019 with much zeal and enthusiasm. A flag hoisting programme was held in front of the administrative block which was attended by CSIR-NEIST staff along with family members and students & teachers of CSIR-NEIST KV. Dr G Narahari Sastry, Director, CSIR-NEIST inspected the Guard of Honour and unfurled the National flag after which the National Anthem was sung. CSIR-NEIST's security personnel and students from KV-NEIST took part in the parade, followed by the address by the Director.

CSIR-NEIST celebrated the National Sports Day-2023

CSIR-NEIST, Jorhat celebrated the National Sports Day-2023 on 29 August, 2023 wherein the students and staff participated in various sports event in the day long program followed by the valedictory and prize distribution ceremony.

Visit of Sri Sarbananda Sonowal at CSIR-NEIST

On 24th of December, 2023, The Union Minister of Ports, Shipping & Waterways and Ayush, Sarbananda Sonowal visited CSIR-North East Institute of Science & Technology (CSIR-NEIST). The Minister assured complete support for an approximate investment of Rs 200 crores to build capacity around the medicinal plant sector of the region. This amount is aimed at creating infrastructure that will strengthen the medicinal plant storage for commercial purpose, boosting research and development of the local herbs and plants for medicinal purpose as well as providing a platform for traditional healers to further their treatments to a wider section of the society.




During this visit, the Minister reviewed the progress of different activities undertaken by the institute to strengthen the huge potential of medicinal plant market in the region. Of the proposed investment for capacity building at CSIR-NEIST, multiple cola storage will be set up for storage of herbal plants for commercial usage. An approximate investment of Rs 100 crores is set to develop these specialized cold storages for Medicinal Herbal Plants. A Centre of Medicinal Herbs and Aromatic Plants is also proposed to be set up which will act as a lynchpin of research and development in medicinal plant from the region. The Centre of Excellence is proposed to be developed with an outlay of Rs 35 crores. In order to explore possibilities from the folk medicine, with scientifically validated outcome, for treatment of ailments, a hospital for traditional folk healers is also proposed. The cost for development of this hospital is pegged at Rs 50 crores.

CSIR Foundation Day

CSIR foundation day celebrated at CSIR-North East Institute of Science & Technology (NEIST) on 7 October 2023 with a diverse array of activities aimed at engaging students, farmers, entrepreneurs, and other visitors. Dr. G Narahari Sastry, the Honorable Director of CSIR-NEIST, extended a warm welcome to students from Don Bosco HS School, Baghchung and Kendriya Vidyalaya No. 3, RRL, Jorhat. Dr. Sastry interacted with the students, encouraging them to pursue science and fostering an environment where asking the right questions is paramount.

Glimpses of the event

In a bid to foster learning and development, CSIR-NEIST distributed quality planting materials of medicinal and aromatic plants to farmers, entrepreneurs, and other visitors, aligning with the mission of doubling farmers' income. The day's events also included a captivating Nukkad Natak performance, raising awareness of Public Interest Disclosure and Protection of Informer (PIDPI). The event was graced by Mr. Bhaskar Jyoti Phukan, Managing Director of Numaligarh Refinery Ltd., as Chief Guest, and Prof. Jagadish K. Patnaik, VC of Nagaland University, as the Guest of Honour. Dr. Sastry welcomed the guests, emphasizing CSIR's achievements and the pivotal role of CSIR-NEIST during national emergencies.

8th Ayurveda Day

CSIR-North East Institute of Science and Technology, Jorhat and Central Ayurvedic Research Institute, Guwahati have jointly celebrated 8th Ayurveda Day on 3 November 2023

at CSIR-NEIST with a number of activities including popular lectures, Ayurveda Medical Camp and Exhibition of Medicinal Plants followed by distribution of medicinal plants to the participants.

India International Science Festival 2023

A one day outreach programme on the 9th India International Science Festival (IISF) 2023 was held at CSIR-North East Institute of Science and Technology (CSIR-NEIST) on 26 December, 2023. The programme was attended by Dr G Narahari Sastry, Director, CSIR-NEIST, Shri Sameer Pradhan, Air Commodore and Air Officer Commanding 10 Wing Air Force Station, Jorhat, recipient of Vayu Sena Medal (VM) and Shri Rajib Chandra Sarma, Prantkaryakarta from Vijinana Bharati (VIBA) and secretary for VIBA-NER. The programme was a big draw a hordes of school students from in and around Jorhat town, viz., Shankardev Vidya Niketan, Dohotia Girls Higher Secondary School, Balya Bhawan, Jorhat and St.Joseph's Higher Secondary School.

Visit of Prof. N. Kalaiselvi, Director General, CSIR & Secretary, DSIR, New Delhi

Prof. N. Kalaiselvi, Director General (DG). CSIR & Secretary, DSIR, New Delhi visited CSIR NEIST, Jorhat during 5-8 January 2024 for the Research council meeting of the institute. The RC meeting held in presence of the RC member wherein the scientific team of the institute presented their presentation.

(Left) Felicitation of Prof. N. Kalaiselvi, Director General. CSIR by Dr G N Sastry, Director, CSIR-NEIST. (Right) Lightening of lamp.

Centre for Pre-clinical Studies (CPS), Inaugurated by Prof.N.Kalaiselvi, Director General. CSIR & Secretary, DSIR, New Delhi on 8th January 2024, in presence of Prof.G.Narahari Sastry, Director, CSIR-NEIST Jorhat.

Inaugration of the Centre for Pre-Clinical Studies (CPS), by Prof. N. Kalaiselvi, Director General. CSIR.

Visit of U.S. Consulate to CSIR-NEIST, Jorhat

Ms. Melinda Pavek, Consul General; Mr. Quazi Rumman Dastgir, Consul for Political and Economic Affairs; and Ms. Sangita Dey Chanda, Economic Specialist, U.S. Consulate visited CSIR-NEIST on 10 January, 2024 and interacted with the women scientists and staff of CSIR-NEIST, Jorhat by engaging discussions on potential areas of collaboration between CSIR-NEIST and the U.S. Consulate to strengthen bilateral scientific and economic ties.

Glimpses of the event

Dr. V.M. Tiwari taken over charge as the Director, CSIR-NEIST, Jorhat (Assam)

Dr. Virendra M. Tiwari, FASc, FNA, FNASc, FTAS, former Outstanding Scientist, CSIR-NGRI, Hyderabad has taken over the charge of the Director of CSIR-NEIST ,Jorhat on 26 February 2024 from Dr. Arvind Kumar Mishra, who was in additional charge of the institute besides being the Director, CSIR-CIMFR, Dhanbad.CSIR - North East Institute of Science and Technology, Jorhat.

CSIR-NEIST celebrated 75th Republic Day

CSIR-NEIST celebrated 75th Republic Day with a special programme on 26 January, 2024. A flag hoisting programme was held in front of the administrative building which was attended by CSIR-NEIST staff along with their family members. Dr Saurabh Baruah, Chief Scientist, CSIR-NEIST inspected the guard of honor and unfurled the National Flag followed by March past conducted by CSIR-NEIST security personnel and NEIST-KV students.

National Science Day Celebration

CSIR-North East Institute of Science & Technology celebrated National Science Day 2024 on 28 February, 2024 with a day-long programme at its premise. This year, the event was organized jointly with Assam Science Society, Jorhat Branch. The day started off with a Science Quiz competition among school students and face-to-face student-scientist interaction. Dr R K Talukdar, Principal, Jorhat Medical College & Hospital graced the function as Chief Guest and Mr Vishal Shastri, Executive Director, A&AA Basin, ONGC, Jorhat was present as Guest of Honour. Addressing the event, Dr V M Tiwari, Director, CSIR-NEIST urged the scientists and students to inculcate independent thinking and express the example of invention of Raman Effect of Sir C V Raman which he said symbolize the very theme of this year's Science Day i.e 'Indigenous Technologies for Viksit Bharat'. He emphasized on solution driven science with a goal to develop local solutions for local problems.

(Left) Dr V M Tiwari, Director, CSIR NEIST felicitating the Chief Guest Dr R K Talukdar, Principal, Jorhat Medical College & Hospital. (Right) Dr V M Tiwari, Director, CSIR NEIST felicitating Guest of Honour Mr Vishal Shastri, Executive Director, A&AA Basin, ONGC, Jorhat.

On the occasion, Mr Umesh Chandra Borah, Chief Scientist (Retd.), CSIR-NEIST and Mr Bhaba Chetia, former employee of H.R.H Prince of Wales Institute of Science & Technology, Jorhat and also Life Members, Assam Science Society were felicitated in recognition of their immense contribution in science & technology. The programme was largely attended by CSIR-NEIST fraternity, invited guests and school students from Jorhat and Sivsagar.

(Left) Lightening of Lamp by Dr V M Tiwari, Director, CSIR-NEIST. (Right) Dr V M Tiwari, Director, CSIR NEIST felicitating Shri Umesh Chandra Borah, Chief Scientist (Retd.), CSIR-NEIST of his immense contribution in science & technology.

International Women's Day

CSIR-NEIST celebrated International Women's Day with all the staff members, research scholars, ladies from the NEIST ladies club members and invited guests at J N boruah Auditorium CSIR-NEIST on 8 March 2022. Dr V M Tiwari, Director, CSIR-NEIST delivered welcome address wherein he stressed on the importance of promoting equitable society.

Glimpses of the event

Dr K Rajeshwari, Founder and MD Director, Bioklone Biotech Pvt.Ltd., Chennai graced the occasion as Chief Guest and Prof Ajanta Borgohain Rajkonwar, VC, Assam Womens University, Jorhat was present as Guest of Honour.

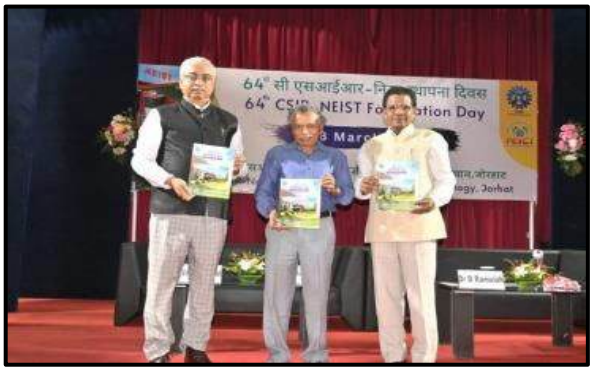
64th NEIST Foundation Day

CSIR-North East Institute of Science & Technology, Jorhat celebrated its 64th Foundation Day today on 18 March, 2024 with a day-long programme in the Dr J N Baruah Auditorium wherein Prof. Bhupendra Nath Goswami, SERB Distinguished Fellow, Cotton University & Former Director, Indian Institute of Tropical Meteorology (IITM), Pune delivered Foundation Day Lecture as Chief Guest while Dr D Ramaiah, Former Director, CSIR-NEIST attended the event as the Guest of Honour.

(Left) Chief Guest Prof. Bhupendra Nath Goswami, SERB Distinguished Fellow, Cotton University & Former Director, Indian Institute of Tropical Meteorology (IITM) delivering the

Foundation Day Lecture. (Right) Guest of Honour Dr D Ramaiah, Former Director, CSIR-NEIST addressing the crowd during the event.

Dr Virendra M Tiwari, Director, CSIR-NEIST welcomed the gathering and expressed gratitude to the founding fathers of the institute and the past & present employees for their contribution in building the institute to its present state. The annual publication, 'Annual Report 2022-23' of CSIR-NEIST was also released by the Chief Guest. Further, the employees who retired during March 2018 to February 2019 were felicitated with mementoes. Also, 'Certificates of Appreciation' were awarded to employees for exemplary performance during 2024-25 in different categories.



(Left) Dr Virendra M Tiwari, Director, CSIR-NEIST addressing the audience during the event. (Right) Release of Annual Report 2022-23.

EXHIBITIONS PARTICIPATED

Vibrant North East Exhibition

CSIR participated in the Vibrant North East exhibition organised at Guwahati held during 16-18 May, 2023 organized by Govt. of Assam and demonstrated the product and technologies of CSIR-NEIST.

CSIR NEIST representatives at the Vibrant North East exhibition

7th Industrial Green Chemistry World (IGCW-2023)

CSIR participated in the 7th Industrial green chemistry world (IGCW-2023) during 7-8 Nov, 2023 at Westin garden city, Mumbai. Along with CSIR-NEIST, other CSIR Institutes such as CSIR- CSMCRI, CSIR- CLRI, CSIR- IIP and CSIR-NIIST participated and showcased various green process technologies to the gathering in the exhibition.

CSIR NEIST representatives at the 7th Industrial green chemistry world

Assam Divas-2023

CSIR participated in the Assam Divas-2023 at Tingkhong, Dibruagarh, organized by Govt. of Assam on 2 December 2023. The officials from the CSIR-NEIST showcased the different products/ technologies of NEIST to the visitors during the exhibition.


CSIR NEIST representatives at the Assam Divas-2023

Platinum Jubilee Celebration at Bahona, Jorhat

CSIR participated in the exhibition organized by Bahona Govt Boys High School on the occasion of Platinum Jubilee celebration of the school at Bahona, Jorhat on 22 December, 2023 and showcased the different products/ technologies along with the essential oil distillation unit during the event.


CSIR NEIST representatives at the Platinum Jubilee celebration of Bahona Govt Boys High School

Atmanirbhar Dhemaji Exhibition

Atmanirbhar Dhemaji is a strategic platform to encourage start-ups and entrepreneurial initiatives of farmers, farm women, youth, producer group, SHGs and FPCs in agriculture and allied sector held during 11-14 January, 2024 at Court field, Dhemaji, Assam. CSIR-NEIST Branch Lab Itanagar participated in the exhibition to showcase the different products/technologies of NEIST and Branch Laboratory. Shri Pradan Baruah, Hon'ble Minister of Parliament, Shri Ronuj Pegu, Minister of Education, Assam and other dignitaries

visited CSIR-NEIST exhibition stall.


Mr Pradan Baruah Hon'ble Minister of Parliament and other visitors at CSIR-NEIST Stall

Arunachal Pradesh Statehood Day Exhibition

CSIR-NEIST Branch Lab Itanagar participated in exhibition at Tawang Arunachal Pradesh in collaboration with Dept of Agriculture, Govt of Arunachal Pradesh on 20 February 2024. The programme was organized by district Administration, Tawang. The team showcased different product and technologies of the institute to a large of numbers of visitiors visited the stall. The visitors highly appreciated the institute's activities.

Exhibition Stall CSIR-NEIST Branch Itanagar

North East Start-Up and Entrepreneurs Conclave 2024

CSIR-NEIST participated in the 'North East Start-Up and Entrepreneurs Conclave 2024', at Srimanta Sankardeva Kalakshetra, Guwahati, organized by The North East Centre for Technology Application and Reach (NECTAR), an autonomous body under the Department of Science and Technology (DST), Government of India, during 27-28 March 2024. Dr. VM Tiwari, Director CSIR-NEIST, attended the program as one of the guests of the valedictory function on 28 March 2024. Participating in the exhibition, the institute showcased its technologies, products, and other activities.

Dr Arvind C Ranade, Director, National Innovation Foundation and Sri Prabin Ram Das, Secretary, Bigyan Bharati along with Dr. V M Tiwari, Director CSIR-NEIST visiting CSIR-NEIST exhibition stall at North East Startup & Entrepreneur's Conclave at Sankardev Kalakshetra, Guwahati

Prof Ashutosh Sharma, President, INSA and Former Secretary, DST; Prof Asis K Mukherjee, Director, IASST, Guwahati; Prof Ram Prakash Sharma, Director, NIT, Arunachal Pradesh visited CSIR-NEIST exhibition stall at NE Startup and Entrepreneur Conclave - 2024 in presence of Dr VM Tiwari, Director, CSIR-NEIST showcasing all major products and technologies of the institute.

SOCIETAL ACTIVITIES

Activities under Jigyasa

CSIR-NEIST Jorhat organized various students scientist connect program under JIGYASA during the year at CSIR-NEIST, Jorhat as well as other in places such as schools, institutions etc. during the year. JIGYASA is a Students-Scientists Connect program and is a unique platform for nurturing young minds. This program envisages opening up the national scientific facilities to school students, enabling CSIR Scientific knowledgebase and facilities to be utilized by school-student. Under Jigaysa project CSIR-NEIST also reaches out to rural school students of NE India and donated children science literature and other books, and laboratory apparatus for the up-gradation of the school's basic infrastructures.

CSIR JIGYASA- a Student-Scientist Connect Program

Under CSIR-JIGYASA various Student-Scientist programs/seminars were conducted during April 2023 to March 2024 for nurturing young minds toward sciences. The programs are given below

- CSIR-NEIST has conducted two Jigyasa Programs one in Government Higher Secondary School, Dimapur with about 60 students from class XII and another at Government High School, AKAHUTO with participation of 40 students on 19 may 2023.
- CSIR-NEIST conducted a 3-days workshop at Balya Bhawan School, Jorhat, Assam, on 05 July, 2023 based on theme Waste-to-Value under CSIR-JIGYASA initiative. More than 200 students from Class 5 to 10 participated and learned to develop various products from waste.
- CSIR-NEIST organised a AI based popular talk program on 10 July, 2023 under CSIR-JIGYASA initiative to create awareness and dissemination about AI to school students, under this year's Jigyasa theme, "Artificial Intelligence". Science enthusiastic students from Axel Public School, Guwahati, Assam, were invited where 30 students from Class 9 and 10 participated along with 2 faculty members.
- Students from Upper Deori School, Jorhat visited CSIR-NEIST on 13 July, 2023 under the Student-Scientist Connect program.
- Students from Duliajan Jatiya Vidyalaya visited CSIR-NEIST on 14 July, 2023 under the Student-Scientist Connect program.
- CSIR-NEIST organised an AI-based popular talk program under CSIR-JIGYASA initiative on the 18 August, 2023 to create awareness and dissemination about AI to school students, under this year's Jigyasa theme, "Artificial Intelligence". Science enthusiastic students from Modern Public School, Guwahati, Assam were invited and a total of more than 60 students from Class 11 participated along with 6 faculty members.
- CSIR-NEIST Jigyasa team organized an AI-based awareness program on 25 August, 2023 under this year's theme "Artificial Intelligence". Students from Jorhat Kendriya Mahavidyalaya were invited to take part in the program where a total of 54 students along with 4 faculty members participated in the program. An awareness lecture on Artificial Intelligence was presented by team Jigyasa followed by a lab visit program.

- CSIR-NEIST organised a Student Scientist Connect Program on 11 September, 2023 at CSIR-NEIST, under CSIR-JIGYASA initiative to create scientific temperament among the school students. Science enthusiastic students from Sonari Senior Secondary School, Assam, were invited where 110 students from Class 11 and 12 participated along with 10 faculty members.
- CSIR-NEIST organised a Student Scientist Connect Program on 22-09-23 under CSIR-JIGYASA initiative to create scientific temperament among the school students. Science enthusiastic students from Unity Christian Higher Secondary School, Dimapur, Nagaland was invited where 30 students from Class 12 participated along with 2 faculty members.
- CSIR-NEIST organised a Student-Scientist Connect Program under CSIR-JIGYASA initiative on 12 January, 2024 at its premise. 49 School students from class 8 along with 11 teachers from Sophy Mercy Memorial School, Sivsagar participated in the program. Under the program, the students visited various laboratories of the institute and had a face-to-face interaction with scientists.

Glimpses of Jigyasa Program

School visit under Jigyasa Program on dated- 13.07.2023

Student- Scientist Connect Program under Jigyasa. Introduction to artificial intelligence and machine learning.

Activities under "Cultivation and Processing of Medicinal and Aromatic Plants"

Distribution and Training under CSIR AROMA Mission

Team Aroma Mission has distributed Quality Planting Materials (QPM) of High yielding varieties of Patchouli Jor Lab P1 and Lemon grass variety Jor Lab L8 at Cachar Dist of Assam on 13 May 2023.

Nursery preparation training was also imparted in the program

Training Program at Namshu village, Dirang, Arunachal Pradesh


A one day farmer training cum awareness program was organized at Namshu village, Dirang, Arunachal Pradesh on 20 November 2023 by CSIR-North East Institute of Science & Technology, Jorhat under CSIR Aroma Mission which was attended by about 75 persons including farmers, women and youth of the region. Dr G. Narahari Sastry, Director, CSIR-NEIST led by a team of scientists imparted the training on aromatic and medicinal plants wherein Dr. Sastry emphasized the importance of the introduction of aromatic and medicinal plants cultivation for agro economic transformation of the region. Plant saplings were also distributed among the participants.

Activities under CSIR- Floriculture Mission

Visit to Nagaland during 19-21 May 2023

During 19-21 May 2023, a team including Director, CSIR-NEIST visited Nagaland for various programs scheduled at different places. Day wise details are below:

19 May 2023

Dr G Narahari Sastry, Director, CSIR-NEIST has attended the inaugural session of “Nagaland Spark: Igniting Innovation & Entrepreneurship Program" organized by Nagaland University in association with BIRAC, KIIT-TBI, and BCKIC at SASRD, Medziphema, Nagaland as the Guest of Honour.


Dr G N Sastry, Director, CSIR-NEIST as the Guest of Honour at the Inaugural session of ‘Nagaland Spark: Igniting Innovation & Entrepreneurship Program’ on 19 May 2023

Dr Sastry also delivered a talk on "Priorities Area in Innovations & Entrepreneurship in North East" in the same event. He talked about the scope, opportunities, and challenges of development in the North East Region, with special emphasis on the state of Nagaland. He stressed on the importance of collaboration and encouraged the gathering to go beyond our comfort zones and experience new fields which can help the region in particular and the nation as a whole.


Dr Sastry delivering a speech at the 'Nagaland Spark: Igniting Innovation & Entrepreneurship Program' on 19 May, 2023

CSIR-NEIST has conducted two Jigyasa Programs- one in Government Higher Secondary School, Dimapur with about 60 students from class XII and another at Government High School, AKAHUTO with participation of 40 students. Brief interaction between the scientists and students was held along with presentation of some glasswares for scientific experiments, a bundle of book and some medicinal plants in both the schools.

Government Higher Secondary School, Dimapur on 19 May, 2023


Government High School, Akahuto, PIMLA village on 19. May 2023

The vehicle carrying Honey Bee Boxes and planting materials to Nagaland

A meeting with the representatives from three different clusters under CSIR-Floriculture Mission *viz*. Dimapur District Floriculture Association, Vihoshe and Hozukhe village, Nagaland was held at STINER-TFC demonstration unit, SASRD where about 30 people attended the meeting. Director, CSIR-NEIST has explained that government consider the honey bee farmers as the landless farmers and also the importance of S&T interventions in this field like quality testing at an affordable price. In the same meeting Dr Mantu Bhuyan, Senior principal scientist and Dr Kalyani Medhi, principal scientist interacted with the farmers in the area of scientific bee keeping and floriculture in NE India respectively. At the end of the meeting, about 1000 no. of grafted rose saplings were distributed to the floriculture farmers.

Interaction with the floriculture/apiculture farmers and distribution of grafted rose sapling

20 May 2023

On the 2nd day, the team moved towards the Phek district of Nagaland and reached Pfutsero town. On reaching, the team visited the Government Higher Secondary School of Pfutsero. The principal welcomes all the team member of CSIR visiting the school. Dr K Medhi from CSIR-NEIST has introduces the Director, CSIR-NEIST and other team members to the gatherings. Dr G N Sastry, Director, CSIR-NEIST has addressed and encouraged the students through his brief speech. He also introduces his two recent PhD holder from Nagaland, Dr Ester Jamir and Dr Kikru and appreciated their hardworks during PhD to encourage the young ones of the state. He urges the students to gather knowledge and make their unique resources available to the world in a sustainable way. He also requested the students to keep themselves away from drugs or other negative elements. About 700 students and teachers of the school attended the program.

Government Higher Secondary School, Pfutsero, Phek on 20 May 2023

Under CSIR-Floriculture Mission, a polyhouse constructed at Pfutsero was inaugurated by the Director, CSIR-NEIST on 20th May 2023 and dedicated it to the Pfutsero Floriculture Cluster, leading by a young enthusiastic female entrepreneur, Ms Vasalu Puro for extension of floriculture activities. He also mentioned about the activities under CSIR-Aroma Mission and RCFC to make awareness about cultivation and conservation of medicinal plants.

Inauguration of the Naturally Ventilated Polyhouse at Pfutsero, Phek on 20 May 2023

Coinciding with the 'World Bee Day", two training programs were conducted on 'Scientific Honey Bee Keeping' at Phek district of Nagaland on 20 May 2023. The first training program was conducted at Pfutsero where about 25 farmers participated. Dr Mantu Bhuyan, Senior Principal Scientist has attended the program as resource person. In interaction with the farmers, , Dr G. Narahari Sastry, Director CSIR-NEIST has requested the farmers to send the feedback after using the boxes that were distributed at the end of the program. He also mentioned that the institute can provide more such boxes, if required on minimal cost or free to the economically weak ones. A total of 15 honeybee rearing kits were distributed to the farmers at Pfutsero.






A training on “Mushroom cultivation” was also provided to a group of 15 interested farmers and distributed spawn to them. The farmers were also interested in cultivate Shiitake Mushroom which is avaialble there wildly. Although Shiitake and other mushroom grow easily but to grow commercially, the availability of spawn is not sufficient in Nagaland and the farmers have procure it from outside the state at a high rate.


In the afternoon, the team were at Government High School, Thipuzu and interacted with about 80 nos. of students, parents and teachers.

Like the previous programs, presented glass apparatus for scientific experiments, a bundle of book and some medicinal plants to both the schools' authorities.




Government High School, Thipuzu, Phek on 20 May 2023

Another training program on "Floriculture and Scientific Honeybee rearing" was held at Thipuzu village of Nagaland with participation of about 35 farmers. Director CSIR-NEIST, Dr G. Narahari Sastry addressed the farmers prior to training and distributed honey bee kits to 15 farmers.

Farmers training and plant materials distribution at Thipuzu, Phek on 20 May 2023

During the visit, about 200 saplings of medicinal plants *viz*. *Tinospora cordifolia, Terminalia bellerica, Capsicum, Syzygiumcumini* and *Murrayakoenigii* were distributed to the farmers and in the schools.
Moreover, the farmers of Thipuzu Village gifted 25 nos. of Persimmon cuttings for planting at Jorhat on experimental basis.

Two days training cum planting materials distribution programs

Two days training cum planting materials distribution programs organized during 10-11 October 2023 at SASRD campus with the flower growers of Mezdiphema and at Red Cross Conference hall, Kohima with the members of Nagaland flower growers Association under CSIR-Floriculture mission. About 6000 chryanthemum and 50 tissues cultured orchid plants from the lab distributed to the growers in presence of the Dr GN Sastry, Director, CSIR-NEIST

Activities under Mushroom Cultivation

Scientific Intervention of CSIR-NEIST towards Atmanirbharta & empowerment of Arunachal Pradesh: CSIR-North East Institute of Science & Technology Branch Laboratory Itanagar, G-Sector, Naharlagun organized one day Science Motivation cum demonstration program today at institute premises. About 50 nos of students along with teachers of Bunny's Fantasy World School, Itanagar Arunachal Pradesh attended the day long program. In welcome address Dr Chandan Tamuly, Sc In Charge, CSIR-NEIST Br

Itanagar briefly introduced about the institute, the objective of the program and delivered a talked on **Scientific Intervention of CSIR-NEIST towards Atmanirbharta & empowerment of Arunachal Pradesh.** The resources person Miss Priyanka Kakoti, T.A. delivered at talked on **Cultivation of Mushroom and its importance in health**. The students further visited different labs for demonstration of practical experiment and received hands on training on Cultivation of Mushroom.

Participating students during the training program

One-day workshop on "Different aspect of soil analysis and Mushroom Cultivation Technology" at CSIR-NEIST Branch Itanagar Naharlagun

CSIR-NEIST Branch Lab Itanagar organized one-day workshop on "Different aspect of soil analysis and Mushroom Cultivation Technology" at lab premises. About 50 nos of M Sc and B Sc students of Dept of Agriculture, Himalayan University, Jullamg along with their teachers attended the day long program. the soil testing activities were demonstration by Mrs Moushumi Hazarika, Sr. T.O. with supports of all the Ph D Research Scholar and Technical staff of the institute. Accordingly a talk on "Importance of mushroom and its cultivation" was delivered by Miss Priyanka Kakoti, T.A. of the institute. A hands on training on "Cultivation of Mushroom" was provided to all students.

Glimpses of training program

Training and awareness program on "Cultivation of Mushroom":

Training on Mushroom Cultivation at CSIR-NEIST Branch Itanagar, Arunachal Pradesh has organized on 21 August, 2023. Total 10 nos. of students from Deptt of B.Sc Agriculture, Himalayan University, Itanagar participated in the training program.

Participating students during the training program

Awareness Program held on Cultivation of Mushroom at Tawang

An awareness and training programe was held on 13 October 2023 at Weikhar village, Tawang by CSIR-North East Institute of Science and Technology, Branch-Itanagar, in collaboration with District Agricultural Officer, Tawang, which was attended by 50 farmers, entrepreneur, SHG etc. Other official like District Agriculture officer, DHO, ADO, AFA etc were also present in the program.

Participating students during the training program

One day training program on Mushroom cultivation

A one day training program on Mushroom cultivation was organised on 13 November 2023 at CSIR-NEIST Jorhat for 13 persons of Sivasagar and Sarupathar area.

Entrepreneurs meet cum Training program on Cultivation of Mushroom and its commercialization

CSIR-NEIST Branch Itanagar Naharlagun **o**rganized one day **Entrepreneur meet cum** Training program on Cultivation of Mushroom and its commercialization at CSIR-NEIST Branch Itanagar Naharlagun on 12 December 2023. About 30 nos of participant from different entrepreneurs, SHG/NGO, college/University students, farmers of different locality of Arunachal Pradesh attended the day long program. Dr Chandan Tamuly Principal Scientist & In Charge, CSIR-NEIST Branch Itanagar briefly introduced about the institute and provided hands on training.

Participants during Hands on training of Mushroom cultivation

One day Training program on Cultivation of Mushroom and its commercialization

CSIR-North East Institute of Science & Technology Branch Itanagar organized one day **Training program on Cultivation of Mushroom and its commercialization** on 10 January, 2024 at CSIR-NEIST Branch Itanagar Naharlagun. About 30 nos of participant from different college/University students like Dolphine PG institute of Biomedical and Natural Science, Dehradun, NERIST, Nirjuli and Apline institute of Management, Dehradun attended the day long program.

Participants during Hands on training of Mushroom cultivation

Awareness program on Biofertilizer

Training on Biofertilizer Production at Ri Bhoi District, Meghalaya

A biorector for OP-12 biofertilizer production unit has been commissioned at SIRD, Nongsder, Ri Bhoi District, Meghalaya on 15 May 2023 under the DBT sponsored project. Training for the operation, application-cum-awareness program has been organized along. Dr. G Narahari Sastry, Director, CSIR- NEIST and Director, SIRD, Meghalaya graced the occasion and an MOU has also been signed for the transfer and propagation of the technology.

Training on Biofertilizer Production at Branch Lab Itanagar

CSIR NEIST organized a training and demonstration program on "OP-12 Bio-fertilizer Production Technology and Entreprenuers Development" at Branch Lab Itanagar 07 June 2023. About 50 nos of farmers, beneficiaries, entreprenuer and students were participated from different locations of Arunachal Pradesh. Dr Jayanta Jyoti Bora, Dr Ratul Saikia and Dr Chandan Tamuly imparted the training under a DBT sponsored project.

OP-12 biofertilizer production-cum Application training and demonstration program for Entreprenuers Development" is organised at Organic Krishi Sewa Gut, Ghilamara, and Lakhimpur on 08 June 2023. About 65 nos of farmers, beneficiaries and entreprenuer were participated from different locations of Ghilamara, Dakuakhana and nearby areas. Er. Jayanta Jyoti Bora, and Dr Ratul Saikia imparted the training under a DBT sponsored project. OP- biofertilizer was distributed among the participants which was produced at the training program.

Other Training Programs

Awareness Program held on Ethnic Monpa Food at Tawang, Arunachal Pradesh

An awareness cum interaction program on ethnic Monpa food was held on 14 October 2023 at Namet village, Tawang by CSIR-NEIST, Branch-Itanagar, in collaboration with District Agricultural Officer, Tawang, which was attended by 60 farmers, Scientists from KVK Tawang, ADOs and AFAs of agricultural department. Chief Guest, Deputy Commissioner,

Shri Tawang Kanki Darang emphasized on conservation on local varieties of crops. In the technical session, Dr Chandan Tamuly, Sr Principal Scientist, CSIR-NEIST, Branch-Itanagar spoke on Scientific Validation and Nutritional analysis of ethnic food of Monpa tribe of Arunachal Pradesh.

Participants during the training program

Awareness program on National Certification System for Tissue Culture Raised Plants held at CSIR-NEIST

A one-day awareness program on National Certification System for Tissue Culture Raised Plants (NCS-TCP) was organised by National Institute of Plant Genome Research (NIPGR) New Delhi in collaboration with CSIR-NEIST on 06 January, 2024. The main objective of the program was to spread awareness and promote the advantages of NCS-TCP. Dr Subhra Chakraborty, Director,

NIPGR and Coordinator, NCS-TCP highlighted the vision and mission and important initiatives of the Institute and provided a comprehensive overview of the NCS-TCP program and discussed its pivotal role in revolutionizing the agriculture sector through the use of tissue culture raised virus-free and genetically uniform plants. She mentioned that NCS-TCP is a unique quality management program of Department of Biotechnology, Government of India which is playing a key role towards nurturing agribusiness by encouraging entrepreneurs and safeguarding farmers. Further, Dr Chakraborty said North East India being one of the Agri-Bio-diversity hotspots in the country has enormous potential to develop entrepreneurship and industry in the area of Plant Tissue Culture through NCS-TCP program. The program was attended by 60 college students from different colleges of Jorhat besides CSIR-NEIST fraternity.

AWARDS

Runner Up Trophy in Carrom (singles) SSBMT(Indoor) tournament

Pride of CSIR-NEIST Mrs. Rumi Borah, won the Runners Up Trophy in Carrom (singles) representing CSIR-NEIST in the final of the prestigious SSBMT(Indoor) tournament held at IMMT Bhubaneswar during 15-19 March 2024.

Fellow of East Himalayan Society for Spermatophyte Taxonomy (FEHT)

Dr HB Singh, Chief Scientist, Branch Lab Manipur (BLIM) has been awarded Fellow of East Himalayan Society for Spermatophyte Taxonomy (FEHT) on July 17, 2023, awarded by East Himalayan Society for Spermatophyte Taxonomy.

Fellow of the 'Indian Association for Angiosperm Taxonomy'

Dr Dipanwita Banik, Principal Scientist**,** has been awarded 'Fellow' of the 'Indian Association for Angiosperm Taxonomy' in Nov 2023 at the International Conference on "Advances in Plant Systematics, Biogeography and Biodiversity Conservation (APSBBC-2023) and 33rd Annual Conference of Indian Association of Angiosperm Taxonomy (IAAT) held during 25-27 November 2023.

Raman Research Fellowship of CSIR

Dr Lakshi Saikia, Principal Scientist, has been selected for the Prestigious Raman Research Fellowship of CSIR.

RECOGNITIONS

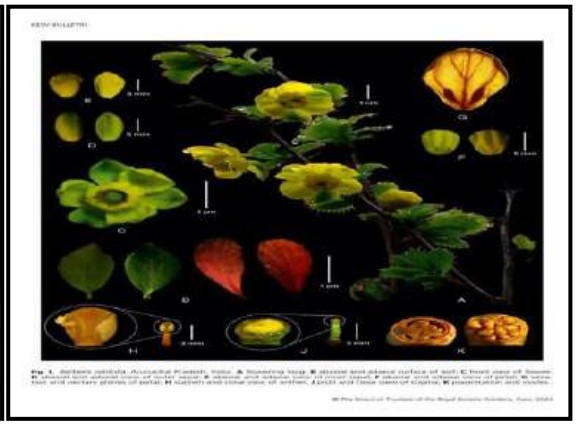
- Dr Anil Kumar Singh, Principal Scientist Participated in a television program as an Expert on ***"AMR and its impact on humans, animals, and environment"*** in NAXTRA News, Bhubaneswar, Orissa
- Dr. Himakshi Sharma awarded Best poster award in Theoretical Chemistry Symposium for the poster presentation on "Poster presentation MPDS PPI: A protein-proteinnteraction Analysis module on MPDS suite of program", IIT Madras held during 7-10 December, 2023
- Ms. Lipsa Priyadarsinee for best Oral talk, Understanding the Mechanism of Viral Transmission and Development of Disease Specific Web Portal, NSARA 2023, CSIR-NEIST, Jorhat, 09 September, 2023.
- Miss Vanlalhruaii Famhawite awarded Best Poster presentation Award in the 11th International Conference on Fermented Foods, Health Status and Social Well-being held during 21-22 Nov' 2023 at NEHU, Shillong.
- Mr Deep Jyoti Das awarded Best Oral Presentation in the Frontiers in Chemical and Pharmaceutical Sciences for the Development of Novel Therapeutics-2024 held on 16 Feb 2024
- Ms. Lipsa Priyadarsinee for best Oral talk, Designing Disease Specific Web portals by Integrating Disease Dependent and Disease Independent Modules of MPDS, EBNP 2023, CSIR-NEIST, Jorhat, CSIR-NEIST, Jorhat, 28-30 November, 2023.
- Dr Banashree Saika, Senior Project Associate, BSTD, CSIR-NEIST, Jorhat awarded best oral flash talk presentation award at 7th International Conference on Plant Genetics and Genomics: GM and Genome Edited Crops held at NASC, New Delhi, 15-17 Feb 2024.This work has been recently published in the Frontiers in Plant Science Journal. CSIR - North East Institute of Science and Technology.
- Ms. Bornali Bora BSTD awarded Best Poster Award at DST-SERB sponsored National Seminar on "Big Canvas for Innovation and Entrepreneurship" The Brushstrokes of Growth & Transformation, held at Jorhat Kendriya Mahavidyalaya, Jorhat. CSIR - North East Institute of Science and Technology.
- Prof. G. Narahari Sastry was awarded CRSI Silver Medal for the year 2023.
- Dr HB Singh, Chief Scientist, BLIM has appointed expert member of Board of Studies of School of Human & Environmental Sciences of Manipur University for 3 years (17/08/2023 to 16/08/2026).
- Dr HB Singh, Chief Scientist, BLIM has attended as Jury Member for selection of State Science Communicator's Award of MASTEC, Govt. of Manipur on 05-01-2024.
- Dr HB Singh, Chief Scientist, BLIM has invited and attended as Panelist in "Apni Bhasha Apni Vigyan" in India International Science Festival held at Faridabad on 18-01-2024.
- Dr HB Singh, Chief Scientist, BLIM has attended as an expert member for establishment of Cancer Research & Training Centre (CRTC) at the Manipur University on May 11, 2023.
- Dr HB Singh, Chief Scientist, BLIM has invited and translated a book "A Matter of Chance" of CSIR-NIScPR; a CSIR Golden Jubilee Series from English to Manipuri medium.

- Dr Chandan Tamuly, Sr Principal Scientist has recommended as a subject expert for RAC (Research Advisory Committee) for National Institute of Technology, Yupia, Arunachal Pradesh for Ph.D scholars, Dept of Biotech and Bioengineering, NIT, Arunachal Pradesh.
- Dr Chandan Tamuly, Sr Principal Scientist appointed as the Director, Board of Directors, Arunachal Pradesh Mineral Development & Co-operation Limited, Arunachal Pradesh.
- Dr Chandan Tamuly, Sr Principal Scientist appointed as a Member, Scientific Advisory Committee, for the Krishi Vigyan Kendra (KVK), Papum Pare, Govt of Arunachal Pradesh.
- Dr Chandan Tamuly, Sr Principal Scientist as an Executive Member for State Medicinal Plant Board, Govt. of Arunachal Pradesh.
- Dr Chandan Tamuly, Sr Principal Scientist Executive member, for State Geology and Mining Dept, Govt. of Arunachal Pradesh.
- A copyright with ROC No. SW-17616/2023 has been granted by the Copyright Office, Govt. of India, which is a computer program titled *"A Graphical User Interface (GUI) Programme for Processing and Analysis of Regional Earthquakes – REQAPP."* It may be mentioned that this is the First Copyright of CSIR-NEIST. Author KVRH Prasad & Bijit Kumar Choudhury
- A Copy right has been granted vide ROC No. SW-17939/2023 by the Copyright Office, Govt. of India which is a computer programme titled *"A Novel Algorithm based GUI Programme To Identify And Prepare Regional Earthquakes database: REQUID".* It may be mentioned that this is the second copyright of CSIR-NEIST and second IP product of GSTD. Author KVRH Prasad & Bijit Kumar Choudhury
- A Copy right has been granted vide ROC No. SW-18742/2024 by the Copyright Office, Govt. of India which is a computer programme titled *"A Python Based GUI Programme for Graphing and Mapping in Seismology-SEISMOGMP".* It may be mentioned that this is the third copyright of CSIR-NEIST and second IP product of GSTD. Author KVRH Prasad & Bijit Kumar Choudhury
- A Copy right has been granted vide ROC No. SW-18766/2024 by the Copyright Office, Govt. of India which is a computer programme titled *"A GUI Programme Through machine Learning Approach to Identify Earthquake Signals from Broadband Seismological Datas (ML_EQSID)".* It may be mentioned that this is the fourth copyright of CSIR-NEIST and second IP product of GSTD.Author KVRH Prasad & Bijit Kumar Choudhury.
- Dr Prakash J Saikia has contributed significantly as a member in the Assessment Committee meeting for conducting **assessment interview** for **Scientists** and **Technical Officer** (Analytical Services) in the Tocklai Tea Research Institute, Jorhat, Assam on November 16, 2023 and December 04, 2023 respectively.
- (Dr Prakash J Saikia performed as an ***External examiner*** through the conduction and evaluation of practical examination for MSc students in the Department of Industrial Chemistry, Mizoram University, Aizawl during June 23-28, 2023.

ABROAD VISITS

Dr. Natarajan Velmurugan, Senior Scientist, CSIR-NEIST was selected to participate in the 43rd Indian Scientific Expedition to Antarctica (43rd ISEA) organized by National Center for Ocean and Polar Research, Ministry of Earth Sciences, Government of India. During this monumental expedition, he was on voyage and conducting research works in Bharati and Maitri Research Stations located in Larsemann Hills and Schirmacher Oasis, respectively, from December 2023 to March 2024. His research work in Antarctica mainly focused on characterizing culturable thraustochytrids of Antarctica and their polyunsaturated fatty acids and pigments contents with emphasis on fish feed formulation. This is the very first attempt from India for the isolation and characterization of Antarctic thraustochytrids.

INNOVATIONS AND DISCOVERIES



A new plant species Begonia Narahari has been discovered from Arunachal Pradesh by scientist from CSIR-NEIST and honored to Dr. G Narahari Sastry, Former Director CSIR-NEIST, in recognition of his immense contribution in S&T intervention in North East.

Begonia L. is one of the largest and fastest growing genera of flowering plants, belonging to the family Begoniaceae, having more than 2100 species (Hughes et al. 2015 onwards). During a recent floristic exploration of the Demwe locality (Mishmi Hills) (Fig. 1) in Lohit district of Arunachal Pradesh in 2023, the authors collected a few individuals belonging to the genus Begonia. These individuals distinguished themselves through their exceptional capacity to exhibit a striking blue iridescence when exposed to direct light. After critical evaluation of these specimens using relevant literature, expert scrutiny and consulting the herbarium housed at the Botanical Survey of India, Eastern Regional Centre, Shillong (ASSAM) and Arunachal Pradesh (ARUN), it was revealed that the specimen belongs to an undescribed species within Begonia sect. Platycentrum and named as ***Begonia naraharii*** B.Hajong, N.Bhat & P.Bharali.

Etymology: The species epithet “naraharii” honors Prof. Garikapati Narahari Sastry, Director of CSIR-North East Institute of Science and Technology (NEIST), Jorhat, in recognition of his immense contribution to establishing the Germplasm Conservation Centre for the Bioresources of Northeast India at CSIR-NEIST campus and his unwavering commitment to improving the well-being of the people in the northeastern region of India.

TRAINING ATTENDED

Sl. No	Title of Programme	Organizers details & duration / date	Name & Designation of the staff member
1.	Laboratory System and Internal Audit Training as per ISO/IEC 17025:2017	Training and Capacity Building (TCB) Cell, Quality Council of India	Dr Bipul Das Senior Scientist Chemical Engineering (ESTD)
2.	Onsite Patinformatics Training Programme	CSIR-URDIP, Pune, 8 - 10 August 2023	Dr. Shridhar Hiremath, Scientist, CIDD
3.	National training program on Biogas Production, Power Generation and Compressed Biogas Technology.	Centre for Rural Development and Technology (CRDT) IIT, Delhi and sponsored by MNRE, Govt of India during 17-19 January,2024.	Er. Dhanjit Das, Senior Scientist Engineering Science and Technology Division.

SKILL DEVELOPMENT TRAINING IMPARTED

Sl. No	Title of training	No of beneficiaries/ participants and their affiliation	Salient features	Organized by and date	Funding Agency
Activities under Cultivation of Mushroom					
1	Training on cultivation of mushroom technology	08 Farmers	Hands on training on mushroom cultivation	CSIR-NEIST on 23.12.2023	CSIR
2	Training on mushroom cultivation	25 members Byapin SHG	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST Branch on 10.05.2023	In House Project
3	Training on mushroom cultivation and soil testing	41students Dept.of Agriculture, Himalayan University, Itanagar	Hands-on training on mushroom cultivation and soil testing	CSIR-NEIST Branch Itanagar at NEIST Branch on 19.05.2023 to 20.05.2023	In House Project
4	training on mushroom cultivation, medicinal and aromatic plants.	4 students Dept of Agriculture, Rajiv Gandhi University, Arunachal Pradesh	Hands-on training on mushroom cultivation, medicinal and aromatic plants	CSIR-NEIST Branch Itanagar at NEIST Branch from 20-06-2023 to 20-07-2023	In house project (OLP-2068)
5	Training on mushroom cultivation	35 students Bunny's Fantasy World School	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST Branch on 11.08.2023	In house project (OLP-2068)
6	Training mushroom cultivation, oil extraction, vermicompost and medicinal and aromatic plants.	3 students Global group of institute, Amritsar, Punjab Technical University	Hands-on training on mushroom cultivation, vermicompost, medicinal and aromatic plants	CSIR-NEIST Branch Itanagar at NEIST Branch from 6-08-2023 to 7-09-2023	In House Project
7	Training on mushroom cultivation	10 students Himalayan University, Itanagar, Arunachal Pradesh.	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST Branch from 21.8.2023	In house project (OLP-2068)
8	Training on mushroom cultivation	8 students Himalayan University	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST Branch on 15.09.2023	In house project (OLP-2068)
9	Training on mushroom cultivation	2 Unemployed Educated youth of Itanagar locality	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST Branch on 21.09.2023	In house project (OLP-2068)
10	Training on mushroom cultivation and vermicompost.	30 participants, ArSRLM, Pakke Kaesang, Arunachal Pradesh	Hands-on training on mushroom cultivation and vermicompost	CSIR-NEIST Branch Itanagar on 12.10.2023	In-house project (OLP-2086)

11	Training on mushroom cultivation	45 participants, Weikhar Village, Tawang, Arunachal Pradesh	Hands-on training on mushroom	CSIR-NEIST Branch Itanagar at NEIST branch on 13.11.2023	In-house project (OLP-2086)
12	Training on mushroom cultivation and vermicompost.	24 B.sc forestry students	Hands-on training on mushroom cultivation and vermicompost	CSIR-NEIST Branch Itanagar at NEIST branch on 14.11.2023	In-house project (OLP-2086)
13	Training program on vermicompost	25 Avenue for Joy Foundation (AJF) in collaboration with Dept. of Agriculture, Papum pare, Yupia	Hands-on training on vermicompost	CSIR-NEIST Branch Itanagar on 17.12.2023	In-house project (OLP-2086)
14	Training on mushroom cultivation	13 students B.sc forestry from three institutes including Dolphin PG institute, BFIT Dehradun, Uttaranchal PG institute.	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST branch on 19.01,2024	In-house project (OLP-2086)
15	Training on mushroom cultivation	14 participants SHGs organized by Block Mission Management Unit (BMMU), Borum, Itanagar	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar at NEIST Branch on 24.01.2024	In-house project (OLP-2086)
16	Training on mushroom cultivation	60 “Yorko Ane SHG”, Menchukha	Hands-on training on mushroom cultivation	CSIR-NEIST Branch Itanagar on 29.02.2024	In-house project (OLP-2086)
17	Training on mushroom cultivation and medicinal plants	2 Students B.sc Forestry Swami Vivekananda Subharti University	Hands-on training on mushroom cultivation and medicinal plants	CSIR-NEIST Branch Itanagar at NEIST Branch from 04.03.2024 to 04.04.2024	In-house project (OLP-2086)
18	Training on cultivation of mushroom technology	30 students of Kaziranga University	Preparing Spawn Mushroom Cultivation	CSIR-NEIST on 22.03.2024	CSIR
Other Training Programmes					
1	16S-Amplicon Metagenomic Sequencing (AMS) data analysis using QIIME *in* “Workshop on Anaerobic Bacteriology and Metagenomic Analysis for the Identification of	20	Hands-on-training for microbiome analysis of 16S-amplicon metagenomic sequencing data using next-generation microbiome bioinformatics platform, Quantitative Insights	Institute of Bioresources and Sustainable Development (IBSD), Gangtok & Sikkim Manipal Institute of Medical Sciences (SMIMS), Gangtok, 5 - 8 June 2023	Inhouse

	Enteric Pathogens		Into Microbial Ecology (QIIME)		
2	Hands on Training on fermented food production (Bamboo shoot) *in* "5 days Hands on Training on "Production of Fermented Food and Beverages""	25	Hands-on training on the traditional preparation and fermentation of bamboo shoots	Institute of Advanced Study in Science and Technology (IASST), Guwahati, 10 - 14 July 2023	-----
3	LED bulb manufacturing	77	Imparted in-house training to the students	CSIR-NEIST,Jorat	In-house
4	Skill development training on AI-ML	36 (All India)	Three months of online training on AI-ML	ACDS Division March to June, 2023 & December, 2023 to February, 2024	CSIR, India
5	DST sponsored training on AI and ML and their applications in areas of natural sciences.	20 (North East and Jammu & Kashmir)	Three months of training on AI-ML	ACDS Division	DST
6	Summer internship training on mushroom cultivation, medicinal and aromatic plants and use of HPLC and GCMS	8 students Dept of Food Technology, Rajiv Gandhi University, Arunachal Pradesh.	Hands-on training on mushroom cultivation, medicinal and aromatic plants, HPLC, and GCMS applications	CSIR-NEIST Branch Itanagar at NEIST Branch from 2-06-2023 to 3-07-2023	In house project (OLP-2068)
7	Training on Vermicompost	30 students Department of Assamese, Khowang College, Dibrugarh, Assam	Hands-on training on vermicompost	CSIR-NEIST Branch Itanagar on 20.02.2024	In-house project (OLP-2086)
8	Summer Training	71 Nos. of students from various Govt/Pvt Institutions.	Hands-on training on R&D activities	CSIR-NEIST, Jorhat	

9	Winter Training	120 Nos. of students from various Govt/Pvt Institutions.	Hands-on training on R&D activities	CSIR-NEIST, Jorhat	

PROJECTS UNDERTAKEN (EXTERNALLY FUNDED)

Sl no	PI & Title	Project Code with Funding Agency	Contract Value (Rs in Lakh)
1	Dr Pravin G Ingole Separation of industrial gases by thin-film nanocomposite and mix matrix membranes.	GPP0414 SERB(DST), Min of Science & Technology	34.67
2	Dr Mohan Lal National Campaign on Ashwagandha-"A Health Promoter".	GPP0415 National Medicinal Plants Board(NMPB), Ministry of AYUSH, New Delhi	18.90
3	Dr C Chikkaputtaiah CRISPR/Cpf1 based dual-gene editing of OsEPB89 and OsCRK10 genes, and molecular genetic analysis for dual-stress tolerance to brown spot disease-drought in Indica rice (North East Indian) cultivar.	GPP0416 SERB(DST), Min of Science & Technology	44.10
4	Dr Prasenjit Manna Ethnomedicinal North-Eastern Spice (Allium spp.) against Respiratory Viral Infections: Efficacy, Bioactives, and Mechanistic Insight.	GPP0417 SERB(DST), Min of Science & Technology	59.43
5	Dr Chandan Tamuly Livelihood enhancement of the Monpa Tribe of Arunachal Pradesh through scientific and technological interventions on ethnic food items.	GPP0418 DST, Min of Science & Technology	62.93
6	Dr Natarajan Velmurugan Evaluation of metabolically stable bacterial endophytes for improving the medicinal plants and crop productivity in net house conditions in different altitudes of Arunachal Pradesh.	GPP0419 Govt of Arunachal Pradesh, Department Of Horticulture, Itanagar	30.23
7	Dr C Chikkaputtaiah To improve the efficiency of genome editing with CRISPR-Cas9 and to create novel sources of epigenetic variation in plants.	GPP0420 DBT, Min of Science & Technology	20.97
8	Dr Dipankar Neog Design and development of manufacturing processes for commercial production and implementation of farming mechanization for small farms and hilly terrains.	GPP0421 DST, Min of Science & Technology	127.01

9	Dr G Narahari Sastry Development of Clinical Data Repository and Analysis Platform for Disease Detection and Prognosis.	GPP0422 DBT, Min of Science & Technology	61.21
10	Dr Anil Kr Singh Delineating the role of transcriptional regulators in various stages of biofilm formation and its involvement in Mycobacterium abscessus drug resistance.	GPP0423 SERB(DST), Min of Science & Technology	53.75
11	Dr Pranjal Gogoi Bottom-up Process for the Synthesis of pi-Extended Carbon Sheets/N-or S-Doped Carbon Sheets for Photonics Applications.	GPP0424 SERB(DST), Min of Science & Technology	33.23
12	Dr Prasenjit Saikia Development of Co-gasification process of NER coal and agro residue biomass for generation of power and fuel.	GPP0425 DST, Min of Science & Technology	171.46
13	Dr Himangsu K Bora Hands on Training on Animal Disease Models, Basic Animal Experimentation Techniques, & Good Laboratory Practices (GLP)	GPP0426 Indian Council For Medical Research (ICMR)	83.03
14	Dr Romi Wahengbam Biomedical Genomics Advancement Program for North Eastern Researchers (BioGAP-NER)	GPP0427 Indian Council For Medical Research (ICMR)	99.87
15	Dr Rituraj Konwar Management and Scientific Intervention in Poultry Farm for Entrepreneurship Development.	SSP0037- Entrepreneurs and STINER beneficiaries	82.63

PROJECTS COMPLETED (EXTERNALLY FUNDED)

Sl no	PI & Title	Project Code with Funding Agency	Contract Value (Rs in Lakh)
1	Dr Jyoti Kumar Doley Preparation of performance standard of bamboo chipping unit.	CNP0484 Assam Bio Refinery Private Limited, Numaligarh	7.07
2	Dr G Narahari Sastry Drug-Cyclodextrin interaction study	CNP0485 Novartis Healthcare Private Limited, Hyderabad, Telangana	9.98
3	Dr Mantu Bhuyan STINER- Technology Facility Centre (STINER-TFC) at SASRD Nagaland University, Medziphema Campus, Medziphema, Nagaland	GPP0335 Min of Development of NE Region (MDoNER)	1000.00
4	Dr Mantu Bhuyan-STINER-Common Facility Centre at CSIR-NEIST, Jorhat, Assam	GPP0347 Min of Development of NE Region (MDoNER)	4000.00
5	Dr Binoy Kumar Saikia A comprehensive approach in understanding the acid mine drainage problem of Makum coalfield and its management	GPP0364 Min. of Earth Sciences, CGO Complex, Lodi Road, New Delhi-110 003.	45.64
6	Dr Natarajan Velmurugan Nutritional enrichment of agricultural wastes with essential fatty-acid producing Thraustochytrids as improved feed for aquaculture	GPP0369 DST, Min of Science & Technology	42.74
7	Dr Mohan Lal Extension and cultivation of aromatic and high value endangered medicinal plants through farmer participatory model for livelihood generation in Arunachal Pradesh	GPP0370 Govt of Arunachal Pradesh, Department Of Horticulture, Itanagar	100.00
8	Dr Madhulekha Gogoi Design and development of lanthanide-MOF using 2-D graphene like sheets as ligand for simultaneous photocatalysis and sensing application.	GPP0371 DST, Min of Science & Technology	27.38

9	Mr Dhanjit Das Design and Development of 500 kg capacity solar-biomass hybrid distillation unit with the mobile type distillation vassal and its field demonstration for entrepreneurship development.	GPP0376 DBT, Min of Science & Technology	74.74
10	Dr Archana Moni Das Bio-evaluation and identification of lead Molecules for Lung and Colon cancer from Selected Medicinal Plants.	GPP0385 Indian Council for Medical Research	19.48
11	Dr Pankaj Bharali Spatiotemporal dynamics of SARS-CoV-2 variants in wastewater systems in North East India through genomic surveillance and epidemiology for forecasting its spread and health outcomes	GPP0397 SERB(DST), Min of Science & Technology	42.39
12	Dr Manash Ranjan Das Carbonaceous Nanomaterials from Graphite Sources of Arunachal Pradesh for Electrochemical Energy Storage and Sensor Applications.	GPP0398 MIN of Mines, New Delhi	20.00

PROJECTS ONGOING (EXTERNALLY FUNDED)

Sl No	PI & Title	Project Code with Funding Agency	Contract Value (Rs in Lakh)
1	Dr Swapnali Hazarika Removal of Phenol from Sour/stripped water, It's Value addition and Recycling of Water.	CLP0289 Numaligarh Refinery Limited	126.56
2	Dr J Leon Raj Structural evaluation of construction quality of 400/220 Mariani substation, Assam	CNP0482 Power Grid Corporation	12.39
3	Dr Binoy Kr Saikia Institute of Repute (IoRs) for conducting audit of City Action Plan under National Clean Air Programme (NCAP)	CNP0486 Pollution Control Board Assam (PCBA)	0.38
4	Dr Binoy Kumar Saikia National Carbonaceous Aerosols Programme(NCAP) Working Group-III project	GPP0325 Min of Environment, Forest & Climate Change	106.08
5	Dr Mohan Lal Identification and Development of High Yielding Varieties of Kaempferia galanga: A High Value Endangered Medicinal Plant	GPP0365 National Medicinal Plants Board(NMPB), Ministry of AYUSH, New Delhi	33.93
6	Dr Swapnali Hazarika Polymers, Their Composites and Polymeric Membranes for Sustainable Development of Petroleum Industries.	GPP0373 Ministry of Chemicals and fertilizers	499.00
7	Dr Chandan Tamuly Empowerment of Apatani tribe of Arunachal Pradesh through value addition of ethnic food items.	GPP0374 DST, Min of Science & Technology	64.09
8	Dr Ratul Saikia Biofertilizer for Yield Enhancement in Normal to Water Stress Conditions for Entrepreneurship Development.	GPP0377 DBT, Min of Science & Technology	110.92
9	Dr Mohan Lal-Demonstration and Captive Cultivation of High Value Medicinal Plant Through Farmer Participatory Programme in Northeast India.	GPP0378-DBT, Min of Science & Technology	70.29

10	Dr Dipul Kalita Establishment of BioNEST bioincubator facility at CSIR-NEIST,Jorhat	GPP0379 BIRAC, DBT, New Delhi	255.70
11	Dr Hemant Sankar Dutta Development of microfluidic paper based ELISA method for rapid detection of Aflatoxin B1 in medicinal herbs and herbal Products.	GPP0380-ICMR	65.92
12	Dr Mohan Lal Establishment of Regional cum Facilitation centre (RCFC) for North Eastern Region at CSIR-NEIST, Jorhat, Assam.	GPP0381 National Medicinal Plants Board(NMPB), Ministry of AYUSH, New Delhi	419.79
13	Ms Neha Thakare Development of structurally modified biopolymer-based electrostatic nanofibers for biomedical applications.	GPP0382 DST, Min of Science & Technology	18.21
14	Dr Binoy Kr Saikia Development of Graphene Super-capacitors using Northeastern coal for power applications.	GPP0383 Ministry of Elecronics & Information Technology,	199.06
15	Dr Jatin Kalita Skill Vigyan Programme on Life sciences and Biotechnology in Arunachal Pradesh.	GPP0387 Arunachal Pradesh State Council for Science and Technology	133.50
16	Dr Jatin Kalita Establishment of Bioresource Centre for making S&T Intervention in Banana Value Chain for Socio Economic Development in Udalguri District, Assam.	GPP0388 DBT, Min of Science & Technology	69.21
17	Dr S Nagamani Centre of Excellence for Avanced Computation and Data Sciences:BIC at CSIR-NEIST, Assam	GPP0389 DBT, Min of Science & Technology	190.73
18	Dr Archanamoni Das Profiling of immunomodulatory potential and development of herbal product (as per AYUSH and FSSAI standard) based upon traditional madicines from Eastern and Western Himalaya with special reference to	GPP0392 DBT, Min of Science & Technology	55.64
19	Dr Jatin Kalita Exploration of potential bioactives from edible insects of North East Region of India with special reference to anti-	GPP0394 DBT, Min of Science & Technology	30.83

	diabetic, anti-inflammatory and antioxidant effects		
20	Dr Pankaj Bharali Varietal improvement and value addition of large cardamom (Ammomum sabulatum L.) and Turmeric (Curcuma sp.) of Arunachal Pradesh through Integrated Approach	GPP0395 Arunachal Pradesh State Council for Science & Technology (APSCS&T)	242.16
21	Dr Pranjal Gogoi-Identification and characterisation of small molecules to block PD-1/PD-L1 pathway in immunotherapy	GPP0396 DBT, Min of Science & Technology	40.13
22	Dr Jatin Kalita-Development of herbal fumigant formulation against stored grain insect pest	GPP0399 Defense Research Laboratory, Tezpur	59.81
23	Dr Sanjay Deori Agro-Industrial Alkali-Activated Composites for Pre-Fabricated Building Elemants and 3-D Volumetric Construction.	GPP0400 Ministry of Housing and Urban Affairs (MoHUA)	262.76
24	Dr Sangeeta Sharma Mapping of Kopili Fault and Slip Rate Estimation for Smart City Development in Northeast India	GPP0401 SERB(DST), Min of Science & Technology	30.32
25	Dr Ashutosh Thakur Development of Heteroatom-Doped Carbon Nanostructured Single Atom Catalysts and Their Applications as Sensors and Electrocatalysts	GPP0408 SERB(DST), Min of Science & Technology	30.28
26	Dr Atul Ashok More Cascade Enantioselective Ring Opening of Saturated Heterocycles: An Easy Access to Indomethacin, Euroticins, Agesamides, and their Analogs for Anti-Inflammatory and Cytotoxic Activity	GPP0409 SERB(DST), Min of Science & Technology	26.07
27	Dr Debasis Mohanty-Source localized modelling of central depth of anisotropy beneath the north-eastern Himalaya and tectonic implications	GPP0411 SERB(DST), Min of Science & Technology	6.60
28	Dr Swapnali Hazarika Membrane based process for treatment of waste water from Assam and Assam Arakam Basin, Jorhat Workcentre and Recycling of Water	GPP0412 ONGC, Jorhat	79.80

29	Dr Pankaj Bharali Genomic Surveillance program for SARS-CoV-2: Consortium of India and Sri Lanka.	GPP0413-CSIR-Institute of Genomics & Integrative Biology (IGIB)	50.00
30	Dr Pravin G Ingole Separation of industrial gases by thin-film nanocomposite and mix matrix membranes.	GPP0414 SERB(DST), Min of Science & Technology	34.67
31	Dr Mohan Lal National Campaign on Ashwagandha- "A Health Promoter".	GPP0415 National Medicinal Plants Board(NMPB), Ministry of AYUSH, New Delhi	18.90
32	Dr C Chikkaputtaiah CRISPR/Cpf1 based dual-gene editing of OsEPB89 and OsCRK10 genes, and molecular genetic analysis for dual-stress tolerance to brown spot disease-drought in Indica rice (North East Indian) cultivar.	GPP0416 SERB(DST), Min of Science & Technology	44.10
33	Dr Prasenjit Manna Ethnomedicinal North-Eastern Spice (Allium spp.) against Respiratory Viral Infections: Efficacy, Bioactives, and Mechanistic Insight.	GPP0417 SERB(DST), Min of Science & Technology	59.43
34	Dr Chandan Tamuly Livelihood enhancement of the Monpa Tribe of Arunachal Pradesh through scientific and technological interventions on ethnic food items.	GPP0418 DST, Min of Science & Technology	62.93
35	Dr Natarajan Velmurugan Evaluation of metabolically stable bacterial endophytes for improving the medicinal plants and crop productivity in net house conditions in different altitudes of Arunachal Pradesh.	GPP0419 Govt of Arunachal Pradesh, Department Of Horticulture, Itanagar	30.23
36	Dr C Chikkaputtaiah To improve the efficiency of genome editing with CRISPR-Cas9 and to create novel sources of epigenetic variation in plants.	GPP0420 DBT, Min of Science & Technology	20.97
37	Dr Dipankar Neog Design and development of manufacturing processes for commercial production and implementation of farming mechanization for small farms and hilly terrains.	GPP0421 DST, Min of Science & Technology	127.01

38	Dr G Narahari Sastry Development of Clinical Data Repository and Analysis Platform for Disease Detection and Prognosis.	GPP0422 DBT, Min of Science & Technology	61.21
39	Dr Anil Kr Singh Delineating the role of transcriptional regulators in various stages of biofilm formation and its involvement in Mycobacterium abscessus drug resistance.	GPP0423 SERB(DST), Min of Science & Technology	53.75
40	Dr Pranjal Gogoi Bottom-up Process for the Synthesis of pi-Extended Carbon Sheets/N-or S-Doped Carbon Sheets for Photonics Applications.	GPP0424 SERB(DST), Min of Science & Technology	33.23
41	Dr Prasenjit Saikia Development of Co-gasification process of NER coal and agro residue biomass for generation of power and fuel.	GPP0425 DST, Min of Science & Technology	171.46
42	Dr Himangsu K Bora Hands on Training on Animal Disease Models, Basic Animal Experimentation Techniques, & Good Laboratory Practices (GLP)	GPP0426 ICMR	83.03
43	Dr Romi Wahengbam Biomedical Genomics Advancement Program for North Eastern Researchers (BioGAP-NER)	GPP0427 ICMR	99.87
44	Dr Mohan Lal Development of CBD rich high yielding variety, agro technology standardization, herbal formulations and post harvest management of raw material of Cannabis sativa L	SSP0036 M/S Indica Nutraceuticals LLP, New Delhi	238.00
45	Dr Rituraj Konwar Management and Scientific Intervention in Poultry Farm for Entrepreneurship Development.	SSP0037 Entrepreneurs and STINER beneficiaries	82.63

TECHNOLOGY DEVELOPED

Lemongrass Jor Lab L-14

Lemongrass Jor Lab L-14 variety is very new, unique high yielding variety developed by CSIR-NEIST. LemongrassJor Lab L-14 has been registered at ICAR-NBPGR, New Delhi with registration No. INGR-18040. Through CSIR-NEIST's efforts, some land have been brought under Lemongrass cultivation in NE Region. To boost the cultivation and for the benefit of the farmers, several distillation units ranging between 200 to 600 kg capacity were installed at different places.

Lemongrass Jor Lab -14

TECHNOLOGIES RELEASED TO THE INDUSTRY

Sl.No	Technology Transfer Agreement	Party	Purpose/Technology
1	Technology Transfer Agreement	Shri Raju Tayeng Roing, Dist Dibang Valley, Arunachal Pradesh, Phn No: +91 9678787878	For technology transfer of Lemongrass variety, Jor Lab L-8
2	Technology Transfer Agreement	The Director Directorate of Cinchona and Other Medicinal Plants Mungpoo. Darjeeling Govt of West Bengal Pin: 734313	For technology transfer of Lemongrass variety, Jor Lab L-9 and Lemongrass variety, Jor Lab L-14
3	Technology Transfer Agreement	Dean, College of Horticulture and Forestry, Central Agricultural University, Pasighat, Arunachal Pradesh-791102,	For technology transfer of Lemongrass variety, Jor Lab L-9, Citronella variety, Jor Lab C-5 and patchouli Variety P-1

MoU/MoA AGREEMENTS SIGNED

Sl.No	Party	Purpose/Technology
1	State Institute of Rural Development (SIRD), Meghalaya Nongsder, Ri-Bhoi District, Meghalaya, PIN–793103;	For propagating Biofertilizer technology of CSIR-NEIST by establishing a Bioreactor (only) for Biofertilizer production, providing training/ demonstration, develop farmer clusters and create entrepreneurship in the Meghalaya state.
2	Nagaland University, Lumani, Nagaland	Academic research collaboration
3	M/s Chayi Trails Pvt Ltd, House No-7, Chandra Teron Path, Kahilipara, Narakasur, Guwahati, Kamrup(Metro), Assam-781019	Incubation Agreement for availing BioNEST bioincubator facilities of CSIR-NEIST, Jorhat
4	Mr Sayed Zahid Mustabin, S/o Syed Abu Arif MD. Musaddique Chaneki Path, Naharani, Dergaon, Golaghat, Assam,-785618	Incubation Agreement for availing BioNEST bioincubator facilities of CSIR-NEIST, Jorhat
5	Organic Krishi Sewa Gut (Self-Help Group), Vill & P.S. Ghilamara, Lakhimpur, Assam- 787053,	For propagating Biofertilizer technology of CSIR-NEIST by establishing a Bioreactor (only) for Biofertilizer production, providing training/ demonstration, develop farmer clusters and create entrepreneurship in the Assam state.
6	M/s Swasti Veda Private, Second floor, Office no. 214, Ravi Bhawan, Jaistamh Chowk, Raipur, Chhattisgarh, 492001 **LIMITED**	Collaboration between the Parties in the interest of producing quality planting material of medicinal plants and herbs. Exchange in information, translation of medicinal plants research outcomes to benefit the medicinal plant cultivators, gatherers and local communities in order to help in sustainable supply chain to AYUSH Industry as well as to increase the income of the farmers, healers, gatherers and Tribal communities.

8	State Institute of Rural Development and Panchayati Raj (SIRDPR), Karfectar, South Sikkim, Sikkim-737121	For propagating Biofertilizer technology of CSIR-NEIST by establishing a Bioreactor (only) for Biofertilizer production, providing training/ demonstration, develop farmer clusters and create entrepreneurship in the Sikkim state.
9	Numaligarh Refinery Ltd (NRL)	For setting up NRL-NEIST research & Development centre
10	Central Council for Research in Unani Medicine (CCRUM), under Ministry of Ayush, Govt of India (situated at 61-65, Institutional Area, Opp. D-Block, Janakpuri, New Delhi-110058	The purpose of this MOU is to foster collaboration between CCRUM and CSIR-NEIST and to provide mutually beneficial working opportunity to develop and validate the Unani formulation(s) with the view to help in solving challenges associated with production of genuine herbal based Unani drugs and related areas.

GLIMPSES OF MoU/MoA AGREEMENTS SIGNED

CSIR-NEIST, Jorhat signed a MoU agreement with State Institute of Rural Development (SIRD), Meghalaya establishing a Bioreactor (only) for Biofertilizer production, providing training/demonstration, develop farmer clusters and create entrepreneurship in the Meghalaya state.

CSIR-NEIST, Jorhat signed a MoU agreement with M/s Swasti Veda Pvt Ltd, Chhattisgarh for collaboration in the interest of producing quality planting material of medicinal plants and herbs.

CSIR-NEIST, Jorhat signed a MoU agreement with Numaligarh Refinery Ltd. (NRL) for establishment of research and development centre at CSIR-NEIST.

Dr V M Tiwari, the Director of CSIR-NEIST Jorhat and Dr N Zaheer Ahmed, DG, Central Council for Research in Unani Medicine (CCRUM), Min. of Ayush signed an MoU between CSIR-NEIST and CCRUM on 7 March, 2024 for fostering collaborative R&D activities of traditional Unani medicine.

PATENTS

GRANTED INDIA

1.	TITLE	A PROCESS FOR THE PREPARATION OF BLUE-FLUORESCENCE EMITTING CARBON DOTS (CDTS) FROM SUB-BITUMINOUS TERTIARY HIGH SULFUR INDIAN COALS
	PATENT NO	440720
	INVENTORS	BINOY KUMAR SAIKIA, TONKESWAR DAS, SONALI ROY, BARDWI NARZARY, HARI PRASANNA DEKA BORUAH, MANOBJYOTI BORDOLOI, JIUMONI LAHKAR, DIPANKAR NEOG, DANABOYINA RAMAIAH
	DATE OF GRANT	26-JUL-2023
2	TITLE	A SYNERGISTIC PHARMACEUTICAL COMPOSITION USEFUL FOR THE TREATMENT OF LUNG CANCER
	PATENT NO	442074
	INVENTORS	MANTU BHUYAN, PRANAB RAM BHATTACHARYYA, PRANAB KUMAR BARUAH, NABIN CHANDRA BARUA, PARUCHURI GANGADHAR RAO, SUSHMITA BHATTACHARYA, RAKESH KUNDU, PRIYAJIT CHATTERJEE, SOMA SEAL, SANDEEP MUKHERJEE, SUMAN DASGUPTA, SUDIPTA MOITRA, SHELLEY BHATTACHARYA, SAMIR BHATTACHARYA
	DATE OF GRANT	01-AUG-2023
3.	TITLE	MEMBRANE BASED PROCESS FOR SEPARATION AND PURIFICATION OF EDIBLE NATURAL DYES
	PATENT NO	442738
	INVENTORS	MEMBRANE BASED PROCESS FOR SEPARATION AND PURIFICATION OF EDIBLE NATURAL DYES
	DATE OF GRANT	03-AUG-2023
4.	TITLE	A PROCESS FOR THE PREPARATION OF FLEXIBLE LEATHER SUBSTITUTE FROM LEATHER INDUSTRY WASTE BLENDED WITH MICROBIAL TREATED JUTE FIBRE
	PATENT NO	21-DEC-2023
	INVENTORS	PALLAV SAIKIA, NIREN KUMAR DUTTA, TRIDIP GOSWAMI
	DATE OF GRANT	21-DEC-2023

5.	TITLE	A STOVE CUM CHARCOAL MAKING UNIT
	PATENT NO	487993
	INVENTORS	JAYANTA JYOTI BORA, DIPANKAR NEOG, SUBODH CHANDRA KALITA, AJOY BORKOTOKY
	DATE OF GRANT	22-DEC-2023
6.	TITLE	HIGH OIL ABSORBING MAT/PAD AND A PROCESS FOR THE PREPARATION THEREOF
	PATENT NO	491963
	INVENTORS	JAYANTA JYOTI BORA, PALLAV SAIKIA, TRIDIP GOSWAMI, DIPANKAR NEOG, DIPUL KALITA, ANITA DAS RAVIDRANATH, SUBODH CHANDRA KALITA, PINAKI SENGUPTA
	DATE OF GRANT	29-DEC-2023
7.	TITLE	AN ECO-FRIENDLY PROCESS FOR THE PREPARATION OF VANILLIN FROM IPOMEA CARNEA
	PATENT NO	501533
	INVENTORS	ARCHANA MONI DAS, MANASH PROTIM HAZARIKA, MONMI GOSWAMI
	DATE OF GRANT	20-JAN-2024

FILED IN INDIA

1.	TITLE	A FLUORESCENT MATERIAL FOR RATIOMETRIC AND GASEOUS PHASE SENSING OF VOC
	APPLICATION NO	202311038420
	INVENTORS	MADHULEKHA GOGOI, LAKSHI SAIKIA, G NARAHARI SASTRY
	FILLING DATE	02-JUN-2023
2.	TITLE	SYNERGISTIC COMPOSITION OF 2-AMINO BENZOFURAN DERIVATIVE WITH RIFAMPICIN TO POTENTIATE EFFICACY AGAINST MYCOBACTERIUM ABSCESSUS
	APPLICATION NO	202311045256

	INVENTORS	ANIL KUMAR SINGH, MOIRANGTHEM VEIGYABATI DEVI, RAM AWATAR MAURYA, SATHEESH BORRA, JYOTI LAKSHMI HATI BORUAH, LODSNA BORKOTOKY
	FILLING DATE	05-JUL-2023
3.	TITLE	FRUIT PEEL WASTES-BASED COMPOSITE AND A PROCESSES FOR ITS PREPERATION THEREOF
	APPLICATION NO	202311058900
	INVENTORS	NATARAJAN VELMURUGAN, DIGANTA KUMAR SAIKIA, CHANNKESHAVAIAH CHIKKAPUTTAIAH
	FILLING DATE	01-SEP-2023
4.	TITLE	A FLOW VELOCITY ENHANCEMENT DEVICE FOR ENERGY CONVERTER
	APPLICATION NO	202311069015
	INVENTORS	JYOTI KUMAR DOLEY, MONUJ KUMAR RAJUWAR
	FILLING DATE	12-OCT-2023
5.	TITLE	A PROCESS FOR THE SYNTHESIS OF DEHYDRODIEUGENOL FROM CLOVE OIL
	APPLICATION NO	202311081169
	INVENTORS	SAIKAT HALDAR, PRANJIT KUMAR BORA
	FILLING DATE	29-NOV-2023

FILED ABROAD

1.	TITLE	FRUIT PEEL WASTES-BASED COMPOSITE AND A PROCESSES FOR ITS PREPERATION THEREOF
	APPLICATION NO	18/504260
	INVENTORS	NATARAJAN VELMURUGAN, DIGANTA KUMAR SAIKIA, CHANNKESHAVAIAH CHIKKAPUTTAIAH
	FILLING DATE	08-NOV-2023

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1.	TITLE	A GRAPHICAL USER INTERFACE (GUI) PROGRAMME FOR PROCESSING AND ANALYSIS OF REGIONAL EARTHQUAKES-REQAPP
	DIARY NO	26132/2023-CO/SW
	AUTHOR	KVRH PRASAD, BIJIT KUMAR CHOUDHURY
	FILLING DATE	19-SEP-2023
2.	TITLE	A NOBEL ALGORITHM BASED GUI PROGRAMME TO IDENTIFY AND PREPARE REGIONAL EARTHQUAKES DATABASE : REQID
	DIARY NO	26131/2023-CO/SW
	AUTHOR	KVRH PRASAD, BIJIT KUMAR CHOUDHURY
	FILLING DATE	19-SEP-2023
3.	TITLE	A PYTHON BASED GUI PROGRAMME FOR GRAPHING AND MAPPING IN SEISMOLOGY-SEISMO GMP
	DIARY NO	7553/2024-CO/SW
	AUTHOR	KVRH PRASAD, BIJIT KUMAR CHOUDHURY
	FILLING DATE	05-MAR-2024
4.	TITLE	A GUI PROGRAMME THROUGH MACHINE LEARNING APPROACH TO IDENTIFY EARTHQUAKE SIGNALS FROM BROADBAND SEISMOLOGICAL DATA (ML_EQSID)
	DIARY NO	7872/2024-CO/SW
	AUTHOR	KVRH PRASAD, BIJIT KUMAR CHOUDHURY
	FILLING DATE	05-MAR-2024

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1	Dr V M Tiwari	Director
2	Dr Saurabh Barua	Chief Scientist
3	Dr Rajib Lochan Goswamee	Chief Scientist
4	Er Jayanta Jyoti Bora	Chief Scientist
5	Dr Huidrom Birkumar Singh	Chief Scientist
6	Dr Sawlang Borsingh Wann	Chief Scientist
7	Dr Ratul Saikia	Senior Principal Scientist
8	Dr Sanjay Deori	Senior Principal Scientist
9	Dr Swapnali Hazarika	Senior Principal Scientist
10	Dr Mantu Bhuyan	Senior Principal Scientist
11	Dr Siddhartha Proteem Saikia	Senior Principal Scientist
12	Dr Dipankar Neog	Senior Principal Scientist
13	Dr Chandan Tamuly	Senior Principal Scientist
14	Dr Anil Kumar Singh	Principal Scientist
15	Dr Archana Moni Das	Principal Scientist
16	Dr Binoy Kumar Saikia	Principal Scientist
17	Dr C Chikkaputtaiah	Principal Scientist
18	Mr Debabrata Das	Principal Scientist
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30	Dr Lakshi Saikia	Principal Scientist
31	Dr Manash Ranjan Das	Principal Scientist
32	Dr Manoj Kumar Phukan	Principal Scientist
33	Dr Mohan Lal	Principal Scientist
34	Dr Pallab Pahari	Principal Scientist
35	Mr Partha Paul	Principal Scientist
36	Dr Prakash Jyoti Saikia	Principal Scientist
37	Dr Pranjal Gogoi	Principal Scientist
38	Dr Prasenjit Manna	Principal Scientist
39	Dr Prasenjit Saikia	Principal Scientist
40	Mr Rajib Deka	Principal Scientist
41	Dr Ravindra Kumar Rawal	Principal Scientist
42	Dr Rituraj Konwar	Principal Scientist
43	Dr Sanjib Gogoi	Principal Scientist
44	Dr Subrata Ghosh	Principal Scientist
45	Mr Tapas Das	Principal Scientist
46	Dr Ajit Singh	Senior Scientist
47	Dr Arup Roy	Senior Scientist
48	Dr Ashutosh Namdeo	Senior Scientist
49	Dr Bijit Kumar Choudhury	Senior Scientist
50	Mr Bipul Das	Senior Scientist
51	Dr Biswajit Saha	Senior Scientist
52	Mr Dhanjit Das	Senior Scientist
53	Dr J Leon Raj	Senior Scientist
54	Dr Jayashree Chiring Phukon	Senior Scientist

55	Dr Jyoti Kumar Doley	Senior Scientist
56	Dr Natarajan Velmurugan	Senior Scientist
57	Dr P Yuvaraj	Senior Scientist
58	Mr Partha Majumder	Senior Scientist
59	Dr Pravin Ganeshrao Ingole	Senior Scientist
60	Dr Ram Awatar Maurya	Senior Scientist
61	Mr Ravi Kumar Lingam	Senior Scientist
62	Dr Rinku Baishya	Senior Scientist
63	Dr Saikat Haldar	Senior Scientist
64	Dr Sangeeta Sharma	Senior Scientist
65	Dr Santanu Baruah	Senior Scientist
66	Dr Ashutosh Thakur	Scientist
67	Dr Atul Ashok More	Scientist
68	Dr Biswajit Gogoi	Scientist
69	Dr Chinmoy Rajkonwar	Scientist
70	Dr Debasis Mohanty	Scientist
71	Dr Hemant Sankar Dutta	Scientist
72	Dr Hridoy Jyoti Mahanta	Scientist
73	Mr Jitendra Singh Verma	Scientist
74	Dr Pankaj Bharali	Scientist
75	Dr Prachurjya Dutta	Scientist
76	Dr Robinson Timung	Scientist
77	Dr Romi Wahengbam	Scientist
78	Dr Sachin Rameshrao Geed	Scientist
79	Dr Sandeep Kumar Dey	Scientist
80	Dr Selvaraman Nagamani	Scientist
81	Dr Sridhar Shivakumar Hiremath	Scientist
82	Dr Srinivas Ambala	Scientist
83	Dr Sumit Singh	Scientist
84	Dr Tonkeswar Das	Scientist
85	Dr Tridip Phukan	Scientist
86	Dr Twahira Begum	Scientist
87	Dr Udita Basu	Scientist
88	Dr Uma Maheswari R	Scientist
89	Dr Budhen Chandra Baruah	Principal Technical Officer
90	Dr Thaneswar Borah	Principal Technical Officer
91	Mr Vaskar Rajkhowa	Principal Technical Officer
92	Mrs Archana Yadav	Senior Technical Officer II
93	Mrs Jonali Saikia Chowdhury	Senior Technical Officer II
94	Mr Madhujya Saikia	Senior Technical Officer II
95	Mr Makhan Borah	Senior Technical Officer II
96	Mr Manuj Kumar Das	Senior Technical Officer II
97	Mr Pradip Dutta	Senior Technical Officer II
98	Mr Sanjoy Kumar Chanda	Senior Technical Officer II
99	Dr Kalpataru Dutta Mudoi	Senior Technical Officer III
100	Mr Amar Jyoti Gogoi	Senior Technical Officer I
101	Dr Ankana Phukan	Senior Technical Officer I
102	Dr Antara Sharma	Senior Technical Officer I
103	Mr Ashok Kalita	Senior Technical Officer I
104	Mr Dhiman Bhattacharjee	Senior Technical Officer I
105	Dr Dipanka Dutta	Senior Technical Officer I
106	Mr Himangshu Lekhok	Senior Technical Officer I
107	Dr Jyoti Lakshmi Hati Boruah	Senior Technical Officer I
108	Mrs Moushumi Hazarika	Senior Technical Officer I
109	Mrs N Abem Devi	Senior Technical Officer I

110	Mr Nibir Pran Borah	Senior Technical Officer I
111	Mr Rajib Das	Senior Technical Officer I
112	Mr Sausthov Maunash Bhattacharyya	Senior Technical Officer I
113	Mr Somananda Thokchom	Senior Technical Officer I
114	Mr Tobiul Hussain Ahmed	Senior Technical Officer I
115	Mrs Anamika Bora	Senior Technical Officer I
116	Mrs Dipa Rajnongshi Kachari	Technical Officer
117	Mr Gaurav Kumar Rastogi	Technical Officer
118	Mrs Kongkona Gogoi	Technical Officer
119	Mr Mukesh Kumar Agarwal	Technical Officer
120	Mrs Palakshi Bordoloi	Technical Officer
121	Mr Ramesh Chand Bohra	Technical Officer
122	Mr Rishi Raj Phukan	Technical Officer
123	Mr Abhishek Borborah	Technical Officer
124	Mr Alok Kumar	Technical Assistant
125	Dr Amit Kumar	Technical Assistant
126	Ms Anita Kachari	Technical Assistant
127	Mr Ankur Dip Boruah	Technical Assistant
128	Ms Babli Borah	Technical Assistant
129	Mr Bhargab Das	Technical Assistant
130	Mr Hrishikesh Sarmah	Technical Assistant
131	Mr Koushik Dutta	Technical Assistant
132	Mrs Lisa Moni Kalita	Technical Assistant
133	Dr Monti Gogoi	Technical Assistant
134	Mr Navajyoti Tamuly	Technical Assistant
135	Mr Nayan Jyoti Borah	Technical Assistant
136	Mr Preetom Kishore Nath	Technical Assistant
137	Ms Priyanka Kakoti	Technical Assistant
138	Mr Rajiv Goswami	Technical Assistant
139	Mr Ravi Kumar Sahu	Technical Assistant
140	Mr Sandeep Kalita	Technical Assistant
141	Mr Shreeram Pandit	Technical Assistant
142	Dr Timangshu Chetia	Technical Assistant
143	Mr Vaikundamani S	Technical Assistant
144	Mr Vikaskumar Gond	Technical Assistant
145	Mr Rama Shankar Sharma	Controller Of Finance And Accounts
146	Mr Laljasei Misao	Stores And Purchase Officer
147	Mr Praveer M Verma	Stores And Purchase Officer
148	Mr Prasoon Kumar	Administrative Officer
149	Mr Abhay Sakhare	Finance And Accounts Officer
150	Mr Ajay Kumar	Section Officer
151	Mr B Mahriili Osanah	Section Officer
152	Mr Ishwar Nath Jha	Section Officer
153	Mrs Radhika Chetri	Receptionist
154	Mr Ajay Kumar	Hindi Officer
155	Mr Ajit Chandra Dutta	Assistant Section Officer
156	Mr Kunja Behari Rabha	Assistant Section Officer
157	Mr Probin Kumar Phukan	Assistant Section Officer
158	Mr Raju Kumar	Assistant Section Officer

159	Mr Bijoy Sharma	Senior Secretariat Assistant
160	Dr Debojit Kumar Sarmah	Senior Secretariat Assistant
161	Mrs Minakshi Das	Senior Secretariat Assistant
162	Mr Pranjal Pratim Gogoi	Senior Secretariat Assistant
163	Mr Pranjal Sharma	Senior Secretariat Assistant
164	Mr Pritom Bordoloi	Senior Secretariat Assistant
165	Mr Ratul Saikia	Senior Secretariat Assistant
166	Mrs Rinku Bora	Senior Secretariat Assistant
167	Mr Uday Kant Trivedi	Senior Secretariat Assistant
168	Mr Hiren Brahma	Senior Stenographer
169	Mr Prodip Bordoloi	Driver
170	Mr Sapam B Singh	Driver
171	Mr Hemanta Sonowal	Driver
172	Mr Poresh Bora	Driver
173	Mr Rupeswar Chetia	Driver
174	Mr Rajen Borchetia	Group-C (Mts)
175	Mr Rajat Saikia	Group- C (Mts)
176	Mr Lilaram Gondhia	Group- C (Mts)
177	Mr Goutom Koch	Group- C (Mts)
178	Mr Himanjal Bordoloi	Group- C (Mts)
179	Mr Kh Ibochou Singh	Group- C (Mts)
180	Mr Kamal Bahadur Pun	Group- C (Mts)
181	Mrs Kobita Saikia	Group- C (Mts)
182	Ms M. Anamika Chanu	Group- C (Mts)
183	Mr Suresh Rana	Group- C (Mts)
184	Mr Puneswar Borah	Group- C (Mts)
185	Mrs Anjali Hatibaruah	Group- C (Mts)
186	Mr Bipul Chandra Boruah	Group- C (Mts)
187	Mr Dilip Saikia	Group- C (Mts)
188	Mr Krishna Kanta Borah	Group- C (Mts)
189	Mr Krishna Prasad Sharma	Group- C (Mts)
190	Mr Lenti Ao	Group- C (Mts)
191	Mr Naba Kumar Dutta	Group- C (Mts)
192	Mr Tame Rajen	Group- C (Mts)
193	Mr Prodip Hazarika	Senior Technician I
194	Mr Chiranjeet Bora	Senior Technician II
195	Mr Hari Chandra Dutta	Senior Technician II
196	Mr Prodip Hazarika	Senior Technician II
197	Mr Suchen Chandra Das	Senior Technician II
198	Mr Chandan Saikia	Technician I
199	Mrs Archana Changmai	Technician II
200	Mr Chandan Boruah	Technician II
201	Mrs Cingsianniang Buansing	Technician II
202	Dr Dibyajyoti Ozah	Technician II
203	Mr Jaganath Saikia	Technician II
204	Mr Jayanta Madhab Boruah	Technician II
205	Mr Jintu Bora	Technician II

206	Mr Jogot Bora	Technician II
207	Mr Lachit Phukan	Technician II
208	Mr Lalit Chutia	Technician II
209	Mr Madhab Chandra Borah	Technician II
210	Mr Manash Hazarika	Technician II
211	Mr Manash Jyoti Borah	Technician II
212	Dr Paran Jyoti Kalita	Technician II
213	Mr Pranjal Handique	Technician II
214	Mr Prasad Hazarika	Technician II
215	Mr Priyam Jyoti Bora	Technician II
216	Mrs Puspa Kumari Das	Technician II
217	Mrs Rinki Kalwar	Technician II
218	Mrs Rumi Borah	Technician II
219	Mr Alok Borah	Technician I
220	Mr Bipul Saikia	Lab Assistant
221	Mr Debajit Sarmah	Lab Assistant
222	Mr Robin Baruah	Lab Assistant
223	Mr Rajit Chandra Gogoi	Lab Attendent I
224	Mr Raju Gogoi	Lab Attendent I
225	Mr Ananda Saikia	Lab Attendent II
226	Mr Arup Kumar Neog	Lab Attendent II
227	Mr Atul Borah	Lab Attendent II
228	Mr Atul Chandra Dutta	Lab Attendent II
229	Mr Bipin Chandra Dutta	Lab Attendent II
230	Mr Dimbeswar Dutta	Lab Attendent II
231	Mr Laba Bora	Lab Attendent II
232	Mr Mantu Sarmah	Lab Attendent II
233	Mr Prasanta Nath	Lab Attendent II
234	Mr Prodip Hazarika	Lab Attendent Ii
235	Mr Rajen Chandra Dutta	Lab Attendent Ii
236	Mr Ram Bahadur Thapa	Lab Attendent Ii
237	Mr Rohit Chandra Borah	Lab Attendent Ii
238	Mr Boloram Gayan	Lab Attendent Ii
239	Mr Rameswar Das	Lab Attendent Ii

RETIRED STAFF

SL NO	NAME	DESIGNATION	DATE OF RETIREMENT
1	Mr Bipul Saikia	Group-C (MTS)	30.04.2023
2	Mr Pobon Chandra Saikia	Technician 1	31.07.2023
3	Mr Hari Chandra Dutta	Sr Technician 2	31.09.2023
4	Laba Bora	Lab Attendant 2	31.10.2023
5	Late Prodip Dutta	Chief Scientist	18.11.2023
6	Mr Rohit Chandra Boraa	Lab Assistant	31.12.2023
7	Mr Chandan Saikia	Technician 1	31.12.2023
8	Late Suchen Chandra Das	Sr Technician 2	02.01.2024
9	Mr Rajen Chandra Dutta	Lab Assistant	31.01.2024
10	Mr Bipul Chandra Baruah	Group-C (MTS)	31.03.2024
11	Mr Krishna Kanta Borah	Group-C (MTS)	31.03.2024