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.

R&D PERFORMANCE: 2021-2022

Knowledge Generation

Papers published	141
International peer reviewed Journals	111
National peer reviewed Journals	06
Non peer reviewed Journals	24
Proceedings	02
Book Chapters	07
Average IF	4.337
Highest IF	16.744

Technological Output

Technologies released to industry	03

Extramural & Human Resource Development

Sr Research Fellows	31
Jr Research Fellows	37
DST Inspire Faculty	01
DST Ramanujan Fellow	01
DST-NPDF	02
Women Scientist	01
DBT-RA	02
CSIR-RA	02
Project Fellows	187

Patents

Granted in India	02
Filed in India	03

R & D ACTIVITIES

ADVANCED COMPUTATION & DATA SCIENCES DIVISION

The Division was created by the institute and formally inaugurated 17 March 2019.The core function of the division is to facilitate other R&D Divisions viz. Geosciences, Chemical Sciences, Materials Sciences, Biological Sciences and Engineering Sciences to perform big data analysis by adopting contemporary scientific and technological advances. The division has undertaken the path of documentation, digitization, and deposition of data in all areas of natural sciences and subject these data for Machine Learning and Artificial Intelligence applications. One of the prime objectives of the division is development of open source drug discovery software known as molecular property diagnostic suite (MPDS).

Mandate:

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 Internet of Things (IoT).

Ongoing Projects

I. In-house, Grant in aid & Consultancy Projects

Project Title: **Designing Advanced Functional Materials for Better Performingphotovoltaic Devices through In-Silico Study**
Project No: **GPP-0360**
Funding Agency: Nanomission, DST, New Delhi, Govt. of India
PI & Members: Dr Supriya Saha (PI)
Objectives:

- Exploit the size-, shape- and composition dependent optoelectronic properties of nanostructured materials based on organic-inorganic nanocomposites, perovskite materials, single walled carbon nanotube SWCNT, fullerene, graphene nanoribbions etc.to design computationally the latest generation photovoltaic devices with higher efficiency.
- Besides single layered solar cell, multilayered tandem solar cell will also be module.
- Static energy calculations will perform using self-consistent charge density functional tight binding SCC-DFTB method and electron transport dynamics will be investigated using Non-Equilibrium Green Function NEGF formalism, an extension of gDFTB method.

- Development of SCC-DFTB parameters for necessary elements will perform using automatic DFTB parameter toolkit ADPT based on particle swarm optimization PSO algorithm.

Project Title: **Advanced Hybrid Nanomaterials and their Photocatalytic Efficiency towards Solar Fuel Generation through CO_2 Reduction: A Quantum Chemical Exploration**

Project No: **GPP-0361**

Funding Agency: EMEQ, SERB-DST, New Delhi Govt. of India

PI & Members: Dr Supriya Saha (PI)

Objectives:

- Exploration of photocatalytic properties of composite nanomaterials, composed with inorganic-organic nanohybrids, semiconductor heterostructures and 2D nanomaterials, as a function of size, shape, and composition of the materials for CO_2 reduction and fuel production.
- Static energy calculations will be performed using density functional theory (DFT) implemented in VASP and for larger system self-consistent charge density functional tight binding (SCC-DFTB) method will be used as it can handle large number of atoms within reasonable computational time and cost and mimic the real scenario.
- Full potential energy surface (PES) will be drawn considering lowest energy barrier path for all involved reactions for CO2 reduction reaction on different catalytic surfaces.
- Calculation of turn over frequency (TOF).

Project Title: **Centre of Excellence for Advanced Computation and Data Sciences**

Project No: **GPP-389**

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

PI & Members: Dr G Narahari Sastry (Co-ordinator), Dr Selvaraman Nagamani (PI), Dr Ratul Saikia (Co-PI), Dr Hridoy Jyoti Mahanta (Co-PI), Mr Debabrata Das (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, modeling and informatics tools.
- Human resources development in molecular modelling and data sciences integrated with bioinformatics applications.

Salient Achievements:

- DBT has empowered the Advanced Computation and Data Sciences Division (ACDSD) at CSIR-NEIST to procure new infrastructure facilities to carry out research in

the area of molecular modeling, chemoinformatics, bioinformatics, computational chemistry, database development etc. We are living in the digital era where data is generated in all the fields. Bioinformatics is a branch of biology where the massive biological data are analysed using computational algorithms and software. There are plenty of online and offline software available, however, developing customised software is essential for analysing disease specific data. The development of customized computer aided drug design software has transformed the knowledge from using the software as a black box to developing its own scripts and indigenous software. Our group has developed the Molecular Property Diagnostic Suite (MPDS) which is a Galaxy-based customised drug discovery software for a specific disease. MPDS is an ideal mixture of various data, small molecular drug discovery tools and algorithms, and advanced ML tools. The idea of this software is to make a single platform where the users can access the data and perform computational drug discovery calculations. The MPDS is structured into a data library, data processing, data analysis and advanced modules. The MPDS portal can be accessed at http://mpds.neist.res.in. Currently our group is working on MPDS^{COVID19}. In addition we have developed an indigenous database on North-East India Medicinal plants to enhance knowledge on therapeutic indications of phytochemical to contribute in drug discovery and development the database can be accessed at https://neist.res.in/neimpdb/. In the past two years, the world has witnessed the outbreak of COVID-19. Drug repurposing is the novel method where already existing drugs will be used for other diseases. We applied a computational drug repurposing approach to identify drug molecules that can be repurposed against 24 different SARS-CoV2 protein targets. Further, protein-protein interactions have been explored to understand the mechanism of action at molecular level involved in various processes such as viral infections, lifestyle diseases, cancer etc. Moreover, machine learning is an emerging field in different sectors. In our group machine learning has been effectively applied and models are generated for the identification of antiviral compounds, M.tb cell wall permeable compounds and non-toxic compounds. In computational chemistry an attempt has been made to understand the nature of interactions between neutral, cationic and anionic guests with benzenoid hosts of varying cavity size. Additionally, we have examined the relative propensity of the first row transition metals in their pristine and ionic state to solvate or split the water molecule.

Project Title: **Drug Discovery Hackathon 2020 Training and Mentorship Program**
Project No: **GPP-390**
Funding Agency: AICTE, MHRD, New Delhi
PI & Members: Dr G Narahari Sastry (Co-ordinator), Mr Jiban Jyoti Mahanta (PI), Dr Selvaraman Nagamani (Co-PI), Dr Hridoy Jyoti Mahanta (Co-PI)
Objectives:

- To build the capacity of the researchers in computational drug discovery.
- To reduce perpetual dependency on the paid softwares used by drug discovery researchers.

- To cut across different disciplines and apply an interdisciplinary approach for research and training in drug discovery.
- To build and expand a talent pool of trained drug discovery researchers.

AGROTECHNOLOGY AND RURAL DEVELOPMENT DIVISION

The main objectives of the division is Exploration of the Plant Resources of North-East India and identification of potential Medicinal and Aromatic plants and Industrial value up for development of technology for mass multiplication of commercially prospective species and their conservation. The value addition of the germplasm through development of different product and dissemination of proven technologies to indigenous people, governmental organizations, entrepreneur for overall economic development is an important focus in the group.

Ongoing Projects

I. Mission Mode Projects

Project Title: **CSIR Aroma Mission**
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:

- Bring about 3500 ha of additional area under captive cultivation of aromatic cash crops particularly targeting rain-fed /degraded land in NE India
- Provide technical and infrastructural support for distillation and values-addition to farmers/growers and entrepreneurs for rural development in NE India
- Exploring international markets for brand 'CSIR Aroma' – essential oils produced under the mission and enabling effective buy-back mechanisms to assure remunerative prices to the farmers/growers
- Value-addition of essential oils and aroma ingredients for their integration in global trade and economy

Salient Achievements:

- Under the introduction of new crops, we have planted 1 ha of *Salvia sclarea* and 11 ha of *Kaempferia galanga*. Major crops like Patchouli, citronella, lemongrass were expanded in the area of 159.5 ha, 748 ha, 800 ha respectively. Further the turmeric and chamomile crops were popularized based on the specific agro-climates. These crops were planted in 2.5 ha and 1 ha area in NE India. The Quality Planting materials were generated at institutional farm as well as farmer's progressive farm. A total of 120 lakhs slip for lemongrass, 160 lakhs slip for citronella and 6 lakhs cutting for patchouli were generated. Under development of resource use efficient high-yielding varieties/genotypes, a total of five varieties were developed through selection or mutation breeding. Development of region-specific agrotechnologies is going on in different climatic conditions of NE India. After the successful completion of the trial period, the locations specific package of practice as well as the standardization of the cultivation practice would be completed. A total of nine (9) improved and efficient distillation technologies / units were deployed in different regions of NE in cluster basis. Twenty-one awareness and training programs were conducted.

Project Title: **CSIR-Immunity Mission**

Project No: **HCP-0035**

Work Package WP 4.2: Combination of regional teas for boosting immunomodulation

PI & Members: Dr Mantu Bhuyan (PI), Dr Himanshu Bora, Dr Rituraj Konwar, Dr Tridip Phukan, Dr Bipul Das, Dr Saikat Halder, Mr. Sanjoy K Chanda, Mr. Himangshu Lekhak

Objectives:

- Developing of immunoboosting tea from Assam tea.

Salient Achievements:

- One Lab Scale Tea Processing Machine was installed for production of different kinds of tea on regular basis required for immunity studies. Several tea varieties were screened and identified one promising tea variety that help to boost immunity, when prepared in the form of black tea. Protocol of water extraction from black tea, protocol of quantitative estimation of various compounds from tea through HPLC-DAD, protocol of estimation of L-theanine have been established. Chemical markers of black tea of the selected tea varieties have been quantified and L-theanine and other dominant phytochemical contents were documented.
- Selected tea variety was tested for *in-vitro* efficacy in Raw 264.7 cell line using cell viability assay, NO production assay and estimation of cytokine markers in order to assess their anti-inflammatory and immune-modulatory activities. The selected tea variety was found to be non-toxic to macrophage cells and found to reverse LPS induced NO production in macrophage cells. It was also observed that LPS induced TNF-α, IL-6 in Raw 264.7 cell line was significantly inhibited by the extract of selected variety.

Work Package WP 7.1: Digital Data Portal of Vegetables From India with Immune Boosting Capacity (Epidemiological and Scientific Evidence Based) - Ultimately a Monograph

Funding Agency: CSIR, New Delhi

PI & Members: Dr Dipanwita Banik (PI), Mr Debabrata Das, Dr Selvaraman Nagamani, Dr Romi Wahengbam

Objectives:

- Development of digital data portal of immunoboosting vegetables grown in India.

Salient Achievements:

- Documented vegetables of approximately 430 species under 110 family from North East India. Reviewed various scientific research papers and available data from authentic databases for the vegetables grown in India which were previously reported in traditional wisdom, with immunity promoting bioactive markers, pharmacological/ epidemiological evidences, and with immunomodulatory markers. The pharmacological evidences were compiled from *in-vitro*, *in-vivo* assays and clinical trials. Initially the portal was developed with 25 immunomodulatory vegetables in collaboration with CSIR-IHBT which is under progress.

Project Title: **CSIR-Floriculture Mission**

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 Dipanwita Banik, Dr Pankaj Bharali, Dr Kalpataru Dutta Mudoi, Mr Sanjay Chanda, Mr Himangshu Lekhok

Objectives:

- Development of new floral varieties.
- Expansion of areas under floricultural crops.
- Integration of Apiculture and Floriculture.
- National level registration and release of existing and new floral varieties.
- Establishing effective domestic and international market linkage.

Salient Achievements:

- For developing new varieties, the seven (7) selected germplasm of Chrysanthemum and eight (8) selected germplasm of Gladiolus were treated with chemical mutagen i.e. EMS (Ethyl methane sulfonate). Chrysanthemum seedlings were treated with five mutation doses (0.2, 0.4, 0.6, 0.8 and 1.0%) for 24 hours and Gladiolus corms were treated with ten mutation doses (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0%) for 24 hours respectively. The mutated seedlings and corms were planted in the field treatment wise and M_1progenies were generated. Quality planting materials of Rose, Chrysanthemum, Impatiens, Bougainvillea, Hibiscus, Sthalapadma, Marigold, Mussaenda etc. were generated through cutting and micro propagation of *Cymbidium aloifolium*(L.) Sw. was performed under the project for mass multiplication. A total of 14 wild plant species with ornamental potential were collected from Arunachal Pradesh, Meghalaya, Nagaland, Assam and planted at CSIR-NEIST, Botanical Garden to initiate acclimatization, domestication and multiplication. ***Begonia roxburghii*** (Miq.) A.DC.,***Begonia hatacoa*** Buch.-Ham. exD.Don, nearly 8 species of epiphytic orchids, 1 species of ***Hoya***were acclimatized along with ferns (***Asplenium*** sp., ***Davallia***sp., ***Lycopodium***sp. and ***Huperzia***sp.) with ornamental potential.
- A total of 40 farmer cluster were prepared covering 651 farmers from various places of North Eastern region with categories of floriculture cum apiculture, existing orchards cum apiculture and floriculture. Accordingly, flower seeds of Gladiolus and Marigold were distributed among the clusters aiming to increasing the area under floriculture crops. Five floriculture parks with an area of 6318m^2, 4690m^2, 2400m^2, 500m^2 and 1500m^2 have been established at CSIR-NEIST under the project for multiplication and raising floriculture plants
- Thirteen (13) trainings and awareness programme were conducted at various places of North eastern region. Citrus farmers clusters have been formed in Assam, Nagaland and Arunachal Pradesh and distributed bee boxes with bee colonies for increasing fruit production through bee pollination and producing specialized unifloral honey. Flowers seedlings are also provided to school gardens. An Interacting Meet of

Farmers & Scientists in virtual mode under CSIR-Floriculture Mission was organized on 12 June, 2021 where 122 participants were participated. A farmers meet with floriculture and apiculture farmers was organized at CSIR-NEIST on 15 March, 2022 in occasion of CSIR-NEIST Diamond Jubilee, where 80 farmers were participated. Honey bee boxes with bee colonies were distributed among them.

Kamarbandh

Silikhabari and

Haju, Kamrup, Assam

Udalguri,

Namsai, Arunachal

Tezu, Arunachal

Seed distribution of Floriculture crops among farmers of different places of North East.


Cultivation of Gladiolus, Chrysanthemum and Marigold flower in the CSIR-NEIST Campus.



In vitro propagation and hardening of *C. Aloifolium.*








Distribution of bee boxes and bee colonies to farmers of different places of Assam, Nagaland and Arunachal Pradesh.

II. Focused Basic Research (FBR) Projects

Project Title: **Conservation of Threatened Plants of India**
Project No: **MLP-0041**
Nodal Laboratory: CSIR-IHBT
Funding Agency: CSIR, New Delhi
PI & Members: Dr Dipanwita Banik (PI), Dr Siddhartha Proteem Saikia, Dr Mantu Bhuyan, Dr Mohan Lal, Dr Chandan Tamuly, Dr Natarajan Velmurugan, Dr H. B. Singh, Dr Budhan C. Baruah, Dr Kalpataru Dutta Mudoi
Objectives:

- Assessment of conservation status of 50 threatened plant species using IUCN criterion.
- Assessment of genetic variability in Critically Endangered (CR) species.
- Development of DNA bar-code for the threatened plant species.
- Development of technologies for mass-multiplication of threatened plant species and its introduction in natural habitats.
- Development of threatened plant species conservatory and gene bank at CSIR-NEIST.

Salient Achievements:

- The threat status of nearly 15 species were assessed by estimating the EOO and AOO using (GeoCAT). Ecological Niche Modellingwas done for ***Coptisteeta*** Wall., ***Nardostachys Jatamansi*** (D.Don) DC., ***Illicium Griffithii*** Hook.f. & Thomson, ***Nepenthes khasiana*** Hook.f. and ***Begonia aborensis*** Dunn by using Maximum Entropy Modelling.
- DNA barcoding was done for 5 species using *ITS2* and *rbcL* loci viz., ***Coptisteeta, Nepenthes khasiana, Aquilaria Malaccensis, Begonia Aborensis,*** and ***Illicium griffithii***.
- Axillary buds of ***Nepenthes khasiana*** Hook.f. wasused to raise plantlet using various concentrations of BAP and KIN. For root induction and elongation different combinations of IBA and NAA were used.

In-vitro morphogenetic development of ***Nepenthes khasiana*** using nodal explant after 27 weeks.

- *In-vitro* seed germination and multiple shoot elongation of ***Aquilaria Malaccensis*** Lam. was achieved for production of disease free explants. *In-vitro* raised shoots were further used as explants in MS media supplemented with different concentrations of BAP and KIN for multiple shoot induction.

To raise disease free explants *in-vitro* seed germination of *Aquilaria malaccensis* was recorded in MS media supplemented with growth regulators after 2 weeks of inoculation. Shoot elongation was recorded per week.

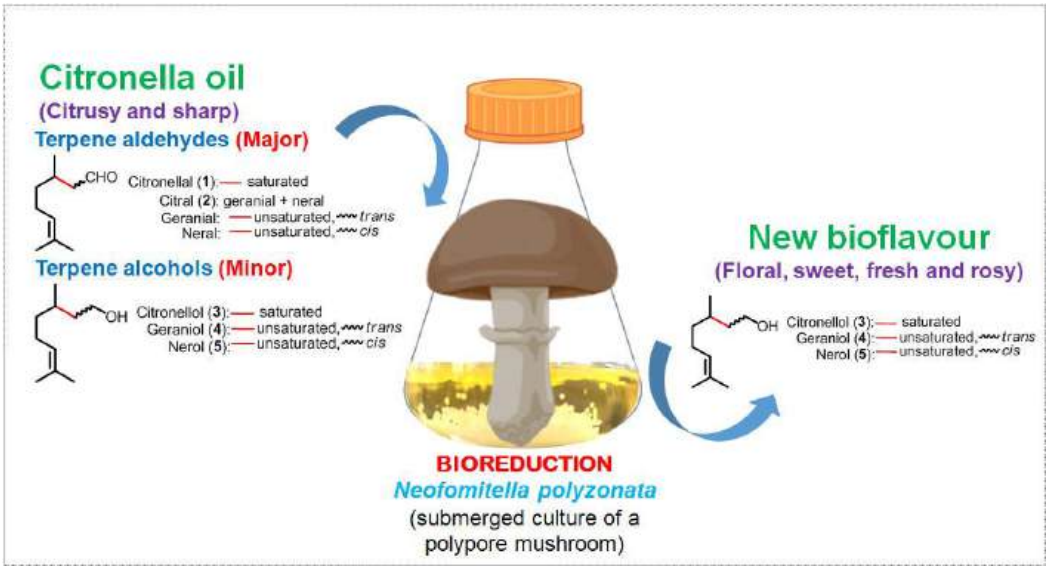
Project Title: **Edible Biocatalyst for the Sensory Alteration of Essential Oils**
Project No: **MLP-1017**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Saikat Haldar (PI), Dr Jitendra Singh Verma (Co-PI), Dr Siddhartha Proteem Saikia (Co-PI), Dr Mohan Lal (Co-PI)
Objectives:

- Identification of edible biocatalyst(s) capable of altering the sensory properties of the commercially and economically viable essential oil(s).
- Insight into the molecular basis of the biocatalyst mediated sensory alteration of the essential oil(s).
- Scale-up of the efficient biocatalytic process(es) up to 5 litre capacity (fermentation broth/biocatalyst).
- To explore the scope of lyophilisate (of the biocatalyst) as a ready to use storable catalyst.

Salient Achievements:

- A mushroom mediated reductive process was identified to alter the aroma of aldehyde-rich essential oils in the submerged culture. A polypore mushroom *viz.Neofomitellapolyzonata* converted linear terpene aldehydes(citronellal and citral) in citronella oil into their corresponding alcohols that changed the overallaroma of the oil and produced a new bioflavour. Also, *N. polyzonata*displayed a broad substrate range within aromatic and linear aldehydes. It efficiently converted up to 1.5 g/L of citronella oil (citrusy and sharp) into terpene alcohol-rich (citronellol andgeraniol) floral, sweet, fresh and rosy oily product (yield 87.2% *w/w*) in an optimized condition of 12 h. The unique aroma of the fermented product was characterized through detailed sensory analyses. The volatile chemo-profiling and odour activity values revealed citronellol and geraniol as the key odorants in the fermented product. The

chemometric analysis showed that the composition of final product was most similar to Damask or Turkish rose oils. According to the preference test for the water flavoured with biotransformed product (0.001-0.005% *v/v*), the final produce has the potential to be used as a rose-likebioflavour for the beverages.



III. In-house, Grant in aid & Consultancy Projects

Project Title: **Agrotechnology & Rural Development (Including Floriculture, Horticulture, Apiculture, Bamboo, Ginger etc.).**

Project No: **OLP-2034**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Siddhartha Proteem Saikia (PI), Dr Dipul Kalita (Co-PI)

Objectives:

- Maintenance of CSIR-NEIST Herbarium.
- Studies on Honey bee.
- Micropropagationof endangered medicinal plant.

Salient Achievements:

- **Digitization of Herbarium Specimens of CSIR-NEIST Herbarium:** A National Repository of Voucher specimens of Medicinal & Aromatic plants since 1961.Early collections housed since 1960 by Dr E.K. Janki Ammal (Approx.. 325).Approximately, 6000 deposited specimens of nearly 147 families were scanned. Data extracted from approximately 4000 herbarium labels of 1146 species from 110 families. Nomenclature was corrected and updated vide (www.theplantlist.org, www.ipni.org, https://powo.science.kew.org/) etc.
- **Studied rearing performance of *Apiscerana* honey bee in different floral resources**. Observations were madeon rearing performance of honey bee in different types of hive. For popularization of beekeeping, several talks, demonstrations have been given to farmers in different parts of Assam, Arunachal Pradesh and Nagaland.
- *Rauvolfiaserpentina* (L.) Benth. isan endangered medicinal plant known as Sarpagandha (the snake root) in Hindi, belongs to family Apocynaceae. The roots of

R. serpentina contain numerous alkaloids, which has been used since in olden days for the treatment of mental illness and insomnia. *In vitro* rooted plantlets of *R. Serpentine* were transferred to 1:1:1 soil: cowdung: vermicompost mixture for acclimatization. About 85% of the rooted plantlets were survived during acclimatization. In *A. malaccensis* optimum shoot multiplication was achieved in cytokinins and auxin enriched MS medium.

Acclimatization of *R. Serpentine.*

Shoot multiplication of *A. Malaccensis.*

Shoot multiplication of *Nepenthes khasiana.*

Project Title: **Characterization and Chemical Composition of High Yielding Varieties of Amada Haldi (*Curcuma zedoaria* Rose) and Kali Haldi (*Curcuma caesia* Roxb): Endangered High Value Medicinal Plants**

Project No: GPP-312

Funding Agency: Ministry of AYUSH, Govt. of India

PI & Members: Dr Mohan Lal (PI), Dr Siddhartha Proteem Saikia (Co-PI)

Objectives:

- Collection, evaluation, characterization and assessing the genetic diversity of different accessions of *Curcuma zedoaria* and Curcuma *caesia.*
- To study the heritability, genetic variability and genetic advancement for morphological, oil yield, rhizome and starch characters etc.
- To find out the direct and indirect effects of some quantitative characters on oil, starch and rhizome yield.
- Selection of high rhizome and high quality oil varieties of both curcuma species and make a germplasm repository of both the species.

Salient Achievements:

- Multilocation trial of advance lines of *Curcuma longa*, *Curcuma zedoaria* and *Curcuma caesia* has been carried out in five locations (Jorhat, Lakhamijan, Imphal,

Pasighat and Madang) in North-East India. Morphological and other data were taken from average of five locations.

Project Title: Development of disease resistant superior variety of *Bhut Jolokia* (*Capsicum chinense* Jacq.) through backcross breeding Varietal

Project No: GPP-333

Funding Agency: : G.B. Pant NIHESD, Almora

PI & Members: Dr Mohan Lal (PI)

Objectives:

- Morphological and chemical characterization of back crossing progenies of Bhut Jolokia genotypes and use of identified viral disease tolerant genotypes JOR-BJ-158 in back cross breeding programme.
- Evaluation and selection of high yielding and viral disease resistant cultivars from back crossing progenies and quality and high capsaicin content using UHPLC.

Salient Achievements:

- During the year, multilocation trial of advance lines of different Capsicum sp. was planted in four locations i.e., Jorhat (Assam), Madang (Assam), Pasighat (Arunachal Pradesh) and Lakhimpur (Assam) of North-East India. Morphological and other quality data were taken from average of four locations (*Kharif* 2021)

Capsicum species											
Pedigree	Botanical name	Plant height	Capsaicin content (%)	Disease resistant score against chilli leaf curl virus	Fruit length (cm)	Fruit Diameter (cm)	Fruit yield/plant (g)	Number of fruits/ plant	Fruit Surface	Fruit colour at young stage	Fruit colour at maturity
BJ-509 (Brown variant)	*C. chinense* Jacq.	60.63	3.51	7	6.87	6.65	492.25	89.50	Rough and dented	Dark Green	Brown
BJ-18 (Red variant with high capsaicin content)	*C. chinense* Jacq.	66.18	4.12	8	4.51	5.59	297.27	76.42	Rough and dented	Green	Deep red
BJ-521 (Disease resistant)	*C. chinense* Jacq.	57.90	3.21	9	4.11	4.09	321.30	88.03	Rough and dented	Dark Green	Deep red
Jorhat local (Check)	*C. chinense* Jacq.	59.21	1.79	4	4.03	3.51	144.67	45.93	Rough and dented	Green	Red
BJ-32 (Yellow variant)	*C. annum*	54.33	1.15	9	3.12	2.95	496.01	180	Smooth and elongated	Light green	Yellow
BJ-53 (Black variant)	*C. annum*	43.69	0.78	6	3.59	2.59	129.15	41	Smooth, small and round	Blackish green	Black

Project Title: **STINER-Technology Facility Centre (STINER-TFC) at SASRD Nagaland University, Medziphema Campus, Medziphema, Nagaland**

Project No: GPP-335

Funding Agency: Ministry of Development for North Eastern Region (MDoNER)/North Eastern Council, Govt. of India

PI & Members: Dr Mantu Bhuyan (PI), Dr Dipankar Neog (Co-PI), Dr Dipul Kalita (Co-PI), Dr Jatin Kalita (Co-PI), Dr Kalyani Medhi (Co-PI), Dr Bipul Das, Mr Tobiul Hussain Ahmed

Objectives:

- Establishment of STINER-Common Facility Center (STINER-CFC) at Medziphema, Nagaland.

Salient Achievements:

- The STINER-Spoke, Nagaland centre focused on bringing the best technologies available (internationally, nationally or locally) for holistic development of the region. In this regard some relevant technologies were identified and parked at the Centre, namely multi-purpose drier, Banana fiber extraction machine, Animal Feed block, Bio-fertilizer unit, Jacquard weaving units, Mushroom spawn production & cultivation unit, Vermicompost, Essential Oil Extraction unit etc. Simultaneously, the centre conducted trainings around the State to create awareness on entrepreneurship among the students, unemployed youth, house wives and other entrepreneur aspirants. A number of hands-on trainings were conducted at the Centre and also in different districts and schools. Besides the University students at School of Agricultural Sciences & Rural Development (SASRD), a total of four districts and five schools could be covered in the second year. Various entrepreneurs well off in their sector were approached to encourage the aspirants through these trainings. The Centre also participated in The International Fest organized by Nagaland Organic Konnect, where our Centre provided hands on trainings on marketing strategies to the Organic farmers during the event. Several online activities, such as webinars and virtual activity-based learning (VABL) were conducted on entrepreneurship and skill development focusing on all categories of participants, including men, women and students. A total number of five webinars, five virtual demonstrations and five practical hands-on training programmes were also conducted in small groups following all necessary protocols. The centre could also manage to visit one district and give awareness programme on entrepreneurship. Besides these activities, an online competition on waste management was organized for the students during the lockdown period to encourage them and to bring out the creative skills in them. Recently, incubation of three entrepreneurs started at the Centre with the Multi-purpose drier, through which they could start a small business during the lockdown period.

Project Title: **Distinctness Uniformity and Stability (DUS), Characterization of Lemongrass (*Cymbopogon Flexuosus* L.) Germplasm**

Project No: GPP-339

Funding Agency: Ministry of Agriculture, Govt of India
PI & Members: Dr Mohan Lal (PI),
Objectives:

- Collection and characterization of Lemongrass germaplsm.
- Development of DUS specific descriptors in *C. flexuosus*.

Salient Achievements:

- A total of 426 germplasms of lemongrass were collected and maintained at the CSIR-NEIST Experimental farm with regular maintenance of the field trial. During the year 2021-22, the evaluation and characterization of total 35 qualitative and quantitative representative characters were completed and report has been submitted.

Project Title: **Varietal Development for High Fruit Yield and Solasodine Content of *Solanum Khasianum*: A High Value Medicinal Plant of North-East India.**
Project No: GPP-343
Funding Agency: National Medicinal Plant Board, Ministry of AYUSH
PI & Members: Dr Mohan Lal (PI)
Objectives:

- Germplasm collection, evaluation and characterization of the genetic diversity of different accessions of *Solanum khasianum*.
- Study of heritability, genetic variability and genetic advancement for morphological, and agronomic traits of *S. khasianum.*
- Establishment of plant tissue culture and extraction of plant stem cells from suitable explants of *S. khasianum* followed by quantitative estimation of solasodine content using U-HPLC.
- Varietal selection of *S. khasianum* with high fruit size, fruit yield and high solasodine content and multi-location trials.

Salient Achievements:

- Multilocation trial of advance high solasodine content line Jor Lab SK-276 of *Solanum khasianum were* planted along with the check variety Jor Lab SK-3 during the period 2021-22. The morphological and all quality data were recorded and found that genotype Jor Lab SK-276 possess high solasodine with more than 1.70% while the check variety having 1.30%. All the genotypes gave the stable performance during the MLT at four different locations namely Jorhat (Assam), Runne (Arunachal Pradesh), Bokakhat (Assam) and Nongpoh (Meghalaya).

Project Title: **STINER Common Facility Centre at CSIR-NEIST, Jorhat (Hub)**
Project No: GPP-347
Funding Agency: Ministry of Development for North Eastern Region (MDoNER)/North Eastern Council, Govt of India
PI & Members: Dr Mantu Bhuyan (PI), Dr Dipankar Neog (Co-PI), Dr Dipul Kalita (Co-PI), Dr Jatin Kalita (Co-PI), Dr Kalyani Medhi (Co-PI), Dr Bipul Das, Mr Tobiul Hussain Ahmed
Objectives:

- Establish and Maintenance of the technologies set-up through STINER for the purpose of demonstration and incubation by the entrepreneurs .
- Establish and maintenance of the food testing facility set-up under STINER to make up it fully operational with self-sustainable business model.
- Providing necessary training.

Salient Achievements:

- **Infrastructure development:** Three numbers of STINER sheds with an area of 27x13 m^2 /shed has been constructed at CSIR-Premise (STINER Hub Incubation Centre). Further, a STINER corridor is established with renovation of 6 existing buildings. Already renovation of 5 buildings completed and another one is in progress, which will be completed soon. One big hall is renovated and established 'STINER Hub: Skill & Training Development Centre'. Three usable bamboo houses have been constructed with different treatment for durability study under the project and also for showcasing bamboo as useful construction materials. Several technologies have been installed at STINER Shed and Corridor. The food testing machineries are installed at one buildings of STINER Corridor.
- **Technologies for exhibition & incubation and equipments for CSIR-NEIST:** Several important and relevant technologies useful for farmers, artisans, entrepreneurs have been established at STINER Hub, Jorhatfor exhibition, demonstration & incubation and for food testing facility.Name of such major equipment and technologies, which are already installed and is ready for operation are Essential oil extraction plant, Paper Plate Making Machine, Paper Cup making machine, Lamination Machine, Handmade Paper Unit, Egg plate making unit, Egg Hatching Unit/Setter, Super Critical Extractor, Vermicomposting unit, Bio fertilizer Unit (Bioreactor plant), Banana Fibre extraction machine, Plastic produce designing facility, Weaving unit, Machining and wielding facility, Milk Processing & Packing Plant, Sealing, Filling and Packaging Facilities, Food testing facility etc. Already the process of incubation of technologies has been started and floated advertisement for expression of interest from SHGs, NGOs for incubation of the facilities during March, 2022.
- **Food testing facility:** A State of art Food Testing Laboratory is being established at CSIR-NEIST under the STINER project at CSIR-NEIST. The laboratory is developed by installing of sophisticated equipment to analyses the parameters for Nutritional Labelling and physical parameters. Presently testing services were provided to the farmers, entrepreneurs, NGOs, Industries and Govt. Institutions particularly in the North East Region of India. Currently, the parameters like protein, carbohydrate, fat, soluble dietary fibre, insoluble dietary fibre, total dietary fibre, micro nutrients (Fe, Ca, Na, K etc), moisture, water activity, texture profile analysis (firmness, hardness, chewiness, crispiness etc.) and colour analysis of food products are estimated. Testing of moisture, refractive index, saponification value, unsaponifiable matter, acid value, specific gravity in oil samples are also conducted. A few parameters of honey viz. moisture, specific gravity, acid value and ash content are estimated and the

scope will be expanded to other parameters of honey. Already more than 300 samples have been tested with the facility.

- Supercritical CO_2 Extraction System is procured under the project for extraction of high end plant products. Protocol of extraction of high value agar oil from infected agar tissue, clove oil from clove, capsaicin from green chilli and caffeine from black tea have been established
- **Skill development activities:** Several training and skill development programmes on vermicompost, banana fibtre extraction process, mushroom cultivation have been conducted under the project. Commercial production for some of the technologies situated in the hub has already been started. The technologies where trial commercial production is going on are jacquard weaving, paper based egg plate manufacturing, and manufacturing of container using plastic product development facility.

STINER Hub: Training & Skill Development Centre.
(Inaugurated by Secretary, DSIR & DG, CSIR on 18 October, 2021)

Low cost bee box was launched by Dr Shekhar C Mande, Hon'ble Director General of CSIR on 17 October, 2021.

Project Title: **Investigation of Oleochemicals of Under-Utilized Wild Nutmegs Native to NE India and Value Addition Thereof**

Project No: GPP-349

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

PI & Members: Dr. Dipanwita Banik (PI), Dr. Pallab Pahari, Dr Saikat Haldar

Objectives:

- Survey, identification and collection of various wild species of *Myristicaceae* distributed in NE India.
- To investigate the oil content (% w/w) in wild nutmegs of NE India.
- Molecular and chemosystematic study of wild nutmegs on NE India.

Salient Achievements:

- ***Horsfieldia amygdalina*** (Wall.) Warb.,***H. kingii***(Hook.f.) Warb.,***Endocomia macrocoma*** subsp.***prainii*** (King) W.J. de Wilde, ***Knema angustifolia*** (Roxb.) Warb.,***K. Linifolia*** (Roxb.) Warb, ***K. Tenuinervia*** W.J. de Wilde and ***K. Erratica*** (Hook.f. & Thomson) J. Sinclair were collected and identified from NE India. The essential and fixed oil yield were recorded and the preliminary identification of the marker compounds were done in GC-MS.Novel source of crude plant kernel wax was reported from ***Endocomi amacrocoma*** (Miq.) W. J. de Wilde subsp. ***Prainii*** (King) W. J. de Wilde (Barman *et al*., *2022, Waste and Biomass Valorization;1–12*).Trimyristin was isolated from the seeds of some species. The genomic DNA were extracted and amplified with standard DNA barcode primers viz., *rbcL*, *matK*, *psbA-trnH*, and *trnL-F* followed by Sanger sequencing at M/s Agrigenome Pvt Ltd., Bank It submission and receipt of > 100 Gen Bank accessions. The intra and inter genetic diversity of these species were studied to determine the efficiency of these barcode loci in species discrimination.

Project Title: **Establishment of BioNEST Bioincubator Facility at CSIR-NEIST, Jorhat**

Project No: GPP-379

Funding Agency: Department of Biotechnoloyg (DBT), Govt of India

PI & Members: Dr Siddhartha Proteem Saikia (PI), Dr. Rituraj Konwar and Dr. Jyoti Lakshmi Hatibaruah

Objectives:

- Generate ideas and promote innovation.
- Nurture start-ups and their sustainability.
- Develop strong business models.
- Facilitate strong industry-academia interaction for mentoring start ups.

Salient Achievements:

- **Inauguration of Bio-NEST Bioincubator Facility:** Dr Shekhar C Mande, Director General CSIR & Secretary DSIR inaugurated the "CSIR-NEIST BioNEST Bioincubator" in presence of Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat; Dr Mrutyunjay Suar, Director General R&D and CEO, KIIT-TBI, Bhubeneswar; Dr KRS Sambasiva Rao, Vice Chancellor, Mizoram University and Dr Arun Bandyopadhyay,

Director, CSIR-IICB, Kolkata and Dr Siddhartha P Saikia, CEO, CSIR-NEIST BioNEST Bioincubator on 18th October 2021. Dr Shekhar C Mande, Director General CSIR & Secretary DSIR also released the Booklet of the "CSIR-NEIST BioNEST Bioincubator" on the occasion.

BioNESTBioincubator Building Inaugurated byDrShekhar C Mande, Director General CSIR.

Releasing a booklet CSIR-NEIST Bio-NEST Bio-incubator by DG CSIR.

- **Awareness Programme for Young Entrepreneurs organized by CSIR-NEIST Bio-NEST Bioincubator:** CSIR-NEIST BioNEST Bioincubator organised "Awareness Programme for Young Entrepreneurs" to commemorate the CSIR-NEIST Diamond Jubilee Celebration and 75 years of India's Independence celebrations - "AzadiKaAmritMahotsav" on 15th March 2022. Dr G Narahari Sastry, Director, CSIR-NEIST, extended a warm welcome to all the participants and mentioned that the CSIR-NEIST BioNEST Bioincubator will provide the state-of-the-art facilities to help startups convert their ideas into commercial products. Dr Sastry also emphasised on providing superior incubation services and hand-holding to startups. Dr Mrityunjay Suar, CEO, KIIT-TBI, Bhubeneswar, emphasised on building the path for incubation. Dr Danish Tamuly, Director, NEATHUB, AAU, Jorhat spoke on the opportunities in agri-allied sector for youths in North East India and Er Akash Jyoti Gogoi, Founder of Bahuboli Eggs, North East Agro Products & Services, Jorhat and ASSAM GAURAV spoke on the Memoir of an Young Entrepreneur. CSIR-NEIST BioNEST Young Entrepreneur Dr Prachurchya Dutta spoke on Future Foods and Dr Madhulekha Gogoi spoke on Imaging Cancers.

Project Title: **Establishment of Regional Cum Facilitation Centre for North Eastern Region at CSIR-NEIST, Jorhat, Assam**

Project No: GPP-381

Funding Agency: National Medicinal Plant Board (NMPB), Ministry of AYUSH

PI & Members: Dr. Mohan Lal (PI)

Objectives:

- The Centre can act as one stop shop for all matters related to Medicinal Plants in the region concerned and would provide support to NMPB to fulfill its mandate and to act also as Facilitation Centre of NMPB. It would also undertake research activities pertain to the region concerned.
- To develop managerial and technical skill among the concerned stakeholders including growers, collectors and to provide strategic support by organizing trainings, workshops, seminars etc. and also to conduct monitoring and evaluation of the projects sanctioned by NMPB as and when assigned.
- Development of Agrotechnology of Medicinal Plants especially endangered and high demand species in the region with focus on organic cultivation and customization/ field trials of already developed Agro techniques.
- To provide inputs on conservation, sustainable cultivation, technology upgradation, training & research on Medicinal Plants and to engage Forest Departments and other concerned Departments of the States in those activities.
- To develop strategy for IEC (Information, Education and Communication) and implement IEC activities.

Salient Achievements:

- A total of 6.5 acre area was covered for the gene bank of rare and endangered species.
- Nursery preparation of high valued medicinal plants: *Andrographis paniculata*, *Acorus calamus*, *Clerodendrum colebrookianum*, *Piper longum*, *Saraca asoca, Tinospora cordifolia, Curcuma caesia*, *Homalomena aromatica*, *Kaempferia galanga* and *Kaempferia parviflora.*
- QPM of approx. 6.9 lakh plantlets were distribution in different states of NE-India.
- Monitoring and evaluation of NMPB funded projects throughout NE-India.

- RCFC-NER has also published Agrotechnology brochure of eight medicinal plants (*C. caesia*, *C. zeodaria*, *A. paniculata*, *V. jatamansi*, *S. asoca*, *T. cordifolia*, *K. galanga* and *K. Parviflora*.
- The multilocation trial (MLT) was conducted for the following medicinal plants in four locations (Bokakhat, Jorhat, Nongpoh, Runne): *Indigofera tinctoria*, *Sida cordifolia, Hibiscus sabdiriffa, Matricaria chamomilla and Abelmoschus manihot* during kharif 2021.
- The MLT data of the following medicinal plants are as follows:

Indigofera tinctoria								
Pedigree No.	Plant Height (cm)	Plant Spread (cm)	No. of branch / plant	Leaves weight /plant (g)	Indican (indoxyl β-D-glucoside) (ppm)	Days to 50% flowering	Days to maturity	Unique Trait
RRLJ-IG-292	106.3	176.78	9	204.78	760.33	55 – 65	95 – 105	Higher Indican percentages
Check variety Local Bangal	90.4	120.23	5	162.34	330.42	70 – 75 days	110 – 120	-

***Matricaria chamomilla* L.**								
Pedigree No.	Plant Height (cm)	No. of branch/ plant	No. of flowers/ plant	Essential oil (DWB) %	Oil yield kg /ha	Alpha bisabolol Oxide A	Days to maturity	Unique Trait
RRLJ-CH-58	79	13.33	126	0.71 %	9.23	32.54	125 – 130	Higher Essential oil %
CIM Prashant Check variety	65	8.56	76	0.34 %	5.58	23.59	128 – 138	-

Abelmoschus manihot								
Pedigree No.	Plant Height (cm)	No. of branch/ plant	Pod length (cm)	No. of pods/ plant	Days to 50% flowering	Days to maturity	Hyperoside content on DWB	Unique Trait
RRLJ-AM-83	210	6	6.5	59	45 – 58	90 – 110	0.83%	Higher plant height, large number of pod and high hyperoside content
Nagaon Local Check variety	70	4	4.2	29	88 – 95	125 – 140	0.41%	-

Sida cordifolia

Pedigree No.	Plant Height (cm)	No. of branch/ plant	Days to 50% flowering	Days to maturity	Ephedrine content in leaves	Unique Trait
RRLJ-SC-63	105	10	50 – 60 days	110 – 130 days	0.36%	Early flowering, large number of flower, high ephedrine content
Rajsathani Sidha Check	102	12	65 – 75 days	110 to 150 days	0.17%	

Hibiscus sabdiriffa							
Pedigree No.	Plant Height (cm)	No. of branch/ plant	Pod length (cm)	Days to 50% flowering	Days to maturity	Anthocyanin	Unique Trait
RRLJ-HS-104	270	5	1.5	70 – 85 days	125 – 140 days	1.32%	Early maturity, large number of pod, high anthocyanin content
Mahabali hibiscus	225	4	1.2	60 – 80 days	140 – 160 days	0.63%	-

BIOLOGICAL SCIENCES & TECHNOLOGY DIVISION

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

- Harnessing soil microbiota for environmental care and development of PGPR-based biofertilizer technology for sustainable agriculture
- CRISPR/Cas application for producing stress tolerant plant variety andmetabolic engineering of agricultural crop and medicinally important plants
- Development of new therapeutic and diagnostics for cancer and metabolic disease using resources of NE India
- S&T intervention on traditional fermented foods and edible insects of NE India
- Understanding bacterial drug resistance and development of microbial therapeutics
- Development of herbal formulation for immunity, infection and health

The division has a DBT-sponsored Bioinformatics Infrastructure Facility (BIF) and DBT sponsored Institutional Biotech Hub which provides training, workshops and caters to the need of researchers and students communities on genomics, proteomics, application to the development of drugs/ drug designing, anti-microbial agents, microbial taxonomic data analysis, mathematical modelling/data analysis, etc.

Ongoing Projects

I. Fast Track Translation (FTT) Projects

Project Title: **Genome Editing for Crop Improvement (GE-Crops)**
Project No: **MLP-0007**
Funding Agency: CSIR, New Delhi
PI & Members: Dr C Chikkaputtaiah (PI), Dr N Velmurugan (Co-PI), Mrs Archana Yadav
Objectives:

- To dual-stress response analysis (brown spot disease and drought) and precision editing of target genes through CRISPR/Cpf1 mediated active genetics for dual-stress tolerance in North East Indian rice cultivar.

Salient Achievements:

- RNA Seq transcriptome analysis revealed the differential expression of WRKY, NAC and ERF transcription factors in susceptible and resistant cultivars upon different time points of *Bipolarisoryzae* infestation (**Fig.**)

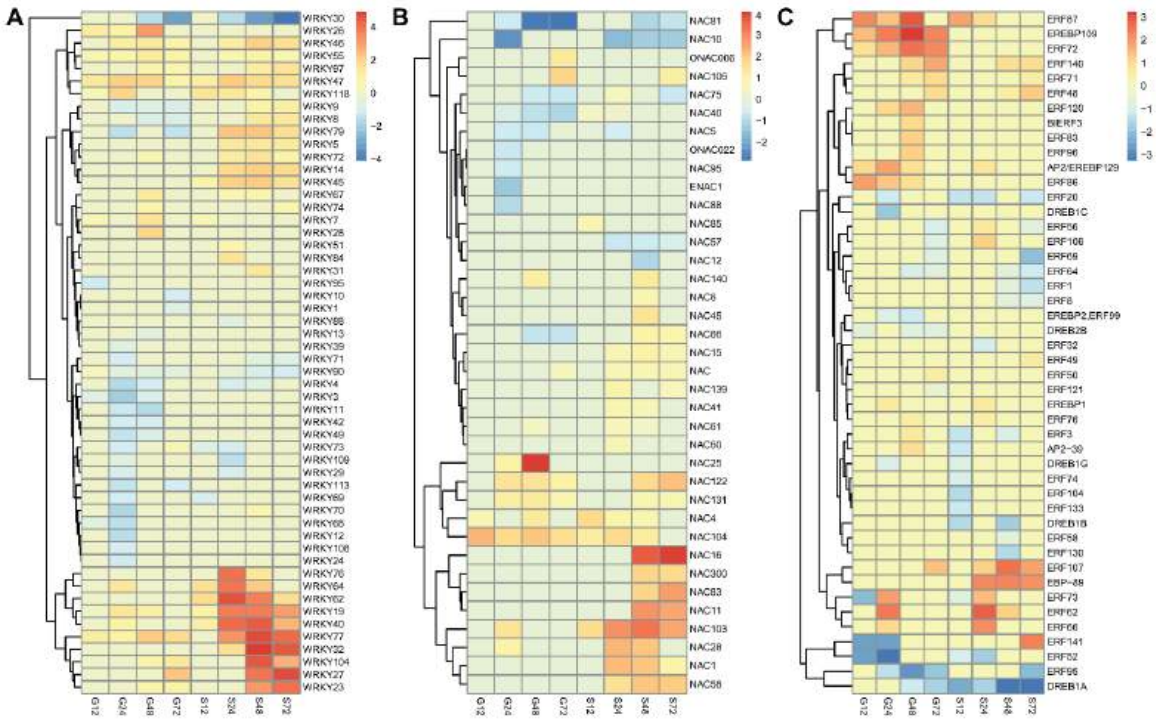
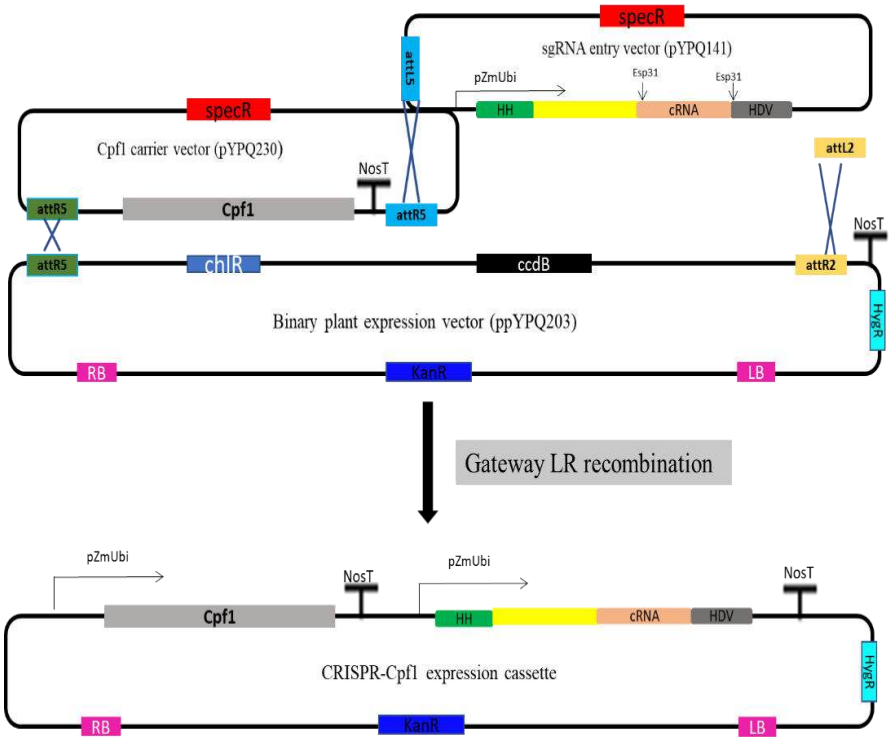


Fig. Expression pattern of WRKY, NAC, and ERF transcription factor family genes upon *B. oryzae* BO1 infection**.** Hierarchical clustered heat map of WRKY (A), NAC (B), and ERF (C) transcription factors. The color index of log2 fold expression is given at the top right. G-Gitesh, S-Shahsarang.

- ❖ CRISPR/Cpf1 genome editing construct of *OsEBP89* has been successfully generated using golden gate recombination system (**Fig.**)



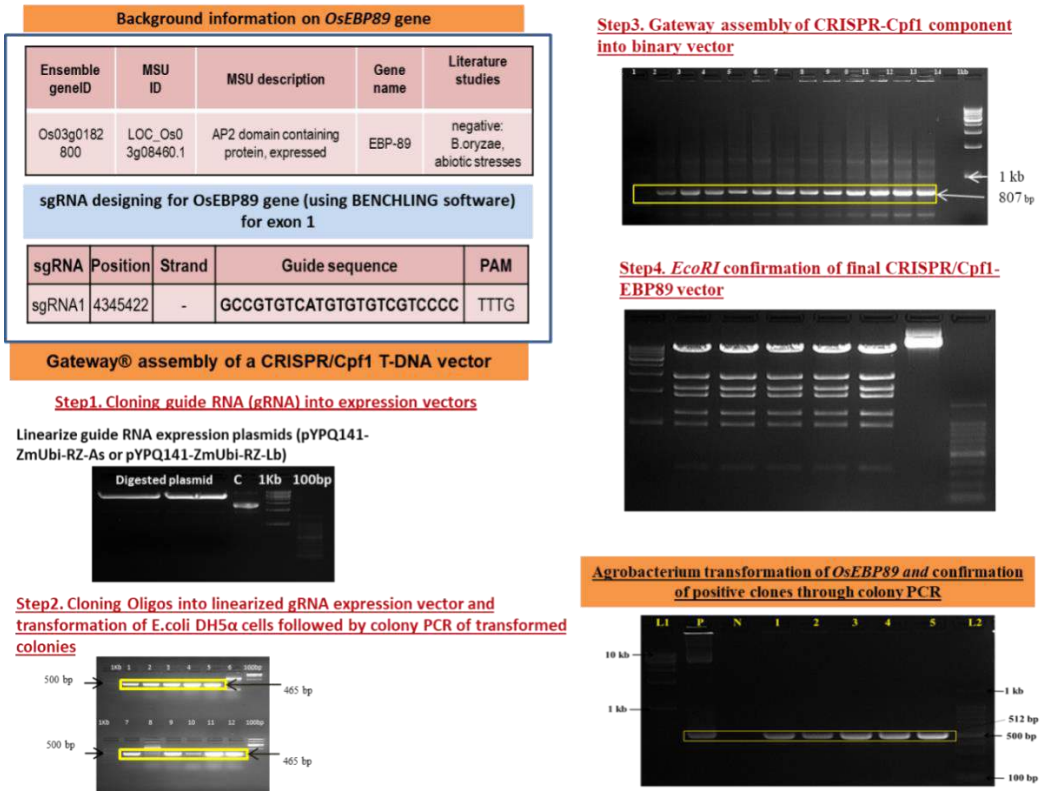


Fig. Integration of *OsEBP89* target gene into CRISPR/Cpf1 expression system through golden gate recombination system.

Project Title: Understanding the rhizobacteria-induced resistance in Bhut Jolokia (*Capsicum chinense* Jacq.) against fungal diseases

Project No: MLP-1016

Nodal Laboratory: CSIR-IHBT

Funding Agency: CSIR, New Delhi

PI & Members: Dr Ratul Saikia (PI), Dr Anil Kumar Singh (Co-PI) Dr Mantu Bhuyan (Co-PI), Dr Mohan Lal (Co-PI), Mrs Archana Yadav, Ms Priyanka Gogoi, Mr Priyankush P Bora, Ms Pooja Talukdar, Ms. Mainee Borah

Objectives:

- To elicit induction of systemic resistance in BhutJolokia (Ghost chili) by rhizospheric bacteria to the fungal diseases
- Understanding of transcriptional as well as translational host responses during induction of systemic resistance
- Selection of promising strains for suppression/control of the diseases

Salient Achievements:

- Collar rot disease is a major constraint to the commercial cultivation of BhutJolokia (*Capsicum chinense*Jacq.) caused by *Rhizoctoniasolani*in North-East India. In this study, five selected antagonistic plant growth-promoting rhizobacteria (PGPR), viz. *Serratia nematodiphila* RJ10, *Ochrobactrum pseudogrignonense* RJ12, *Serratia ureilytica* RJ21, *Bacillus subtilis* RJ46 and *Bacillus megaterium* JPR68 were

examined for growth promotion and induced systemic resistance with BhutJolokia against *R. solani*. Among the rhizobacterial strains, *Bacillus megaterium* JPR68 enhanced the highest induced resistance against the disease. In greenhouse conditions, PGPR treatment showed suppression of collar rot along with significantly increase in plant growth ($p< 0.05$) than pathogen-treated plants (**Fig.**). The ISR plant boosted the defense-related enzyme activity i.e., peroxidase (PO), polyphenol oxidase (PPO) and phenylalanine ammonia-lyase (PAL) in comparison to the uninoculated plant (control). Gene expression studies demonstrated that rapid induction of the defence response genes which were significantly up-regulated in the PGPR pre-treated plant challenged inoculated with the pathogen. Overall findings demonstrated that PGPR exhibit a complex phenomenon in Bhut Jolokia that induced resistance against collar rot by enhancing expression of ISR mediated defense response genes and improved plant health by inducing metabolic activities. The present results showed the possible application of few PGPR as a biocontrol agent against *Rhizoctoniasolani* infection in Bhut Jolokia. With our knowledge, this is the first report of ISR against any fungal disease in Bhut Jolokia.

Fig. Morpho-physiological response of plants subjected to *Rhizoctonia solani* infection. Pathogen (*R. solani*) infection was imposed on host plants.*Rhizoctoniasolani*-Rs,*Serratia nematodiphila*-RJ10, *Orchrobacterium pseudogrignonense*-RJ12, *Serratia ureilytica*-RJ21, *Bacillus subtilis*-RJ46 and *Bacillus megaterium*-JPR68; f-g. Symptoms like leaf lesions and collar rot were observed in pathogen stress plants; h. Healthy collar region/basal stem of pathogen stressed plant treated with PGPR.

II. In-house, Grant in aid & Consultancy Projects

Project Title: **Harnessing the Soil Microbiota for Sustainable Socio-Economic Upliftment of North-East India through Multi-Omics Approach**

Project No: **OLP-2035**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Ratul Saikia (PI), Dr Rituraj Konwar, Dr C Chikkaputtaiah, Dr Anil Kumar Singh, Dr Himangsu K Borah, Dr. Sachin R. Geed, Mrs Archana Yadav, Dr. Jyoti Lakshmi Hatiboruah, Mrs Polakshi Bordoloi, Ms Babli Borah

Objectives:

- Profiling and characterization of soil microbiota for different functional perspectives using multi-omics approaches
- Bio-prospection of microbes for biotechnological, health and environmental care applications

Salient Achievements:

- ***Isolation of Cellulolytic Bacteria from Rainforest area of Assam for Valorization of Lignocellulolytic Waste Biomass:*** Management of lignocellulosic wastes in and around municipality as well as household areas requires special consideration. The present study aims to screen cellulolytic strain for low-cost enzyme production using various cellulosic waste-materials. A total of 114 bacterial isolates isolated from the rainforest area of Assam, India were screened for their cellulolytic activity based on Carboxy-Methyl-Cellulose (CMC) utilization and congo red test. The isolate belongs to the genus *Novosphingobium* was found to be the most efficient strain. The optimum pH, temperature and incubation time was recorded as 5, 37°C and 96 h, respectively. Further, the highest enzyme activity was recorded in 1.5 % CMC and 0.25% yeast extract. The cost-effective enzyme production was investigated using three different cellulosic wastes viz. vegetable waste, coco peat and rice straw and the highest activity was found. Further, SEM and FT-IR analysis confirmed bacterial interaction and degradation/utilization of these waste substrates as carbon source. *Thus, the present study suggested that the strain could be used as a potent candidate for cost-effective cellulase production on cheap cellulosic substances.*
- ***Antibiotic resistanceprofiling in bacteria isolated from poultry*:**To study the effects of eminent use of antibiotics in poultry gut microflora, we studied faecal samples from 6 sites from and around Jorhat town. We collected soil and faecal samples from all the sites in sterile falcon tubes and isolated bacterial colonies in LB agar medium. We studied the antibiotic resistance pattern and further analysed by MIC assay. The results (**Fig.**) showed a higher resistance of colistin (COL) and ciprofloxacin (CIP), which was further tested by MIC method at temperatures 37 ˚C and 42˚C for different resistant isolates. We focused more on the vancomycin (VAN) isolates as the presence of resistance for VAN and cefepime (CIF) was under-reported. The results showed a higher MIC for colonies SI(F)8, SI(F)12, SI(S)12. These colonies were used for further studies.

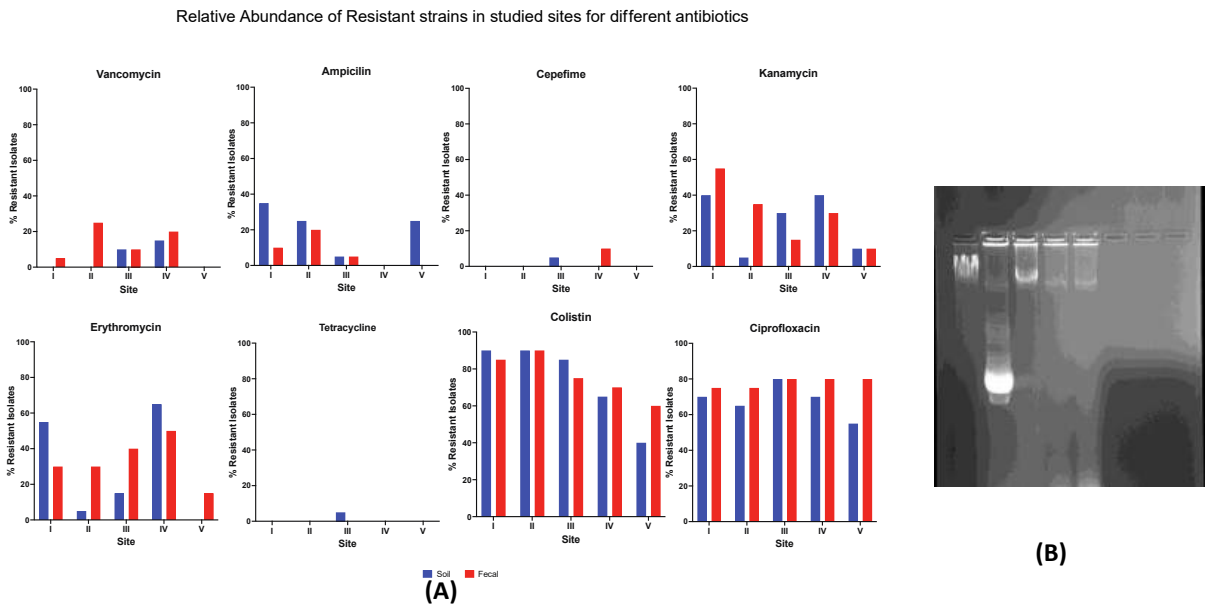


Fig. 1. Antibiotic resistance pattern in different isolates (A) and their plasmids isolation (B)

- ***Whole genome sequencing of resistant isolates*:** Whole genomic DNA from VAN resistant*Alcaligensfaecalis*and *Bacillusaltitudinis*isolated from both faecal and soil samples, were sequenced and were submitted to NCBI's Genome database. The sequences of *A. faecalis* were further analysed using GView tool for a comparative analysis against in resistant genomes.The genomes showed high degree of similarity however, genome of S1 showed differences from the other 3 genomes and the references as well as indicated in **Fig.**

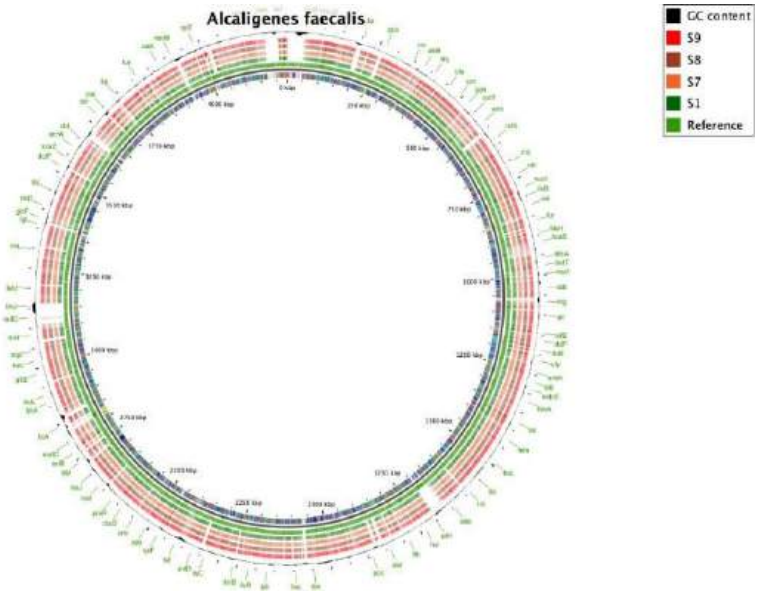


Fig. Genomic comparison of different isolates of *A. faecalis*

- ***Bio-process development for treatment of petroleum waste/sludge:*** Environmental pollution is a global issue due to the growth of the industrial sector.

Crude oil spillage is one of the major environmental pollutants due to the activities of petroleum industries.The uses of physicochemical methods for treatment have drawbacks such as sludge formation, operational costs, and so on. In recent years, bioremediation using potential microorganisms for oily sludge treatment has emerged as a promising eco-friendly sustainable cleaning solution.Oily sludge is a major environmental contaminant, and biodegradation has emerged as a promising cleaning solution. For the effective treatment of oily waste, various approaches such as sludge characterization, isolation of potential bacteria, consortium formulation, well designed batch composting experiments, slurry phase treatment, field treatment etc. are the main objective of the study. This research outcome might be useful in the development of a technological platform for the treatment of oily waste **(Fig.)**

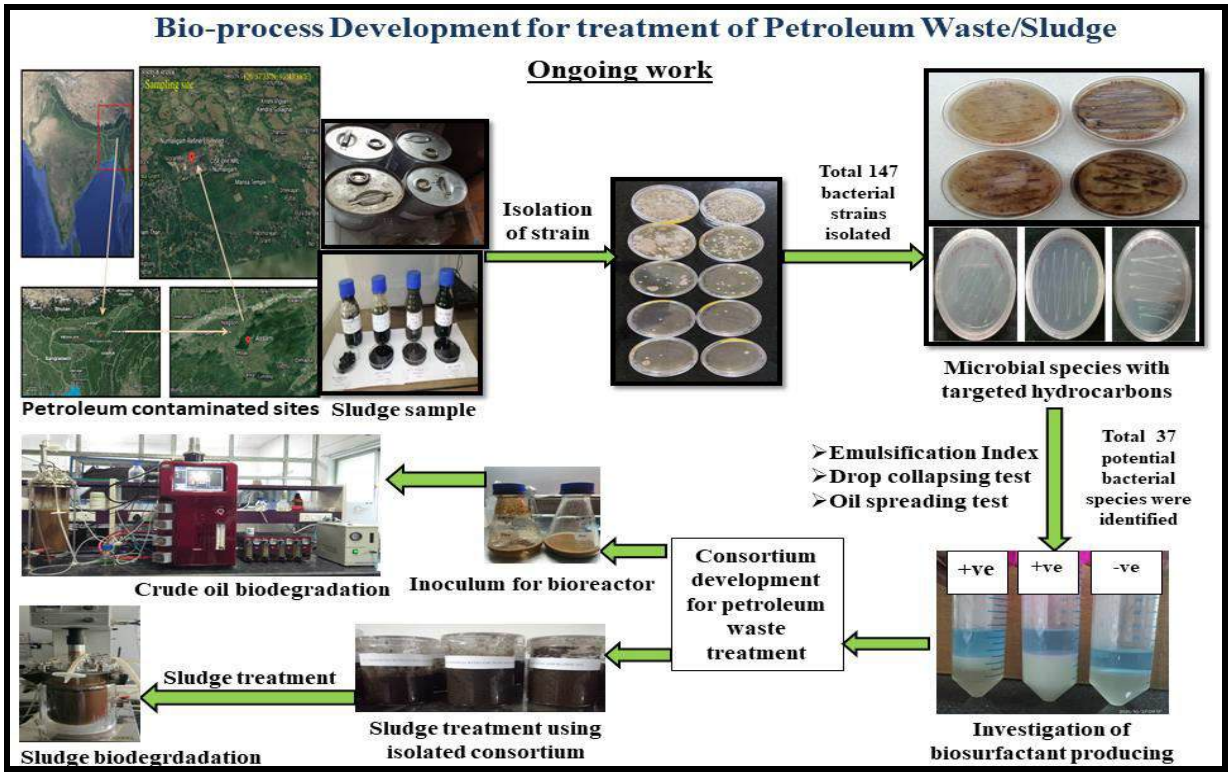


Fig. Bio-process development for treatment of petroleum waste/sludge.

- ***Transcriptome-wide analysis of North-East Indian rice cultivars in response to soil borne fungal pathogen:*** Pathogenicity study on brown spot disease causing soil borne plant pathogenic fungi *Bipolarisoryzae* infecting different North East Indian (NEI) rice cultivars has identified Shasharang as the most susceptible rice cultivar for *B. oryzae*infection while Gitesh as the most resistant rice cultivar. Transcriptome-wide analysis of North-East Indian rice cultivars in response to soil borne fungal pathogen *Bipolarisoryzae* infection revealed the importance of early response to the pathogen in suppressing the disease progression. Differential gene expression analysis revealed EBP-89 and WAK25 genes as negative regulators of brown spot disease tolerance in North East Indian rice cultivars in response to soil borne fungal pathogen *Bipolarisoryzae.*
- ***Development ofbio-medical applications of quantum dots produced form resources of NE India:*** In this period, few sets of quantum dots such as coal derived carbon quantum

dots and boron nitride quantum dots were synthesized using standard methodology. These quantum dots were rigorously characterized with various analytical methods such as TGA, FT-IR, zeta potential, UV spectrophotometry, Raman spectroscopy, XRD, SEM, TEM to characterize their quantum yield, structural organization, photo-electric, surface and other physico-chemical properties. Next, the biocompatibility and acute toxicity of these quantum dots were investigated using standard *in vitro* mammalian cell line and *in vivo* animal models. **Fig.** 4 shows the relative safety of boron nitride quantum dots in HEK-293 cells determined using MTT assay. Subsequently, selected quantum dots are conjugated with known bioactive pharmaceutical molecule and characterized using a series of analytical methods including fluorescence spectroscopy, TGA, FTIR-ATR, XRD, LCMS etc. Currently, these sets of quantum dots are under evaluation for their efficiency alone or as conjugated form for targeted drug delivery, therapeutic, diagnostic and bio-imaging applications.

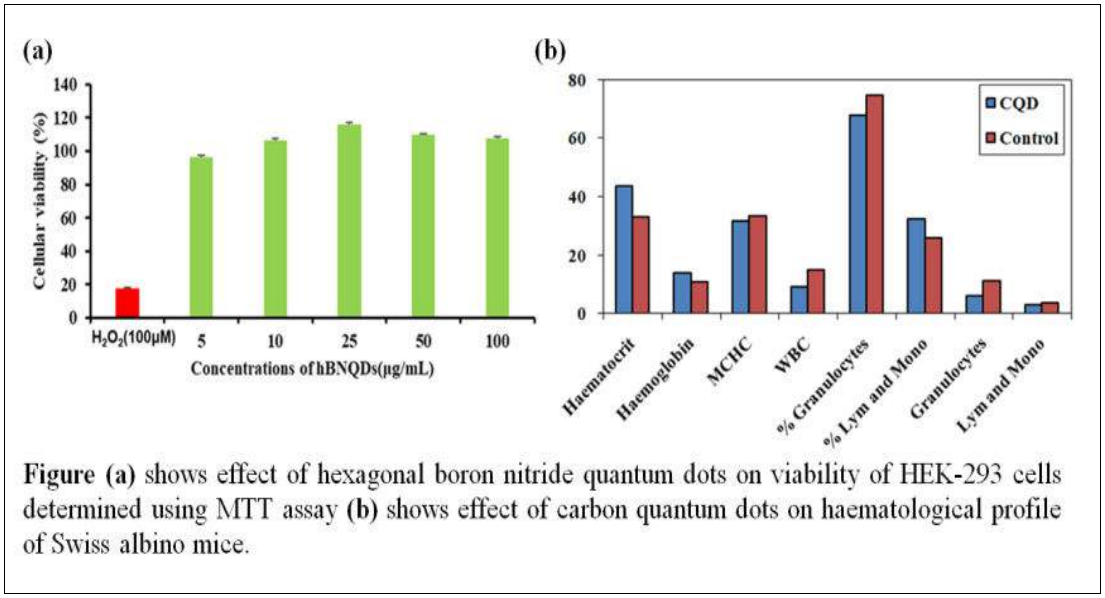


Figure (a) shows effect of hexagonal boron nitride quantum dots on viability of HEK-293 cells determined using MTT assay **(b)** shows effect of carbon quantum dots on haematological profile of Swiss albino mice.

Fig. Biocompatibility and acute toxicity of these quantum dots.

- ***Characterization of pharmacological activity of traditional beverage of NE India and its constituents:*** About 20% people of Assam and 70% people of tribal community of North East India uses traditionally processed fermented foods and alcoholicbeverages. Ethnically it is believed that these beverages have medicinal value and sometimes they are administered as a part oftraditional medicine. More than 100 different herbal plants are traditionally used to prepare beverages which may have pharmacological effect and additionally the fermentation produced pro-biotics may have effect on gut health. Different solvent-based (ethanol, methanol, water) extraction resulted in characterization of variety of classes of molecules like carbohydrate, phenolic acid, ethanol, Amino acid, pepides, Alkaloids, Isoflavons etc using NMR, GCMS and LCMS. In preliminary study, the different solvent extracts of two major types of beverage showedsignificant dose-dependent free radical scavenging activities. Further studies are going on to investigate their effect using *in vivo* animal models (**Fig.**).

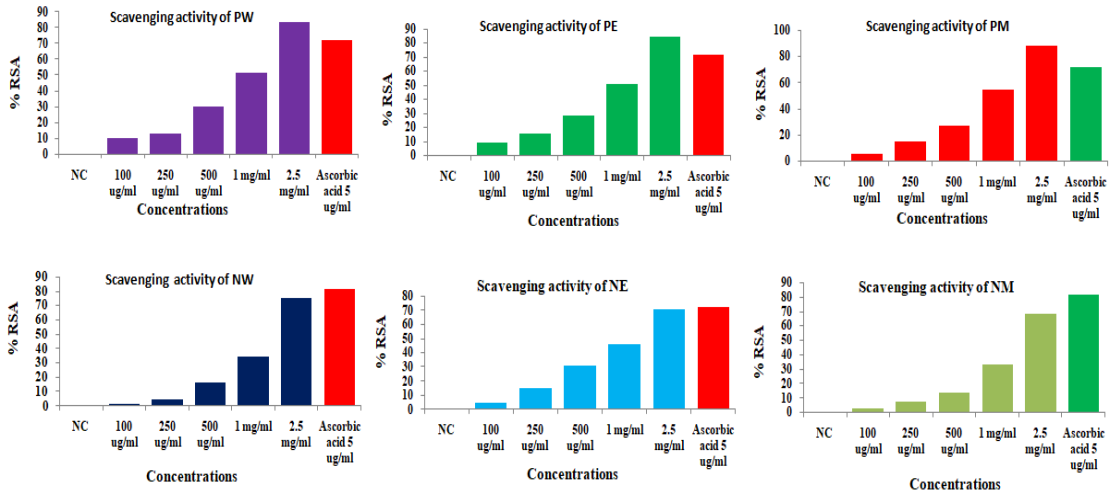


Fig. Free radical scavenging activity of solvent extract constituent of beverages

Project Title: **Molecular Investigation into the Lignocellulolytic System of a Few Wild Silkmoth in North-East India**

Project No: **GPP-359**

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

PI & Members: Dr Ratul Saikia (PI), Dr Jatin Kalita (Co-PI), Dr Pallab Pahari (Co-PI), Mrs Archana Yadav, Ms Parishmita Gogoi

Objectives:

- Impact of host plant range on the microbial community in *Antheraeaassamensis* Helfer and *Samiaricini* Donovan
- Lignocellulose degradation by the gut microbes associated with *Antheraeaassamensis* Helfer and *Samiaricini* Donovan
- Molecular characterization of the lignocellilotic biomass degrading enzyme

Salient Achievements:

- North-East India harbours ample sericigenous insect resources which are exploited for their silk products. *Samiaricini* Donovan is an economically important poly-phytophagous silkmoth capable of digesting foliage from different plant species, suggesting versatility of robust gut system. A total of 250 putative gut bacteria were isolated across the holometabolous life cycle during summer and winter seasons from the larvae of *Samia ricini*. Theguts bacterial profile was determined by 16S rDNA characterization revealing 3 phyla, 13 families and 22 genera morphology (NCBI Accession No. MW784856 - MW784875) (**Fig.**). Comparative analysis among the seasonal gut isolates revealed a high diversity in summer, predominated by the genus *Bacillus*due to its high occurrence in all developmental stages. Shannon's diversity index demonstrated second and fourth instars of summer along with fifth instar of winter to be relatively better developmental stages for gut bacteria assemblance. Bacterial community shifts in concert to host developmental changes were found to be apparent between early instars and late instars in summer which differs from those of winter. Based on substrate utilization, *Paenibacillus* sp. SB6 was

found to be a prospective strain with potential industrial application in cellulolytic and xylanolytic enzyme production. Present results illustrate gut microbiota of *S. ricini* over the seasons and support holometabolous life cycle effect as the more likely factor shaping gut bacterial microbiota.

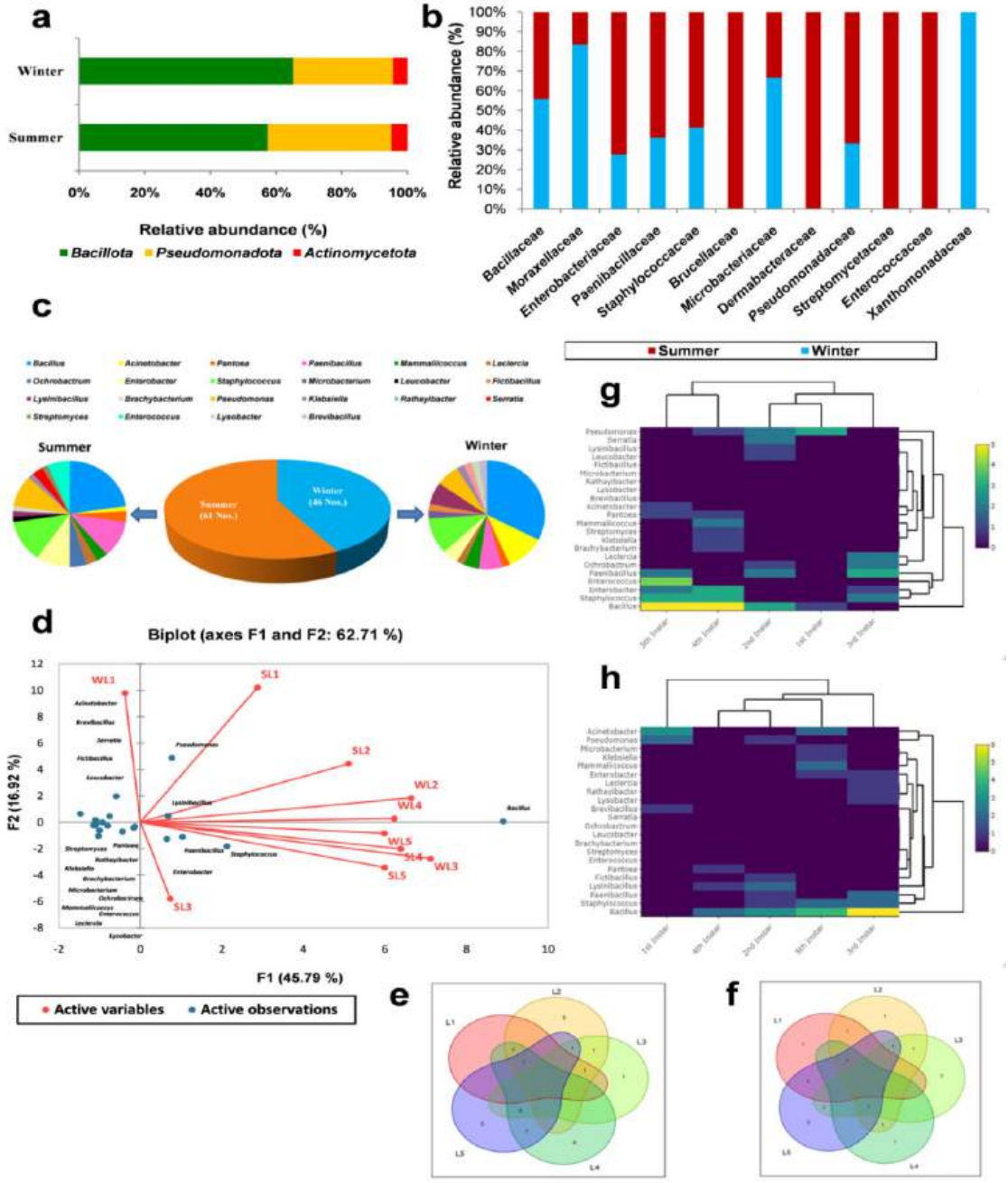


Fig. Gut bacteria dynamics across the two seasons of *Samiaricini*; a. Phylum-level community composition, **b.** Family-level, **c** Gut bacteria assemblages in summer and winter. Highest numbers of gut bacteria were isolated in summer followed winter, **d.** PCA analysis showing gut bacteria segregated strongly according to seasonal change, **e.** Venn diagram for bacterial overlap at larval stage in summer, **f.** Venn diagram for bacterial overlap at larval stage in winter, **g.** Heatmap of major taxa found across developmental stages in summer and **h.** winter.

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:

- **Designing of Bioreactor:** A bioreactor was designed in such a way that it is able to address improved productivity, validation of desired parameters for obtaining compatible and higher quality products in a cost effective manner. The bioreactor we designed is effective enough to prevent contamination and positively influence the biological reaction. The capital investment and cost of operation was also considered while designing the bioreactor. The basic feature of the bioreactor includes the headspace volume, agitator system, oxygen delivery system and lines for charging and emptying the reactor (**Fig.**)

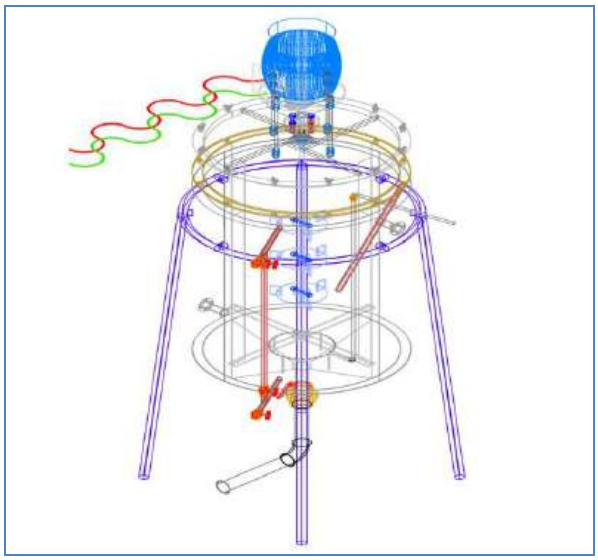


Fig. Wireframe view of the bioreactor

- **Viability test of liquid formulation of OP-12 biofertilizer.** Liquid inoculant formulation contains not only the desired microorganisms and their nutrients but also special cell protectants or additives that promote for longer shelf-life and tolerance to adverse conditions. Here the viability of OP-12 in different liquid formulations of Biofertilizer over six months was checked. Each formulation of the liquid Biofertilizer

consists of nutrient broth as a nutrient media and glycerol as a cell protectant. The survivability of OP-12 biofertilizer over different time intervals.

- ***Training, Demonstration of the technology for Entrepreneurship development.*** Different training, demonstration and awareness programmes were organized by Biological Science and Technology Division, CSIR-NEIST. The major focus of the awareness programmes was to share information regarding the use of OP-12 biofertilizer and its beneficial impact on normal to water stress conditions. Further to educate the trainees on withdrawal of use of chemical fertilizers to avoid contamination in the field crops as well as ground water and its severe health impact on human health. In the demonstration and training programmes, various skills and technical knowledge on method of production of OP-12 biofertilizer has been imparted to the farmers and common people**(Fig. a & b).**

Fig. a. A view of training session on Biofertilizer production and entrepreneurship development on 21st October, 2021.

Fig. b. A view of awareness programme on biofertilizer held at Mudoijan, Jorhat, Assam on 9th February, 2022and field visit where OP-12 biofertilizer was applied.

Project Title: **Establishment of OP-12 Biofertilizer Plant in Mizoram**
Project No: **GPP-386**
Funding Agency: Govt. of Mizoram, Aizawl
PI & Members: Dr Ratul Saikia (PI), Er J J Borah, Dr Dipanka Neog, Dr Jatin Kalita, Dr Rituraj Konwar, Dr Himangshu K. Borah, Mrs. Archana Yadav

Objectives:

- To establish the OP-12 Biofertilizer Plant in Mizoram in Turnkey basis at Directorate of Agriculture, Aizawl, Mizoram

Salient Achievements:

- A scientist group of CSIR-NEISThad visited the site **Agriculture Department Farm, Neihbawi, Sihphir, Aizawl, Mizoram** from **31-08-2022 to 02-09-2022** (3-days).One jacketed bioreactor plant for production of Biofertilizer (540 L.per batch) was installed and commissioned on 31/08/2022 - 01/09/2022 to manufacture Biofertilizer that increase soil fertility, restore its natural balance and increase crop productivity. The team hadalso provided hands-on training cum-awareness of OP-12 Biofertilizer to the scientist/research scholar/technical officer/technician and 56 numbers of college students/ NGO/ at Neihbawi Farm, Sihphir, Aizawl, Mizoram on 1st September, 2022 (**Fig. a**). The team had handed over the OP-12 Biofetilizer Technology Package to the Deputy Director, Directorate of Agriculture, Govt. of Mizoram. Additionally, explained the step-by-step operational/production protocol/SOP has also given them.
- The Honourable Chief Minister of Mizoram has inaugurated the OP-12 Biofertilizer Plant on **7th November, 2022** in front of the honourable Agriculture Minister, Mizoram and other officials of Agriculture Department, Govt. of Mizoram (**Fig. b**).

Fig. a. A view of technology package hand over, installation, training-cum-demostration of biofertilizer productionand interaction with farmer.

Fig.b. Inauguration, inspection and delivering speech by Mr. Zoramthanga, Chief Minister of Mizoram on7th November, 2022

Coal and Energy Division

The Coal & Energy division is one of among the excellent research division working in the area of coal sciences & technology and energy-environment interface in India and abroad. It is a new division which is engaged in the resource quality assessment and the development of indigenous processes for the rational utilization of NER low-grade high-sulfur coals, since its inception. The division is also working on resource quality assessment of coal resources, carbon-based energy storage devices, and different aspects of environmental issues including national emission inventories for this region.

The mandate of the division is to develop indigenous processes for effective and gainful utilization of low-quality NER coals and biomass for the benefit of the people and society of the region in particular and the country in general. It is mandate to assess and mitigate the environmental degradation during utilization of these coals in the region.

Ongoing Projects

I. In-house, Grant in aid & Consultancy Projects

Project Title: **Coal and Energy Sciences**
Project No: **OLP-2055**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Binoy K. Saikia (PI), Dr Prasenjit Saikia (Co-PI), Dr Ashutosh Thakur, Dr Ajit Singh, Dr Tonkeswar Das, Mr Vikash Kr Gond
Objectives:

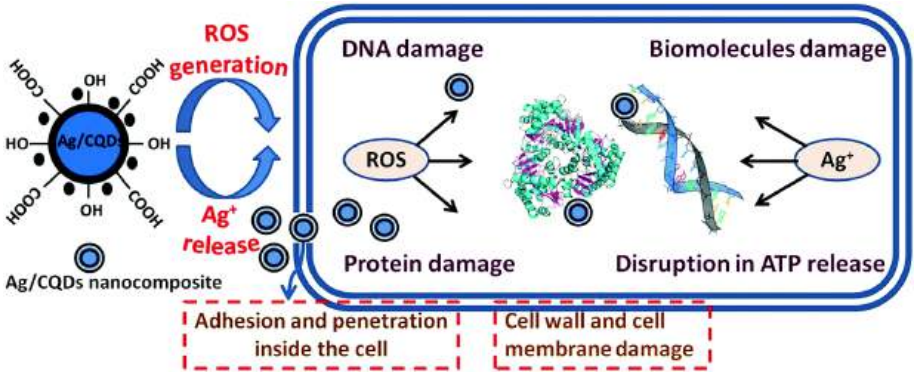
- Quality assessment and economic production of high-value carbon products from NER coal and other carbonaceous materials.

Salient Achievements:

- **Scalable production, cell toxicity assessment, and plant growth promotion activities of carbon quantum dots derived from low-quality coal feedstock:**
  In this study, fluorescent nitrogen and sulphur co-doped CQDs (NS-CQDs) has been prepared from low-grade subbituminous coal as feedstock. The co-doped NS-CQDs were identified using a suite of microscopic and spectroscopic approaches. The coal-derived CQDs show blue and cyan fluorescence with quantum yields of 9.35 and 16.96%, respectively. The cytotoxicity, genotoxicity, and reactive oxygen species (ROS) of the coal-derived CQDs were investigated, which revealed that these CQDs are biocompatible, non-cytotoxic, and non-genotoxic. Moreover, these coal-derived CQDs also have proved to be good carriers of nutrients and microbes for plant growth promotion, effectively behaving as a nanofertilizer.

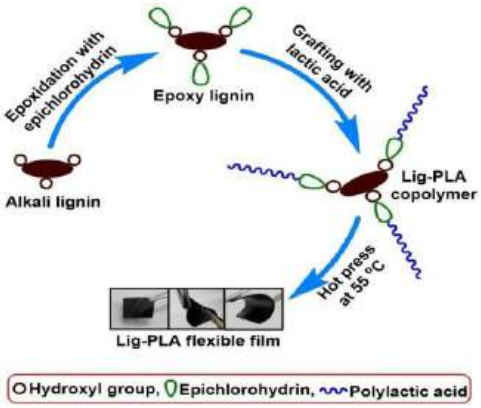
(Saikia et al. CEJ, 2022, 433, 133633).

- **A novel rapid synthesis of highly stable silver nanoparticle/carbon quantum dot nanocomposites derived from low-grade coal feedstock:**
  A novel, single-step, sustainable, and low-cost fabrication of silver carbon quantum dot (Ag/CQD) nanocomposites by using coal-derived carbon quantum dots (CQDs) as a reductant and stabilizer having great potential for simple and quick synthesis of silver nanocomposites has been documented for the first time. The Ag/CQD nanocomposite depicts the crystalline nature with graphitic core or aromatic carbon and also attributed to the (111) and (122) lattice planes of Ag. The size distribution of the particles found to be within 2–12 nm in diameter, complying with the Gaussian distribution. The nanocomposite shows a zeta potential of −9.91 mV, signifying their high stability. In addition, the nanocomposite has promising bactericidal behaviour for both Gram-positive and -negative bacterial strains for application as an antibacterial material. The Ag/CQD nanocomposite shows a maximum inhibition against bacterial strain *Rhodococcus soli* with an inhibition zone diameter of 17 mm as compared to the other strains.



(Saikia et al. New J. Chem., 2022, 46, 309-321).

- **Development of value added material from biomass**
  In this work, lignin was firstly chemically modified with epichlorohydrin to enhance it's reactivity and later lactic acid (LA) was grafted on it to synthesize lignin-g-PLA copolymer. The copolymer was characterized and confirmed with various spectroscopic techniques such as FT-IR, XRD, TGA, DSC, GPC etc. Hydraulic hot press technique was used to prepare flexible polymer film from the developed lignin-g-PLA copolymer. Further, properties enhancement and biological properties evaluation of the above polymer film is in continuation.



Schematic diagram of the polymer film development from lignin.

Furthermore, North East rice straw was used to isolate lignin. The isolated lignin was chemically depolymerized with the cost effective catalyst to synthesize platform chemical like vaniline and acetosyringol. The synthesized platform chemicals were characterized and confirmed with various spectroscopic techniques such as FT-IR, GC-MS, NMR, HR-MS, etc. further work is still in continuation to starderize the methodologies.

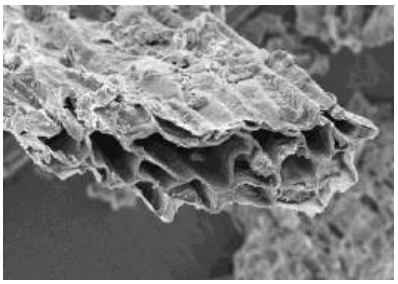
- **Studies on wastes to wealth:**
  Banaba seed, areca husk, corn cob, coconut husk for production of methyl esters and its product characteristics for its strategic use as a fuel by thermal degradation process. The yield of the methyl ester was observed quite significant from 34 – 42%. Further study related to engine testing would reveal the efficacy of the produced methyl ester as a substitute for conventional diesel.

(Banaba, Corn corb and coconut shell for methyl

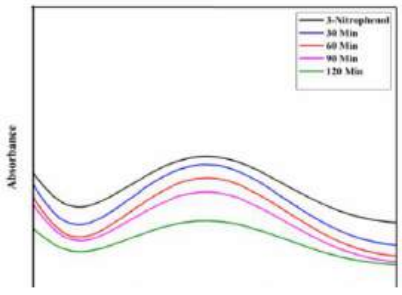
(Produced methyl ester).

- Development of biomass based carbon sources through dopping of nitrogen and phosphorous gaining attention for production of high value materials that could be efficiently utilized for removal of organic dyes from industrial effluents as photocatalyst and also for heavy metal removal. In this regard a new biomass based activated carbon treated with different activating agents were prepared and the results were compared with different heavy metals such as Pb, Cd etc., and found very encouraging for such applications.

(Carbon materials developed from bio-waste)



(SEM image of Carbon materials developed from bio-waste)



(Removal of phenolic compounds utilizing the developed material as photocatalyst)

Project Title: National Carbonaceous Aerosols Programme (NCAP) Working Group-III: National Carbonaceous Aerosol Emissions, Source Apportionment and Climate Effects

Project No: GPP-325

Funding Agency: Ministry of Environment, Forest and Climate Change, Govt. of India (MOEFCC, GOI)

PI & Members: Dr Binoy K. Saikia (PI), Dr Prasenjit Saikia (Co-PI), Dr Tonkeswar Das (Investigator)

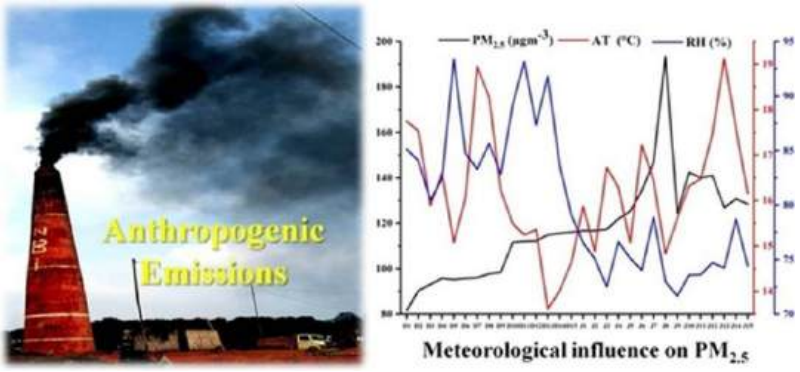
Objectives:

- Identification of regionally representative location for particle sampling for Black Carbon (BC) source apportionment.
- Particle sampling for a two year period, including QA/QC protocol development and implementation. Filter papers are to be passed on to the associate institution for full chemical analysis and source apportionment modelling.
- Analysis of seasonal variations in source contributions to $PM_{2.5}$ as related to meteorology and emissions. Data generation for final receptor modelling results for North-Eastern India site.

Salient Achievements:

- **Meteorological Influence and Chemical Compositions of Atmospheric Particulate Matters in an Indian Urban Area**

  In this study, sampling and chemical analysis of $PM_{2.5}$ were carried out for about two winter months during December 2018 and January 2019 to determine their chemical components and possible emission sources in a Northeast Indian urban area (Jorhat). $PM_{2.5}$ mass concentrations were observed to be exceeding the permissible limit (60 μg m^{-3}) of the National Ambient Air Quality Standards (NAAQS) of India. The average total water-soluble ions account for 12.27% of total $PM_{2.5}$ mass, of which anions contributed up to 50.52% and cations contributed 49.48%. The correlations among the water-soluble ionic species indicate the formation of NH_4NO_3 and $(NH_4)_2SO_4$ as major ammonium products with high ammonium concentration (30.73% of the total water-soluble aerosol mass) making the $PM_{2.5}$ alkaline. A high concentration of acenaphthylene and naphthalene was also found out of the 16 US EPA poly-aromatic hydrocarbons (PAHs). The correlation study between the chemical components and the meteorological parameters pointed out coal and biomass burning as the main contributor to such high winter loading in Northeast India.



(Rabha et al. ACS Earth Space Chem. 2021, 5, 7, 1686–1694).

Project Title: **Development of Hybrid Battery Power Module with Indigenously Developed Super-Capacitor and Li-Ion Cell**

Project No: GPP-348

Funding Agency: Ministry of Electronics and Information Technology (MeitY), Government of India, New Delhi

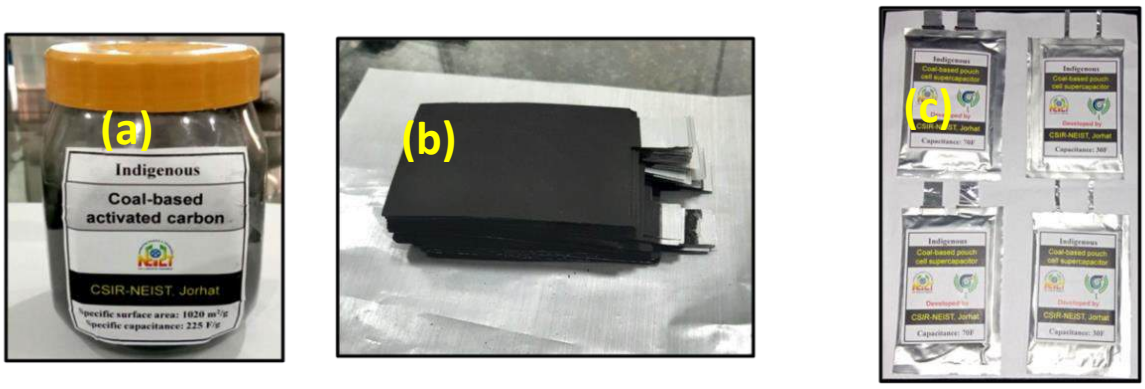
PI & Members: Dr Binoy K. Saikia (PI), Dr Dipankar Neog (Co-PI), Dr Dhrubajyoti Bhattacharjya, Dr Prasenjit Saikia, Dr Tonkeswar Das

Objectives:

- Development of hybrid battery power module with indigenously developed super-capacitor and Li-ion cell.

Salient Achievements:

- A simple and eco-friendly synthesis method for the high-valued activated carbons (ACs) product from low-grade subbituminous coals have been developed and scaled up the process (~2 kg) having specific surface area of the AC of 1021 m^2/g with highly porous structure. The AC has been tested as an electrode material for a supercapacitor and found excellent electrochemical performances in aqueous as well as organic electrolytes. The constructed coal-derived ACs supercapacitor cell exhibited the highest specific capacitance value of 227 F/g in an aqueous electrolyte and 99 F/g in organic electrolyte at a current density of 0.5 A/g with excellent capacitance retention of 88% and 52% at a high current density of 10 A/g. The fabricated supercapacitor cell showed the highest energy density of 25 Wh/kg with a maximum power density of 12952 W/kg in organic electrolyte. The obtained results confirm that the coal-derived ACs can exhibit excellent electrochemical characteristics in comparison to other carbon materials reported in the literature as well as commercially available activated carbon. The fabricated supercapacitor battery hybrid module was placed in an e-rickshaw along with the BMS and found its better impact on the performance of the vehicle.



Coal-derived (a) activated carbon, (b) carbon electrodes in required dimension, (c) prototype pouch cell supercapacitor.

Project Title: A comprehensive Approach in Understanding in Acid Mine Drainage Problems of Makum Coalfield and its management

Project No: GPP-364

Funding Agency: Ministry of Earth Sciences, New Delhi

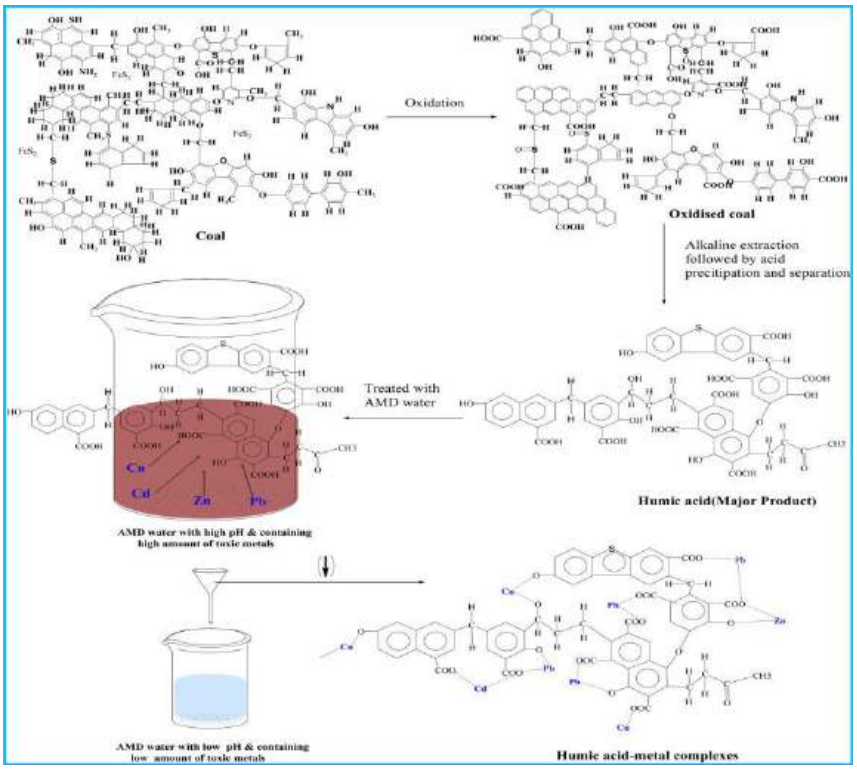
PI & Members: Dr Binoy K. Saikia (PI), Dr Manuj Kumar Phukan (Co-PI), Dr Prasenjit Saikia, Dr Tonkeswar Das

Objectives:

- Geochemical and kinetic studies of Acid Mine Drainage (AMD) problem in Makum coalfield (Margherita), Assam.
- Development of a site-specific prototype for management of AMD from Makum coalfield.

Salient Achievements:

- This study has been carried out for isolation of humic acid from NER sub-bituminous coal. The study also targeted for application of the coal-derived humic acid in acid mine drainage (AMD) water treatment and electrochemical devices. From the study,the isolated coal-derived humic acid is found to be high degree of humifications and relatively stable up to about 200 °C. The FTIR study indicates the formation of metal-humic acid complexes. On treatment with acidic water (AMD), the coal-derived humic acid was found to have the ability to remove toxic metal such as (in order) Pb > Cu > Zn > Cd. Furthermore, the preliminary electrochemical properties of the isolated humic acid shows the specific capacitance of 7 mF/g at scan rate 10 mV/s and 22 mF/g within the potential window 0.4 V, respectively. This study will create a new pathway for the further research in this field.



(Das et al. Int. J. of Coal Sc. & Tech. 2021, 8, 1479–1490).

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.

CPR, CSIR NEIST is involved in R & D and translational work in the area of high relevance and importance to solve contemporary problems encountered by petroleum and oil industries. About 25 nos. of scientific staff have been working in the centre to achieve its goals. The centre has started collaborative work with oil and petrochemical industries of north east India.

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

II. Inhouse, Grant in aid & Consultancy Projects

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 G Narahari Sastry (Co-ordinator), Dr Swapnali Hazarika (PI), Dr Sangeeta Sharma (Co-PI), Dr J Jayaramudu (Co-PI), Dr Prakash Jyoti Saikia (Co-PI), Dr Upendra Nath Gupta (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:

- Synthesis of regenerated PET-nano clay composite polymers has been done.
- A superhydrophilic and organic solvent resistant membrane was designed from waste plastic bottles made of polyethylene terephthalate and waste cellulosic paper. The designed membrane was used for the separation of synthetic crude oil-water emulsion. The best membrane showed maximum permeability of 98 $Lm^{-2}h^{-1}$ applying pressure 1.5 bar with removal of more than 98% organic contaminants present in the synthetic crude oil-based wastewater. The optimum membrane showed a good mechanical strength of 0.86 MPa and good initial degradation temperature of 350^0C. The antimicrobial property of the nanocomposite membranes could be achieved by coating its surface with carbon dots rooted graphene oxide.
- A carbon di-oxide selective membrane has been designed. The membrane is made up of synthetic polymer “polysulfone” and modified cellulose nanocrystal. An ionic liquid having specific tendency toward CO_2 dissolution has also been incorporated inside membrane matrix. The membrane is utilized for selective CO_2 permeation and CO_2/N_2 separation performance with variation of membrane components, pressure and flow rate. Till now the best membrane shows highest CO_2 permeability of 114 GPU and highest CO_2/N_2 selectivity of 9.3 is found at 220.665 and 183.88 cmHg pressures respectively. Gas chromatographic analysis has also been done and analysis of the permeate for mixed gas separation shows the best result with permeate ratio of $CO_2 : N_2 = 94.5 : 5.5$ (mole%). The membrane is well characterized via different analytical techniques such as FTIR, FESEM, XPS, BET, AFM, Tensile strength and TGA. The membrane shows ultimate stress of 2.06 MPa and thermal stability upto 240^0C. Further analysis and works are ongoing for better selectivity.

- Carbon nanotube based functionalized membrane was designed for removal of heavy metal from industrial waste water. The polymeric hydrophilic base membrane was coated with carbon nanotube-based nanocomposites and optimization of the coating on the surface of the membrane was carried out until a homogeneous crack free coating was obtained. Characterization of the designed membrane was carried out using different analytical techniques. TGA analysis of the membrane was carried out which shows higher thermal stability of the coated and base membranes. The coated membrane showed higher thermal stability as compared to the base membrane which might be due to the presence of the designed nanocomposites on the membrane surface. SEM analysis of the designed membrane shows effective and homogeneous distribution of the designed nanocomposites on the bare membrane surface. Performance analysis of the designed membrane to check its efficiency towards the removal of heavy metal from water system is going on. The focused heavy metals for the membrane are lead, cadmium, nickel, chromium(III) and chromium(VI).
- Digitization of Maps for study of potential source zone in and around Numaligarh Refinery Limited (NRL), Assam.

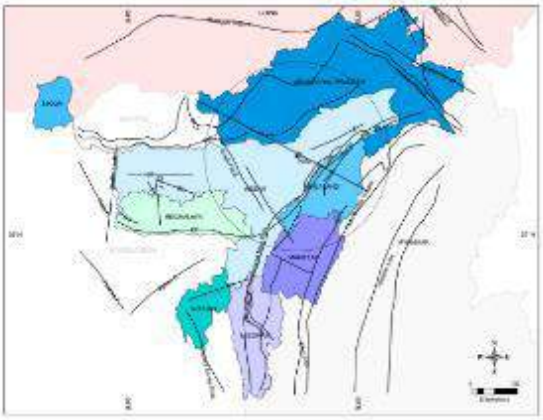


Fig: Map of major fault lines of Northeast India. Location of NRL is marked in star.

- Major fault & lineament maps are prepared & digitized for probable source zone identification.

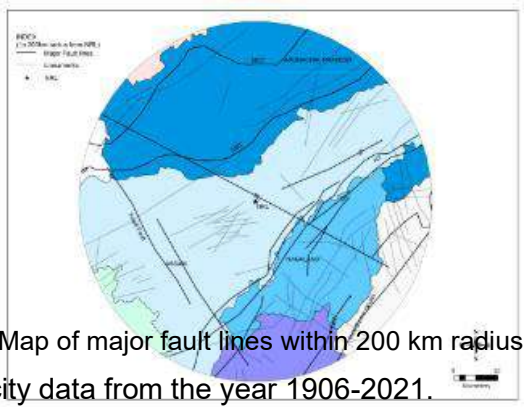


Fig: Map of major fault lines within 200 km radius of NRL.

- Acquisition of seismicity data from the year 1906-2021.

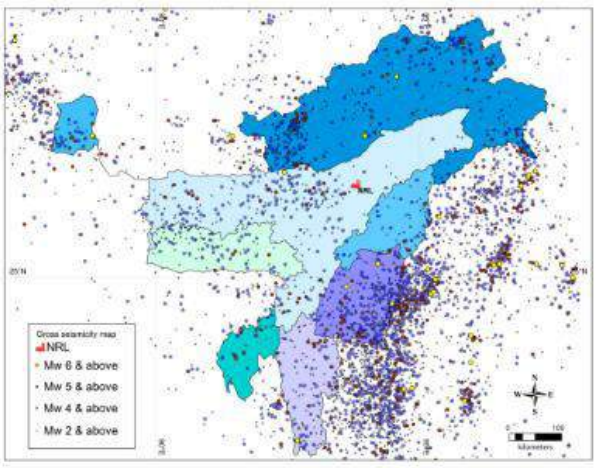


Fig: Seismicity map of Northeast India from the year 1906-2021.

❖A combination plot is prepared for analysis of pattern of occurrence of earthquake from 2012-2020 along with its magnitude.

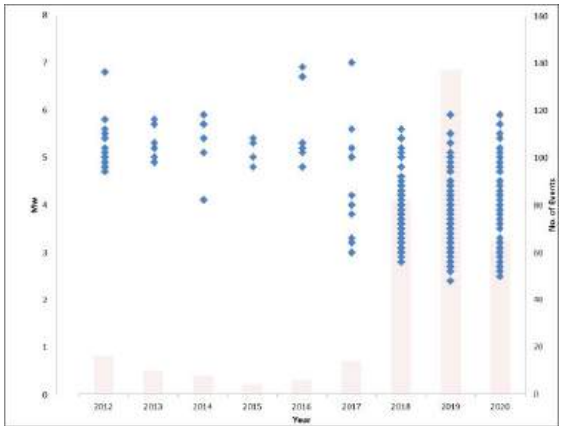


Fig: Combination plot showing pattern of occurrence of earthquake from 2012-2020 along with its magnitude.

❖ A b value distribution graph was prepared from the catalogue covering a period from 2012 to 2020.

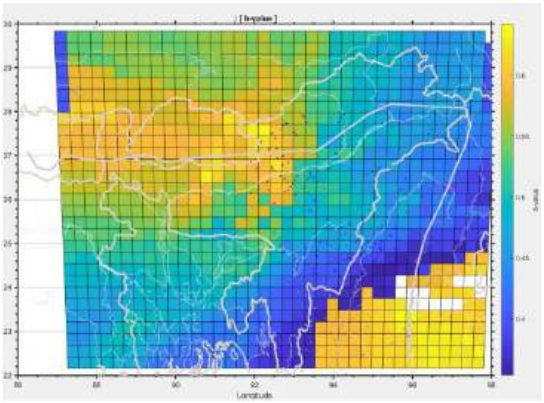


Fig: b value distribution graph of NE India.

- Satellite imageries (Cartosat and Sentinel) for different time periods are acquired for land subsidence studies.

Fig: Satellite imagery of NRL.

- Drainage map of study area is prepared for geomorphological studies & also for assessment of potential source of threat from river migration.

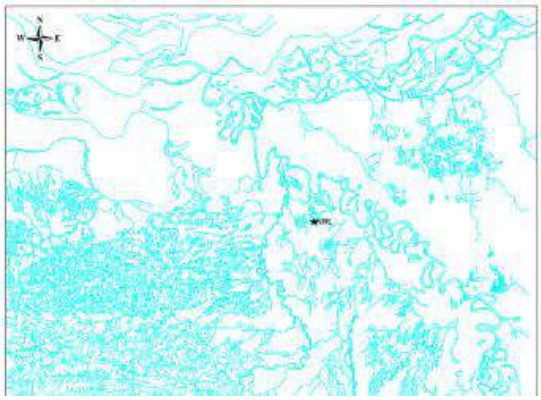


Fig: Drainage map of the study area showing major rivers and bills/swamps.

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

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 mini pilot plant. The treated water has been used for recycling as process water.

Centre for Infectious Diseases

The Centre for Infectious Diseases (CID) was established on 21 July 2020 to strengthen the capacity and the capability building in the North East region (NER) of India to carry out biomedical research on diseases having priority in the national health program and unique to the region. The centre carries out high priority R&D such as genomics studies of infectious diseases, virology, host microbiota and pathogen interaction, molecular biology, food and nutrition and molecular basis of metabolic diseases. Initially, an old mechanical shed was renovated during the first wave of COVID-19 pandemic and converted into a fully functional COVID-19 Testing Laboratory with facilities like BSL-2+ and RT-PCRs with ICMR-approval.

Mission: The mission of the centre is to serve the NER of India through 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.

Ongoing Projects

I. Mission Mode Projects

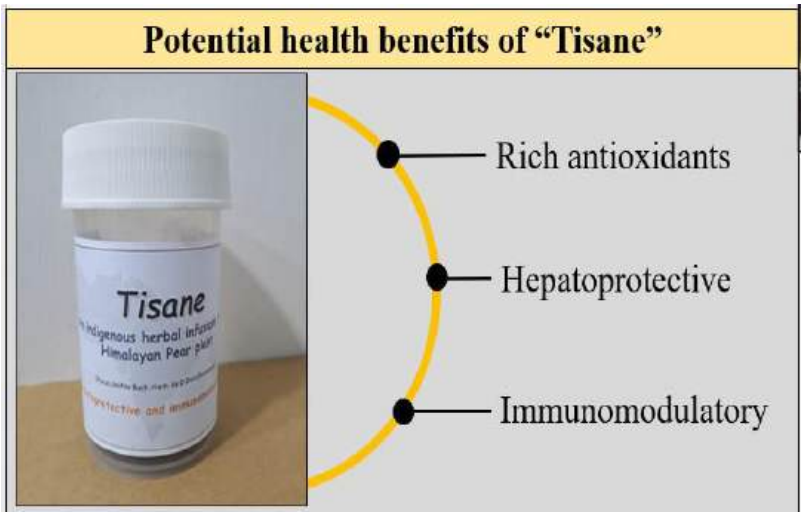
Project Title: **Development of Plant Extractive-Based Nutraceuticals for Immunomodulation and Hepatoprotection**
Project No: HCP-035
Funding Agency: CSIR, Govt. of India
PI & Members: Dr Pankaj Bharali (PI)
Objectives:

- Collection and preparation of plant extracts and phytochemical profiling
- Determination of immunomodulatory and hepatoprotective activity (in vitro and in vivo)
- Final product development and efficacy and safety validation studies

Salient Achievements:

- Hepatoprotection study was carried out in APAP induced hepatic injury model in rats. The hydroalcoholic extract of Pyrus pashia was administered orally to the rats (test group) along with the standard drug Silymarin (standard control). LFT and liver histopathology was evaluated. Up to 2000mg/kg body weight the hydroalcoholic extract of P pashia was found to be safe in rodents (rat) as there was no mortality and toxicological signs could be observed.
- A product in the form of herbal infusion has been developed from the young leaves of *Pyrus pashia* which are having health benefits likeantioxidant; Immunomodulatory

(Proinflammatory marker (TNF-α, IL-6, IL-,1β) and anti-inflammatory marker (IL-4, IL-10); Hepatoprotective; Anti-inflammatory;Mind-refreshing



II. In-house, Grant in aid & Consultancy Projects

Project Title: **Prevention and Management of COVID-19**
Project No: OLP-2046
Funding Agency: CSIR, Govt. of India
PI & Members: Dr Jatin Kalita (PI), Dr S. B. Wann, Dr Prasenjit Manna, Dr Romi Wahengbam, Dr Pankaj Bharali, Dr Tridip Phukan, Mr Nayan Jyoti Borah
Objectives:

- COVID-19 sample testing.
- Genomic surveillance of SARS-CoV-2 from North Eastern states to identify and detect variants infecting the population and understanding the genetic epidemiology.
- Immune surveillance of SARS-CoV-2 infection.

Salient Achievements:

- Total of 8039 COVID-19 samples were tested (544 confirmed cases, test positivity rate: 6.77%).
- Created a state-of-the-art Next Generation Genomics Facility (NGGF), and became a member of the Indian SARS-CoV-2 Genomics Consortium (INSACOG) as an IGSL.
- Sequenced, assembled and analyzed 1581 SARS-CoV-2 whole genomes from Arunachal Pradesh, Assam and Nagaland, and deposited them in the All-Influenza Virus and Coronavirus Database (GISAID) and Indian Biological Data Centre (IBDC) database.
- The 2nd wave was predominated by Delta and Delta-like AY sublineages, while 3rd wave was predominated by Omicron and Delta.
- Prevalence of seropositivity (IgG-N, IgG-S, and IgG-M antibodies) against SARS-CoV-2 increased while the frequency of neutralizing antibody decreased both in

intermittent phase (Feb 2021) and second wave (Jun 2021) compared to those seen in first wave (Aug 2020).

- ❖ Neutralizing activity gradually increased by ~10-fold from Aug 2020 (8.57%) to middle of July 2021 (88.57%), correlating well with the vaccination event.

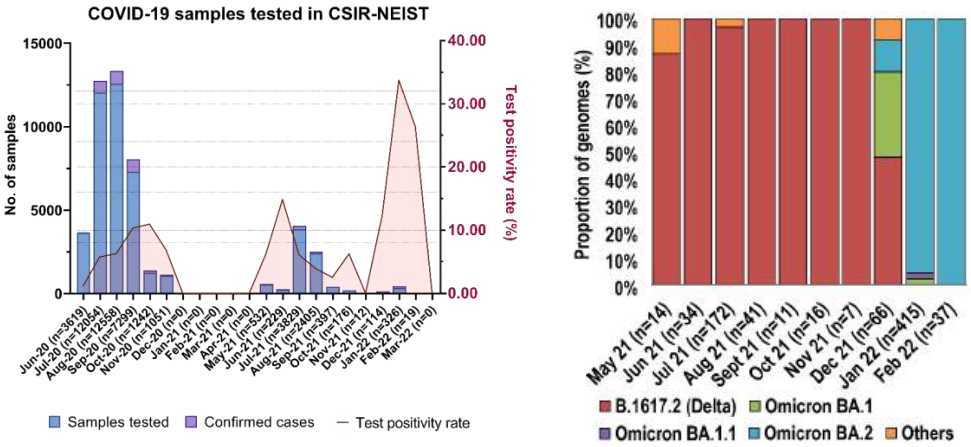


Fig. COVID-19 samples tested during April 2021 to March 2022; Evolution of SARS-CoV-2 variants during April 2021 to March 2022.

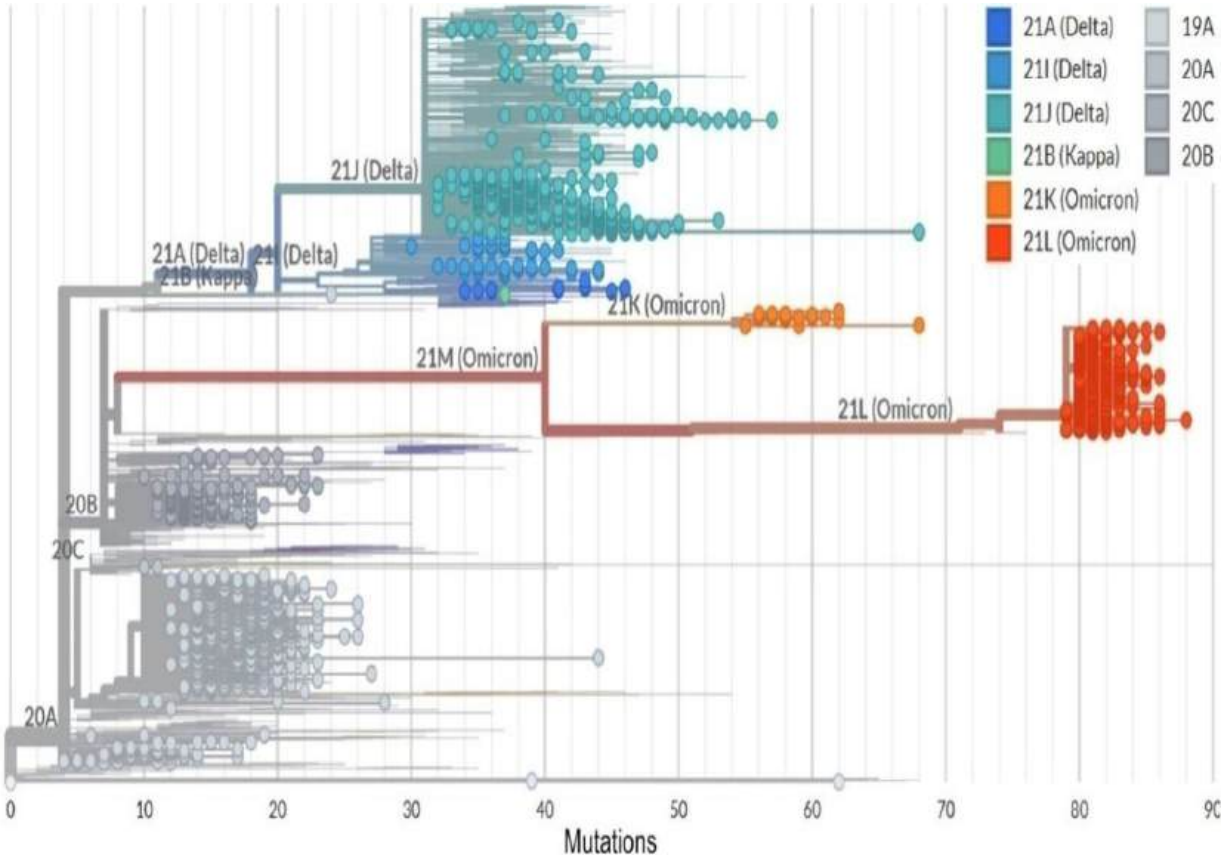


Fig. WGS-based phylogeny of SARS-CoV-2 variants detected during April 2021 to March 2022.

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-392

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

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

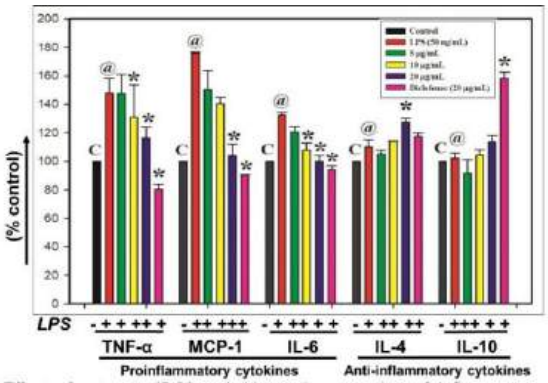
Objectives:

- Identification of ethnomedicinal plants of Assam, Arunachal Pradesh, and Manipur with potential immunomodulatory efficacies by using *in vitro* and *in vivo* models.
- Micronutrient profiling, phytochemical characterization and standardization of the effective plant extracts.
- Development of polyherbal product as per FSSAI standard with potential immunomodulatory efficacies.

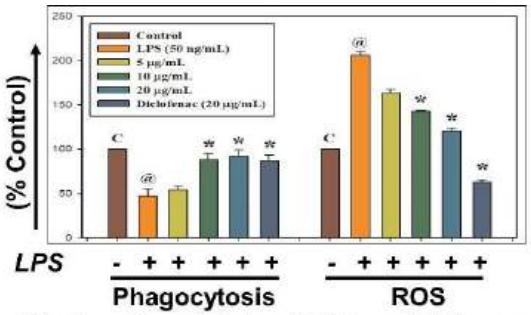
Salient Achievements:

- Treatment with lipopolysaccharide (50 ng/mL) caused a significant increase in reactive oxygen species (ROS) production, secretion of pro-inflammatory cytokines (TNF-α, MCP-1, IL-6) and decrease in anti-inflammatory cytokines (IL-4, IL-10) and phagocytosis potential compared to untreated group.
- Supplementation with the hydro-alcoholic (70% ethanol) plant extract dose-dependently reduced the ROS production, prevented the alternation in the secretion of pro-inflammatory and anti-inflammatory cytokines, and upregulated the phagocytosis potential in LPS-treated cells.
- Micronutrients namely, Zn, Fe, Cu, Cr, Mg, Mn, and Se were present in significant amount compared to recommended daily allowance (FSSAI guideline).
- Phytochemical analyses (LC-MS/MS) revealed the presence of various compounds, like methyl eugenol, eucalyptol, linalool, gamma-lactone, alpha-pinene, limonene, myrcene, which may play an important role underlying the anti-inflammatory potential of “Hill Pepper”.

Piper mullesua commonly known as “Hill Pepper”



Effect of extracts (5-20 ug/mL) on the secretion of inflammatory cytokines (pro & anti-inflammatory) in cells treated without or with LPS (lipopolysaccharide). Diclofenac is used as positive control; $p<0.05$.



Effect of extracts (5-20 ug/mL) on phagocytosis and ROS production in cells treated without or with LPS. Diclofenac is used as positive control; $p<0.05$.

Project Title: **MicroLabs-Based Genomic Surveillance of the SARS-CoV-2**

Project No: **GAP-393**

Funding Agency: FIND, Switzerland

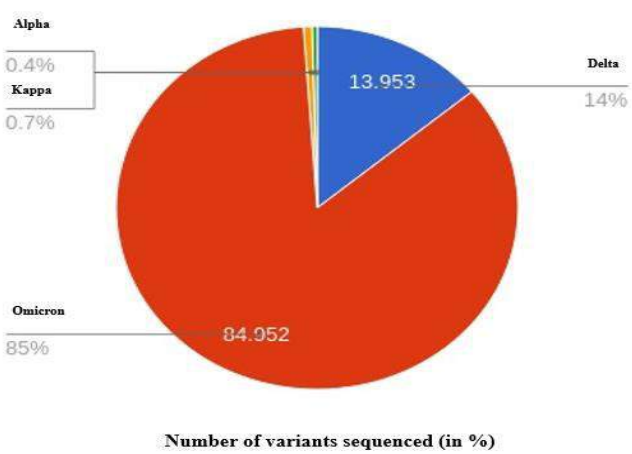
PI & Members: Dr Pankaj Bharali (PI), Dr Wahengbam Romi (Co-PI)

Objectives:

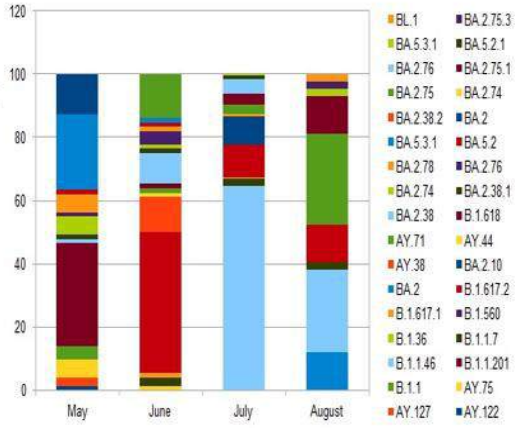
- Advance discovery of the Variants of Concern (VOC) and Variants of Interest (VOI).
- Track the evolution/progression of VOI to VOC.
- Identify genomic hotspots# based on the whole genome sequencing (WGS).
- To identify mutations associated with disease severity for preemptive surveillance for targeted geographical locations.

Salient Achievements:

- Establishment of the MicroLab based Genomic Surveillance facilities for SARS-Cov-2 genome of NE India at Centre for Infectious Diseases.
- A total of 895 SARS-CoV-2 positive samples have been sequenced and the data have been and deposited in the All-Influenza Virus and Coronavirus Database (GISAID) and Indian Biological Data Centre (IBDC) database.



Number of variants sequenced (in %)



Variant distribution (in %)

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: GAP-395

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

PI & Members: Dr Pankaj Bharali (PI), Dr Wahengbam Romi (Co-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 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:

- Samples were collected from 10 different locations from 5 districts of Arunachal Pradesh viz. Siang, East Siang, Upper Siang, Lohit and Anjaw and planted at CSIR-NEIST field for further experiment
- Conducted training and awareness programme on “Cultivation and Harvesting of Large Cardamom and Turmeric”
- Most of the endophyte isolates from soil and plant parts (rhizomes, stems, roots, and leaves) of healthy Cardamom and Curcuma belong to the genera Fusarium and Bacillus. All the isolates were identified morphologically and 16sRNA sequencing is under processed for the proper identification
- Mass propagation of both Turmeric and Cardamom has been undertaken and the regeneration protocol has been standardized.

Amomum direct regeneration- Hormone Con: 0.5mg/l Kin +0.1mg/l NAA

Curcuma direct regeneration- Hormone Con: 0.5mg/l Kin +0.1mg/l NAA.

Different types of Fungal Isolates from *Amomum subulatum* L. and Turmeric (*Curcuma* sp.).

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: GAP-397

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

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

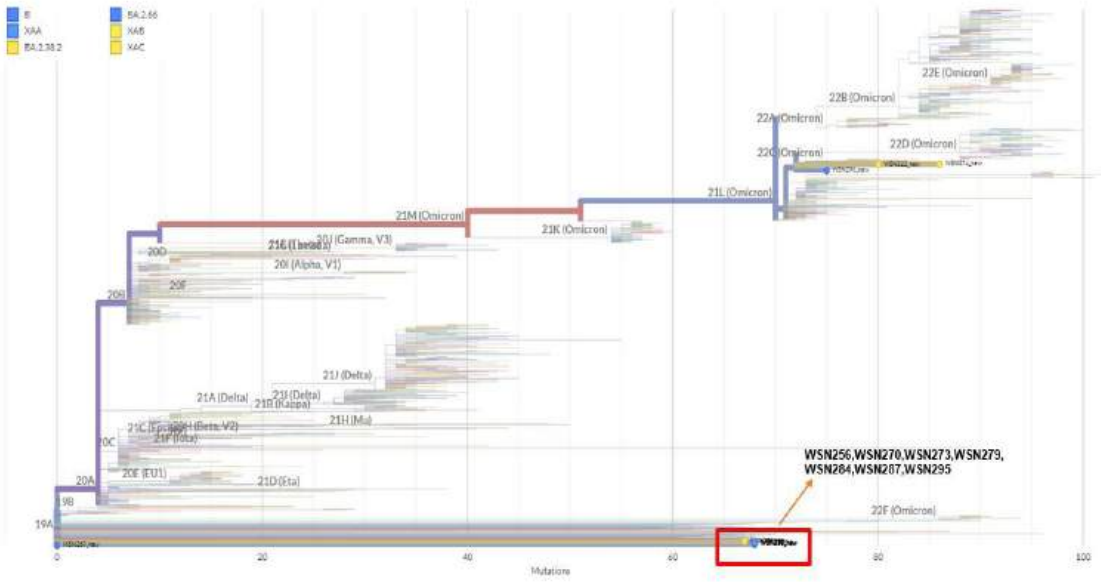
Objectives:

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

Salient Achievements:

- Several waste water samples have been collected from different water bodies of Jorhat District and all physicochemical parameters have been evaluated to determine the levels of toxicity in the water bodies. 69 wastewater samples tested positive for SARS-CoV-2 and out of which 48 samples passed the QC for sequencing and sequence have been generated for only 11 samples. The detected mutation/variants are aas follows: WSN256 (Recombinant, Lineage- XAB), WSN269 (19A Lineage-B), WSN270 (Recombinant, Lineage-XAA), WSN273 (Recombinant, Lineage-XAC), WSN 274 (21L- Omicron, Lineage- BA.2.38.2), WSN279 (Recombinant, Lineage-XAA), WSN 282 (21L- Omicron, Lineage- BA.2.38.2), WSN284 (Recombinant, Lineage-XAA), WSN 287 (Recombinant, Lineage-XAA), WSN295 (Recombinant, Lineage-XAA), WSN296 (21L-Omicron, Lineage- BA.2.66).

Sample collection Sites



The phylogenetic tree is shown by NextcladePango Lineage.

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

Project No: GAP-797

Funding Agency: Indian Council of Medical Research (ICMR), Govt. of India

PI & Members: Dr Wahengbam Romi (PI), Mr. Moirangthem Goutam Singh

Objectives:

- Assess the atherosclerosis-linked gut microbiota and host metabolome in context to dietary intervention.
- Elucidate mechanism of gut microbiota amelioration of atherosclerosis.

Salient Achievements:

- Selected the *in vivo* models of atherosclerosis and formulated the experimental diet for the intervention.
- Standardized the metagenome extraction protocol for gut microbiome study.
- Optimized the library preparation method for microbiome sequencing.

Project Title: **Human Microbiome as a Therapeutic Target for Improving Women Health**

Project No: GAP-802

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

PI & Members: Dr Wahengbam Romi (PI)

Objectives:

- Profiling of host microbiome and metabolome of women with symptomatic and asymptomatic PNM.
- Elucidating microbiota, microbial genes and microbial-derived metabolites that are key contributors to PNM.
- Deciphering the microbial and metabolite interactions underlying pathogenesis of PNM.

Salient Achievements:

- Optimized the metagenome extraction from mid vaginal swabs for maximum recovery, purity, microbial content & diversity.
- Targeted metagenomic sequencing showed the dominance of vaginal microbiota (VM) by *Lactobacillus* spp. The VM existed in three community state types (CSTs), which were differentiated by microbiota abundance and distinct diversity. CST-I (*L. iners* dominated) occurred in healthy VM, while menopausal VM was dominated by CST-II (*L. crispatus*, *L. helveticus*, and/or *Lactobacillus* sp._1 dominated) and CST-III (non-*Lactobacillus* dominated).
- The VM was predicted to play significant key functional roles in the host metabolic pathways in a manner specific to each CST.

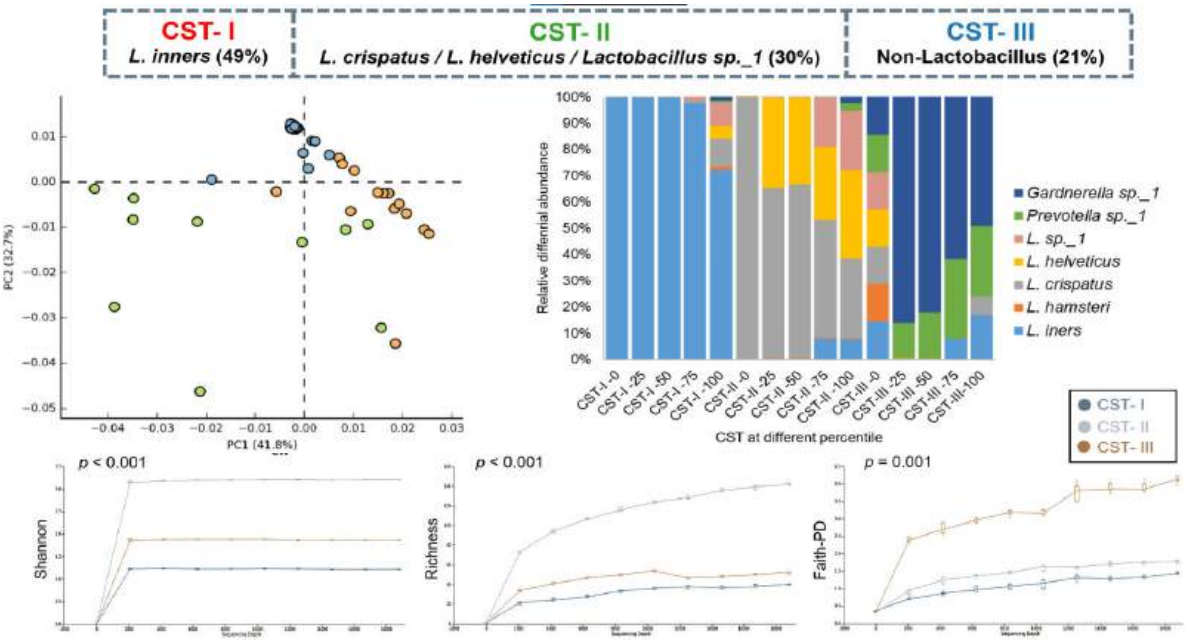


Fig. Difference in the VM community structure and diversity between the CST types.

CHEMICAL SCIENCES & TECHNOLOGY DIVISION

The Chemical Science & Technology Division (CSTD) of CSIR-NEIST, Jorhat is devoted for novel basic and application oriented organic chemistry and natural products. It is involved in isolation of biomarkers and phytochemicals as herbal formulation development and new synthetic methods for pharmaceutically important organic scaffolds, drug intermediates, agrochemicals.

Extraction of bioactive molecules from plant materials has the significance impact in the society as well as industry towards the development of herbal product based drug/ formulation etc. To develop affordable medicines from resources of medicinal plants of North East India and a data base on traditional herbal products used by different tribes/ethnic population in the North East India. Based on the activity, chemical investigation of some of the plants have been taken-up on their innovativeness activity and for successful formulation of herbal medicine for various diseases from plant sources to get commercialization.

Ongoing projects

I. Mission Mode

Project Title: Development of Spice Based Immunomodulatory Nutraceuticals from North East India

Project No: HCP-0035

Funding Agency: CSIR, New Delhi

PI & Members: Dr Ravindra K. Rawal (PI), Dr Prasenjit Manna, Dr Mantu Bhuyan, Dr Rituraj Konwar, Dr Jatin Kalita, Dr N. Velmurugan, Dr Subrata Ghosh, Dr Arup Roy

Objectives:

- Development of scalable processes for the key starting materials of lopinavir and ritonavir.

Salient Achievements:

- Plant materials (*Capsicum chinenses* and *Cinnamomumtamala* in place of *Cinnamomumpauciflorum*) have been collected and documented.
- Plant materials have been Identified and Herbarium vouchers were prepared.
- The Lab Scale Plant materials have been dried, grinded and extracted in triplicate with 100% ethanol via soxhlet method.
- Chemical profiling of *Capsicum chinenses* and *Cinnamomumtamala* extracts have been completed and standardized of extracts with biomarkers has been done.

- *In-vitro* efficacy of both the extracts were tested for in Raw 264.7 cell line using cell viability assay, NO production assay, DPPH assay and estimation of cytokine markers (TNF-α, IL-6, IL-4, and IL-10) in order to assess their anti-inflammatory and immune-modulatory activities.

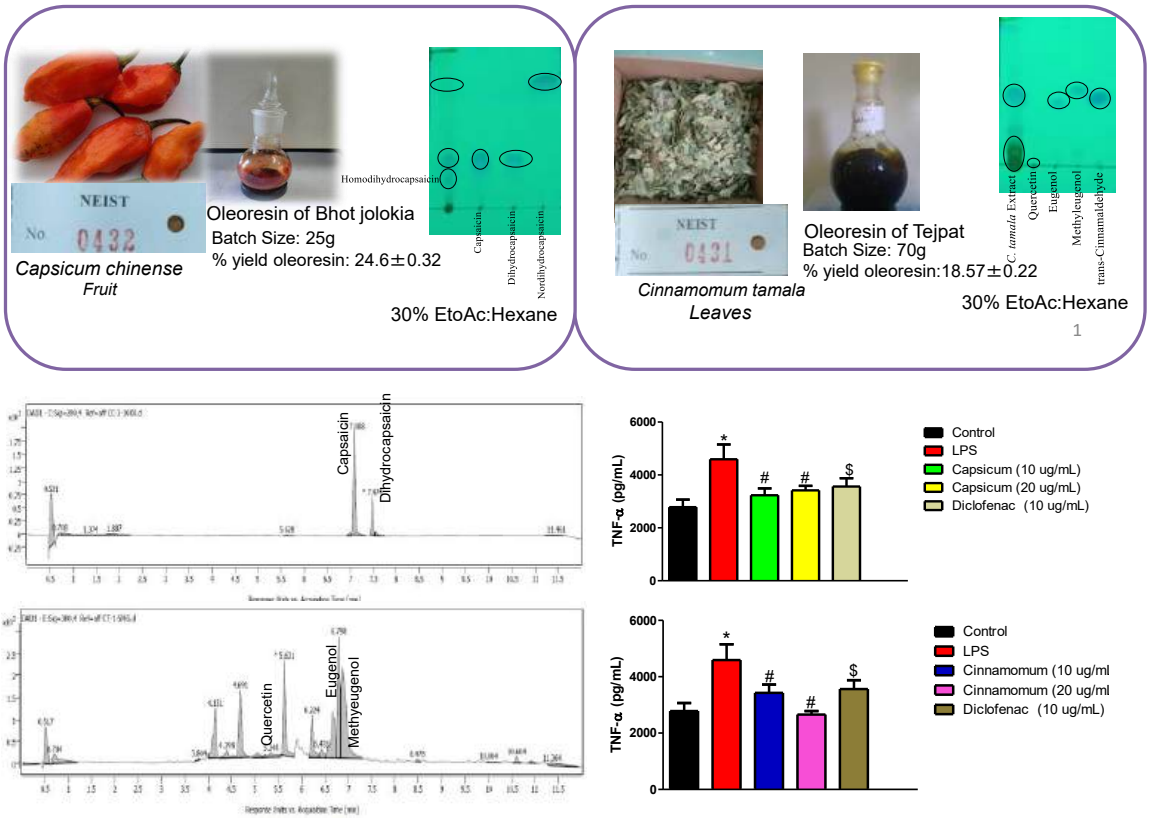


Figure: TLC, LC-MS/MS and TNF-α Inhibition of *Capsicum chinense* and *Cinnamomumtamala* extracts.

Project Title: Immunomodulatory Function of nutritionals and Nutraceuticals for health and wellness (Immunity Mission)

Project No: HCP-0035

Funding Agency: CSIR, New Delhi

PI & Members: Dr Rinku Baishya (PI), Dr H B Singh, Dr Archanamoni Das, Dr Pallab Pahari, Dr Dipanwita Banik, Dr Chandan Tamuly,

Objectives:

- To develop a polyherbal based Immunomodulatory Product

Salient Achievements:

- Synergistic combination of three plants of northeast India were evaluated for their immunomodulatory activity under CSIR-Immunity Mission project, HCP-035.
- One polyherbal based immunomodulatory product is being developed.

II. Focused Based Research Projects

Project Title: **Design and Synthesis of π-Extended Carbon Materials for Photonic Applications**

Project No: **MLP-1015**

PI & Members: Dr Pranjal Gogoi (PI) and Dr Hemant S. Dutta (Co-PI)

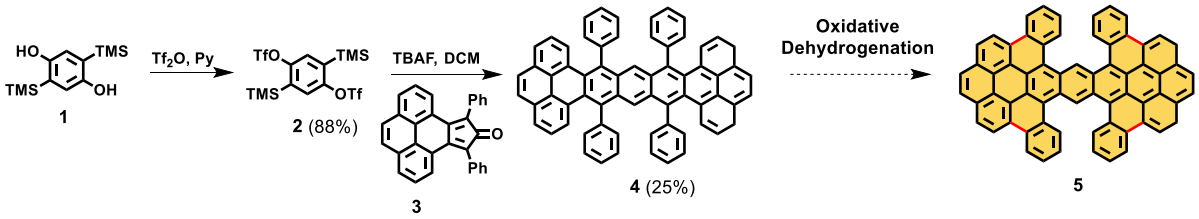
Funding Agency: CSIR, New Delhi

Objectives:

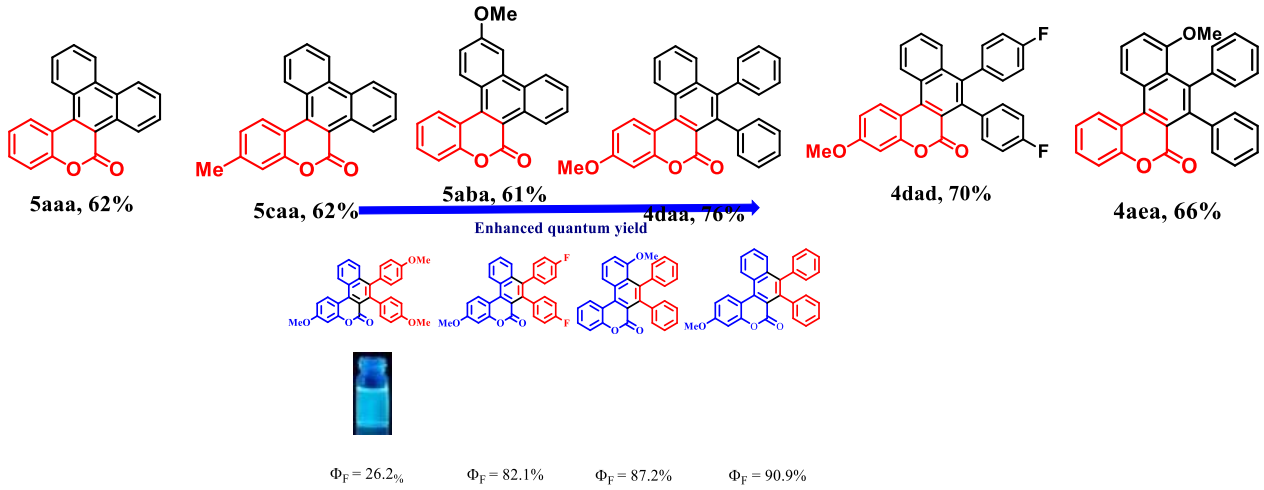
- Synthesis of graphene nano flakes by highly reactive aryne intermediate.
- Synthesis of dibenz[a,c]anthracene.
- Synthesis of heterocycle-fused π-extended carbon network.
- Tuning of their photophysical properties for designing efficient fluorescent probes for photonic applications.

Salient Achievements:

- Successfully synthesized the intermediate **4** which will undergo oxidative dehydrogenation to give dibenz[*a,c*]anthracene derivative **5**.



- Synthetized 26 π-extended coumarins (a few 14-C and 10-C π-extended fused coumarin derivatives)*via* Pd(0)-catalyzed annulation process with alkynes and arynes. The 10-C π-extended fused coumarin derivatives have shown excellent photophysical properties with fluorescence quantum yield upto 92%. This work has been published in reputed peer reviewed journal "The Journal of Organic Chemistry".



III. In-house, Grant in aid & Consultancy Projects

Project Title: **Natural Products/ Phyto-Pharmaceuticals/Herbal Formulations/ New Chemical Entities for Value Addition**

Project No: **OLP-2066**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Archana Moni Das (PI), Dr Sanjib Gogoi, Dr Gokul Baishya, Dr Pranjal Gogoi, Dr Ravindra Kumar Rawal, Dr Pallab Pahari, Dr Subrata Ghosh, Dr Ram Awatar Maurya, Dr Rinku Baishya, Dr Arup Roy, Dr Atul Ashok More, Mr. Gaurav Kumar Rastogi, Dr Jugal Bori, Mr Amit Kumar, Mrs. Rumi Borah, Dr Rituraj Konwar, Dr ChandanTamuli, Dr Dipanwita Banik

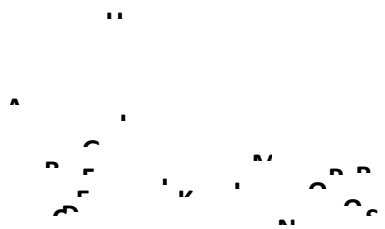
Objectives:

- Bioassay guided extraction and isolation of secondary metabolites from selected medicinal plants against different diseases and chemical investigation of the active extracts for drug like molecules.
- Studies on novel chemistry and their application in the synthesis of natural products and bioactive molecules.
- Development of Natural Products and their analogues for their phyto-pharmaceuticals, chemical profiling, identification of marker compounds and herbal formulations.
- Maintenance of the state-of-the-art equipment and facilities and animal house facility and providing services.

Salient Achievements:

- **Phytochemical analysis of ginger oleoresin**

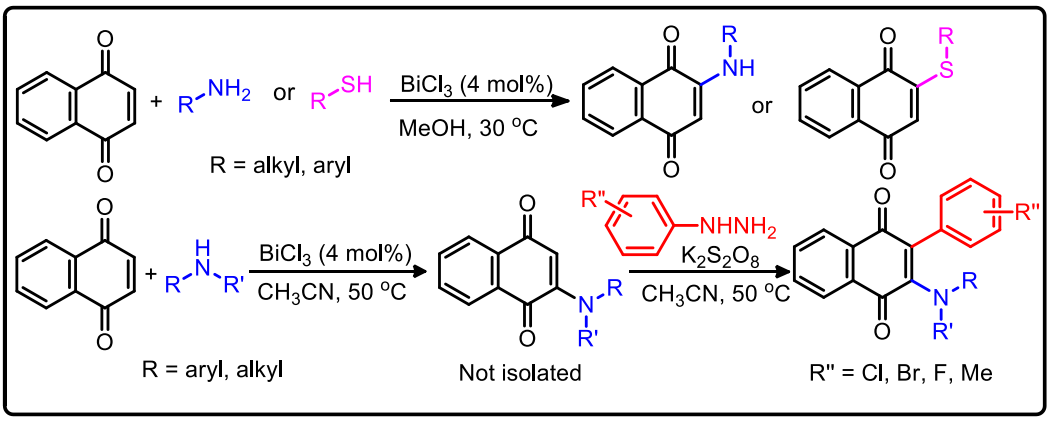
  Phytochemical analysis of 28 different ginger varieties have been carried out. For the analysis dried ginger powder was extracted with 95% ethanol and after removal of solvent the crude oleoresin was injected in a HPLC-HRMS facility. From the HRMS data eighteen (18) compounds namely, Hexahydrocurcumin, 3,5-Diacetoxy-7-(3,4-hydroxyphenyl)-1-(3,4-hydroxyphenyl)heptane, Tetrahydro-curcumin, 3,5-Diacetoxy-7-(4-hydroxy-3-methoxyphenyl) heptane, 6-Gingerdiol, Gingerenone A, 6-Gingerol, Methyl 6-Gingerol, 8-Gingerol, 6-Shaogaol, 8-Gingerdione, Dehydro-6-gingerdione, Coronarin, 10-Gingerol, Dehydro-10-gingerol, 10-Shogaol, Dehydro-8-gingerdione, and Dehydro-10-gingerdione were identified. These eighteen compounds were present among all the tested varieties of ginger and 6-gingerol was the major compound.



The amounts of individual compounds were relatively measured by the integration of the corresponding peak areas in the HPLC. For relative quantification 4-methoxy benzoic acid (A) was used as standard. Low level of diversity among individual components were observed across the studied ginger varieties. Work is going on for the standardization of the quantification method of individual chemical components and thereby comparison of.

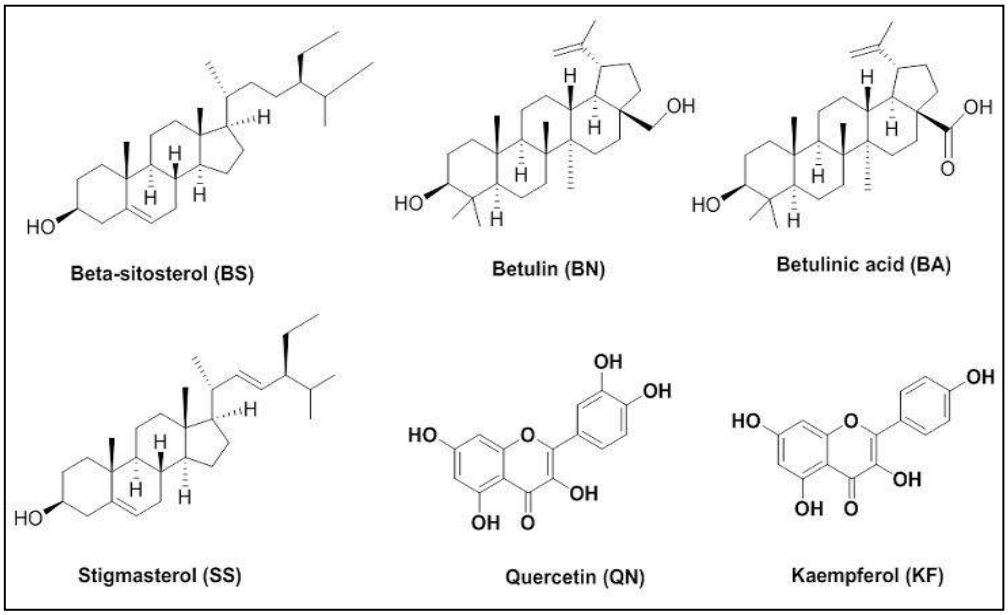
- A novel and efficient visible-light-mediated denitrogenativephotoannulation of *α*-azidochalcones into 2,5-diaryloxazoles was developed. The carbon-carbon double bond of *α*-azidochalcone was cleaved leading to the formation of new C-O and C-N bonds in the photoannulation. The generality and scope of the reaction was studied by synthesizing a series of 2,5-diaryloxazoles including two naturally occurring oxazoles (Texamine and Balsoxin) in excellent yields. (U. D. Newar, S. Borra, R. A. Maurya*, Visible-Light 2,4-Dinitrophenol-Mediated Photoannulation of α-Azidochalcones into 2,5-Diaryloxazoles. *Org. Lett.* 2022, 24, 24, 4454–4458)
- 1,8-Diazabicyclo[5.4.0]undec-7-ene (DBU) catalyzed redox neutral coupling of isatin with phenacylazides in acetonitrile to yield 2-oxoindolin-3-yl benzoates under mild reaction conditions was developed. The scope of the reaction that leads to the formation of a new C-O and C-H bond in the overall transformation was explored by synthesizing more than 35 examples in high yields (70- 85%). Un-substituted phenacylazides as well as those bearing electron donating groups (Me, OMe, OH, OCH_2O), halogen atoms (Cl, Br) or electron withdrawing group (CN, NO_2) led to the reductive aroylation of isatin in high yields in a short reaction time (6 h). (U. D. Newar, K. Bora, S. Borra, R. A. Maurya*, DBU mediated coupling of isatin with phenacylazides: synthesis of 2-oxoindolin-3-ylbenzoates. *New J. Chem.*, 2023, 47, 2464-2473)
- We are also in the process of developing C-peptide mimetics to unravel its therapeutic role in Diabetes Mellitus (DM) and related complications. Biomimetic strategy has been one of the most powerful tools to understand the structure and function of biomolecules. Herein we have prepared a series of prepare C-peptide mimics, which displayed better activity than the native C-peptide. These mutations we believe will help us understand the active sites of C-peptide, and also assist to explore its intracellular signal transduction pathways in DM. Studies with different cell culture models are underway, and will help understand the role of C-peptide in insulin secretion, glucose metabolism, and the prevention of vascular inflammation in DM. If the proposed study leads to tangible results, it would certainly lead to the development of novel adjuvant therapy to achieve better control of glycemia and improve the lives of the diabetic patient population.
- **$BiCl_3$ catalyzed synthesis of 2-amino-1,4-naphthoquinones and 1,4-naphthoquinon-2-sulfides and one-pot sequential amine-arylation of 1,4-naphthoquinone:**Using the Lewis acid catalyst $BiCl_3$, a new method for the synthesis of 2-amino-1,4-naphthoquinones and 1,4-naphthoquinon-2-sulfides from 1,4-napthoquinone has been devised. This method has a broad substrate range and

easy product extraction. It contributes to low-cost, mild and sustainable reaction conditions as well as superior product yields. Additionally, this study presents the first technique for one-pot sequential amine-aryaltion with amines and arylhydrazines/$K_2S_2O_8$ to produce arylated 2-amino-1,4-naphthoquinones directly from 1,4-naphthoquinone. This operationally straightforward generation of the aryl radicals from arylhydrazines undergoing free radical coupling reaction is well demonstrated by the radical trapping control experiments. (*Org. Biomol. Chem.,* **2022,** *20*, 9172-9183).



Scheme 1. Synthesis of 2-amino-1,4-naphthoquinones and 1,4-naphthoquinon-2-sulfides, and one-pot amine-alkylation and amine-arylation of 1,4-naphthoquinone.

- Several natural products like betulinic acid, betulinic acid (BA), betulin (BN), *β*-sitosterol (BS), kaempferol (KF), quercetin (QN), and stigmasterol (SS) have been identified by LC-QTOF-MS method analysis of ethanolic extract of Dilleniaindica bark and found to be having tyrosinase inhibitory activity.



Project Title: Oxidative Addition and Electrophile Driven Cyclization Approach Towards Azaspirocycles: Synthesis and Anticancer Activity

Project No: GPP-356

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

PI & Members: Dr Pallab Pahari (PI), Dr Mintu Pal (Co-PI)

Objectives:

- Synthesis of azaspirocycles via intramolecular oxidative addition cyclization and electrophile driven intramolecular cyclization.
- Synthesis of library of azaspirocycles including skeleton of biologically active azaspirocyclic natural products and spiroindoloalkaloids.
- Study of *in vitro* cytotoxicity and anticancer activity of the synthesized compounds.

Salient Achievements:

- **Synthesis dihydroquinazoline derivatives and study of their potential inhibitory activity against intracellular infection of *Staphylococcus aureus***

  Sucessfully synthesized a seventeen different dihydroquinazoline derivative using a very simple method and tested for their NorA efflux pump inhibitory effects on norfloxacin and ethidium bromide resistance of *S. aureus* 1199b strain. Eight dihydroquinazoline analogues out of seventeen were found to reduce the MIC of norfloxacin and Etbr for S. aureus 1199b. In addition to their very low toxicity, they showed high EtBr and norfloxacin accumulation respectively. Among them four dihydroquinazoline analogues were able to reduce the intracellular S. aureus 1199b in human THP-1 monocytes in presence of sub-inhibitory concentration of norfloxacin.

Project Title: Design and Evaluation of Peptide Assisted Delivery Strategy Targeting Avβ3 Integrin for Potential Alleviation of Atherosclerosis

Project No: GPP-366

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

PI & Members: Dr Rinku Baishya (PI)

Objectives:

- To evaluate a novel hexapeptide as potential carrier to atherosclerotic plaque.
- To design a novel hexapeptide conjugated liposome encapsulating baicalin.
- To evaluate its αvβ3 specific targeting capacity in atherosclerotic plaque through *in vivo* biodistribution studies.

Salient Achievements:

- One novel hexapeptide conjugated liposome was evaluated for its αvβ3 specific targeting capacity in atherosclerotic plaque through in vivo biodistribution studies.

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

Project No: GPP-367

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

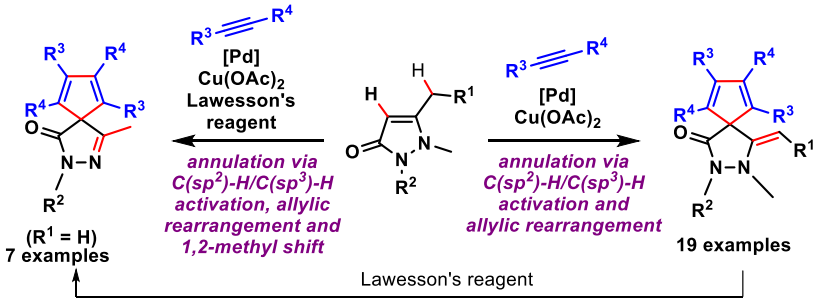
PI & Members: Dr Sanjib Gogoi (PI)

Objectives:

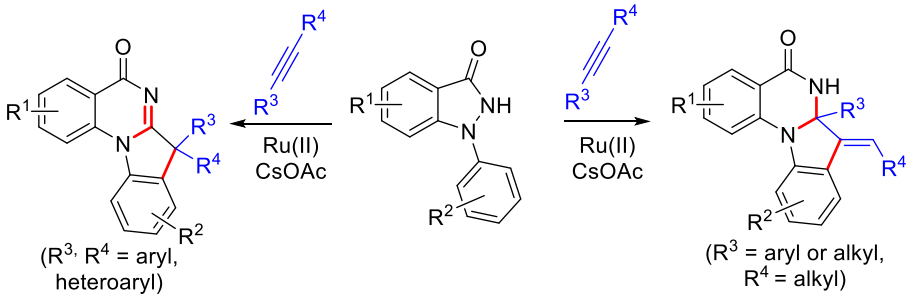
- To develop asymmetric synthesis of spirocyclic compounds using proper combination of metal complex and chiral ligand.

Salient Achievements:

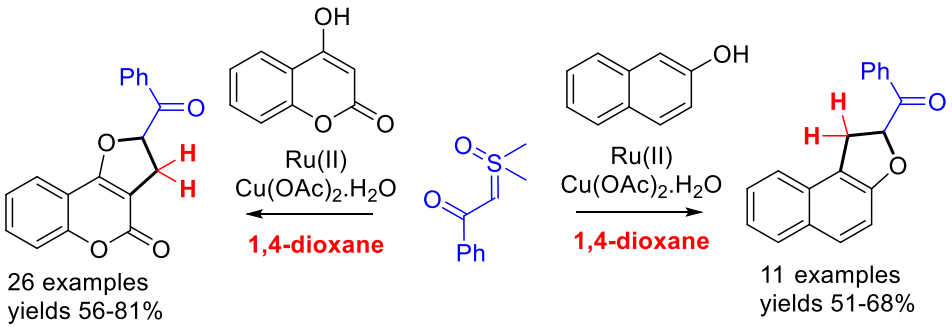
- The first Pd(II)-catalyzed activation of Csp^2-H bond and double alkyne annulation which proceeds via allylic isomerization is developed.This reaction of antipyrines with alkynes provides an efficient synthetic route for the biologically important spiro-cyclopentadiene pyrazolones. In the presence of Lawesson's reagent, this Pd(II)-catalyzed annulation reaction affords another spiro-cyclopentadiene pyrazolones which display very good fluorescent properties.



- Developed a Ru(II)-catalyzed reaction of phenylindazolones with diaryl substituted alkynes and arylalkyl/dialkyl substituted alkynes which have provided an efficient route for the construction of all-carbon quaternary centered indolo[1,2-a]quinazolin-5(7H)-ones and quaternary carbon centered 6a,7-dihydroindolo[1,2-a]quinazolin-5(6H)-ones, respectively. Indolo[1,2-a]quinazolin-5(7H)-ones are formed via C-H activation, annulation and 1,2-aryl shift reactions whereas dihydroindolo[1,2-a]quinazolin-5(6H)-ones are formed via C-H activation, annulation and deprotonation reactions.



- An unprecedented annulation reaction is developed for the synthesis of dihydrofuran fused compounds. In this Ru-catalyzed hydroxyl group directed reaction, easily affordable sulfoxoniumylides and 1,4-dioxane were used as the annulating partners. This is the first example of use of 1,4-dioxane as a methylene source to construct a heterocyclic scaffold. A wide range of dihydrofuran fused coumarins and naphthalenes were synthesized using this three component reaction.



Project Title: **Bio-Evaluation and Identification of Lead Molecules for Lung and Colon Cancer from Selected Medicinal Plants**

Project No: GPP-385

Funding Agency: ICMR, New Delhi

PI & Members: Dr.Archana Moni Das (PI)

Objectives:

- Isolation, purification and characterization of active compounds from selected medicinal plant extract.
- Phytochemical analyses of crude as well as pure compounds, target identification and lead optimization and structure activity relationship (SAR) study.
- *In-vitro* evaluation of plant extract, isolated compounds and lead molecules for anticancer activity, A549 and HCT15 cell lines.
- *In-vitro* evaluation of tumor regression will be done using xenograft model of cancer progression.
- Attempt will be made for preparation of herbal formulation and technology development.

Salient Achievements:

- Plant materials (*Lantana Sp., Artemisia Sp.,Kayea Sp. And Zanthoxylum Sp.*) have been collected, documented and extracted with green solvent for identification of its marker compounds.
- Phytochemical analyses of the extractinboth ethanolic and methanolicsolventhad been done.
- Biological activity for antimicrobial analyses had been studied in bacteria and fungus and showed very good result.

Project Title: **Profiling of Immunomodulatory and Anti-Inflammatory Activities and Estimation of Micronutrients of Traditional Medicines from the Eastern and Western Himalaya with Special Reference to Assam, Arunachal Pradesh, and Manipur**

Project No: GPP-392

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

PI & Members: Dr. Archana Moni Das (PI), Dr.Prasenjit Manna (Co-PI)

Objectives:

- Identification of ethnomedicinal plants of Assam, Arunachal Pradesh, and Manipur with potential immunomodulatory and anti-inflammatory efficacies by using in vitro and in vivo models.
- Micronutrient profiling, phytochemical characterization and standardization of the effective plant extracts.
- Elucidation of mechanism of action of the efficacious plant fractions.

Salient Achievements:

- Exploration of unique herbal bio-resources of East Himalaya and generate new information on bioactive components from indigenous medicinal plants of North-East India.
- Plant materials had been collected, documented and extracted with green solvent for identification of its marker compounds.
- Phytochemical analyses of the extractinboth ethanolic and methanolicsolventhad been done.
- Biological activity for antimicrobial analyses had been studied in bacteria and fungus and showed very good result.

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:

- Newly Sanctioned: Work in Progress.

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 areas 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 has the expertise in the field of Engineering R&D, applied and translational research, technical consultancy, testing and evaluation S&T intervention for rural development, entrepreneurship and skill development activities. The thrust areas of research include Design & simulation, thermal-fluid analysis, advanced manufacturing, materials properties analysis, advanced welding technology etc. The Group also imparted skill development training on different trades like welding, fitting, plumbing, glass blowing, CNC, Weaving, etc. In addition this group provided infrastructural services to all the division by fabrication, repairing, maintenance, glass blowing services, vehicle repair (repair and maintenance), refrigeration and air condition services. General Engineering Group is involved in different types of technology development work; scale up of lab scale technology, optimization at commercial level, preparation of detail project report (DPR) and techno economic feasibility report (TEFR) etc.

Ongoing Projects

I. FTT and FBR Projects

Project Title: Development of an Efficient and Cost-Effective Process for Production Of Caffeine and Tannin from Tea Waste

Project No: MLP-1012

Funding Agency: CSIR, New Delhi

PI & Members: Dr Bipul Das (PI), Er Ravi Kumar Lingam (Co-PI), Dr Sanjib Gogoi (Co-PI), Mr Tobiul Hussain Ahmed (Co-PI), Dr Swapnali Hazarika (Co-PI), Dr Pallab Pahari, Dr Jatin Kalita, Er Jayanta Jyoti Bora, Dr Dipul Kalita

Objectives:

- Characterization of raw material, product and residue.
- To develop a cost-effective process for production of 1 kg per batch caffeine and tannin from tea waste.
- Development of value-added products from the tea waste residue remained after extraction of caffeine and tannin.
- Technology know-how package preparation for 50 kg/day caffeine and tannin production.

Salient Achievements:

- **Extraction of Caffeine from Tea waste**: Caffeine is a drug intermediate for the production of wide range of pharmaceutical formulations. Tea waste is the principal resources for the production of natural caffeine which contains 2 – 3.5% caffeine. Because of the huge demand of caffeine in global market, there is still a long way to go for production of natural caffeine using readily available unused tea waste of Assam to bring up the economic growth of this region. The proposed work is to develop a process technology for extraction of caffeine from tea waste of Assam using environmental friendly solvents in economic way. The detail technology know-how package will be made for setting up caffeine production unit to help various entrepreneurs and people of NER.

Fig: Process for production of caffeine and tannin from tea waste.

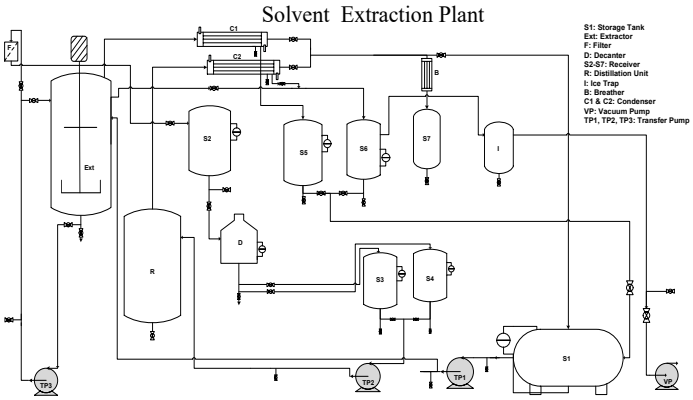


Fig: Process Flow Chart for production of caffeine and tannin.

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

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:

- Collection of microbial strain from various bio-resources and natural materials.
- Bio-chemical characterization of collected microbial stains in the laboratory.
- Physico-chemical and morphological characterization of collected natural materials in the laboratory.

Project Title: Development of Processes for Edible and Industrial Dyes from Plant Sources for Enhanced Income

Project No: MLP-1018

Funding Agency: CSIR, New Delhi

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

Objectives:

- Development of process for extraction and separation protocol of edible and non-edible dyes from plant species.
- Structural identification of dyes and their stability, safety and toxicity studies.
- Application of dyes for food, cosmetics and textile uses.

Salient Achievements:

- The process for natural dye production has been developed. Process operating conditions for 2 kg input (Fruit and plant) in terms of temperature, solid to solvent ratio, stirring speed, filtration conditions, membrane area for product separation, piping size, pump capacity, washing and drying conditions etc. for obtaining pure product of purity 98% have been established. It was found that the effective Membrane performance for separation and purification of natural dyes is > 120 cycle with Selectivity 100%.

(A) (B)

(C)

Fig: Liquid and solid dyes after membrane treatment (A) Orange (B) Deep pin (C) Red dye

It has been established that the dye has nutritional value as evidence from the nutritional analysis. The dyes contain protein, carbohydrate, fat, Fe, antioxidant and micronutrient (Vitamin C).

II. Skill Development Projects

Project Title: **Skill Development Training Program of CSIR–NEIST, Jorhat**
Project No: **NWP-100**
Funding Agency: CSIR, New Delhi
PI & Members: Er Dipankar Neog (PI), Er Jayanta Jyoti Bora (Co-PI), Er Dhanjit Das (Co-PI)
Objectives:

- To conduct skill development training in six basic and three advance training courses.

- To look after the post training intervention for the successful candidates
- To conduct all academic activities related to skill development training in line with NSDC of Ministry of Skill Development, Government of India.
- To do all formalities related to NSDC, Ministry of Skill Development, Government of India

Salient Achievements:

- CSIR NEIST has conducted nine (9) numbers of training programs and a total of 161 numbers of trainees have been trained, out of which approximately 65-70% of students has either got employed or self- employed.
- Conducted different awareness activities to popularize the skill development training program. The institute also organized a special program "*Skill Development Initiative for an AatmaNirbhar Future: An awareness program*" in connection with its Diamond Jubilee celebration.
- Keeping in connection with NSDC, our institute has got the approval for PMKVY 3.0 with 12 courses in the approval letter, out of which 6 courses shows approval status on PMKVY portal.
- Previously trained weavers under skill development training, have successfully created the rural entrepreneurship platform and are marketing their products through both offline and online modes. They successfully delivered a 100 numbers of "Man's Handloom Shawl" as corporate gift for a Bangalore based software company named "Assenture".Their products are now available in the e-portal "Mahila-E-haat" of Rashtriya Mahila Kosh of Ministry of Women and Child Development, GOI. Efforts are being made to make their items available at e-market portal "Amazon Karigar".

Glimpses of Skill Development training

Group photo of students and trainers after completion of skill development training.


Students during theory classes.



Students during practical classes.


Special program on skill development in association with the Diamond Jubilee Celebration of CSIR-NEIST.


Manufacturing and supplying of 100 numbers of man's shawl to M/s Accenture, Bangalore, India.

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:

- 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:

- A bio adsorbent has been successfully prepared from tea waste for treatment of tea factory wastewater.
- Color components from tea factory wastewater have been successfully removed up to environmental tolerable limits.
- Different nonlinear models have been fitted based on experimental in adsorption process.

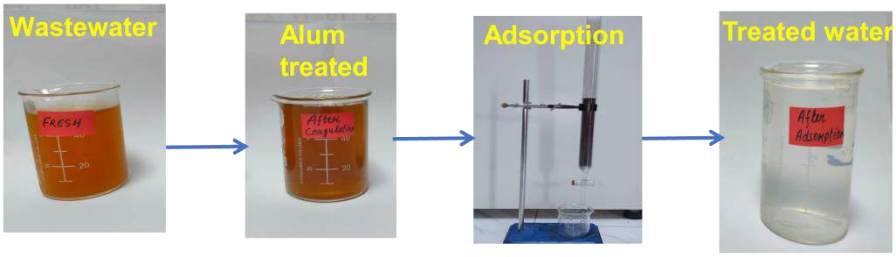
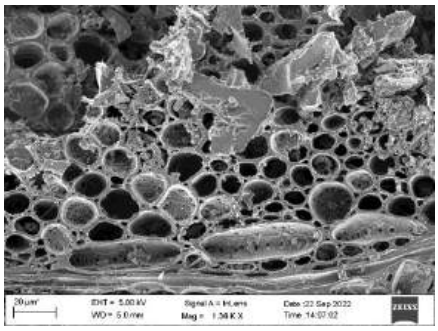
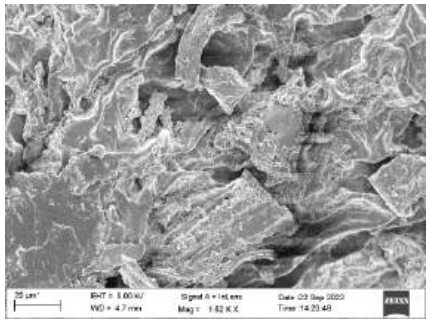


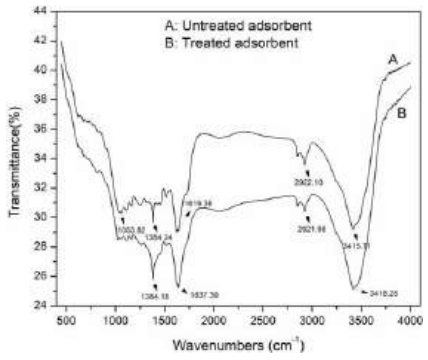
Fig: Step wise treatment procedure.



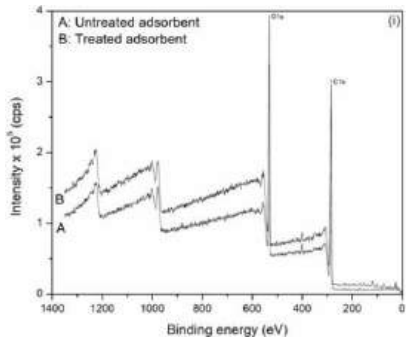
FESEM images of untreated adsorbent.



FESEM images of treated adsorbent.



FT-IR spectra of untreated and treated adsorbent.



XPS spectra of untreated and treated adsorbent.

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/industrial waste and used for treatment of oil contaminated wastewater for removal of oil, heavy metals and biological impurities. The surface of electrospun membranes have been modified with addition of nanofillers such as graphene oxide, cellulose nanocrystals etc.

III. In-house, Grant in aid & Consultancy Projects

Project Title: **Development of Reusable Facemask with Enhanced Antimicrobial Efficiency for Medical Care**

Project No: OLP-2041

Funding Agency: CSIR, New Delhi

PI & Members: **Dr Swapnali Hazarika (PI**), Dr Bipul Das, Dr Ashutosh Namdeo, Er Prtha Majumder, Er Ravi Kumar Lingam, Dr Pravin G Ingole, Dr Jitendra Singh Verma, Er Tobiul Hussain Ahmed,

Objectives:

- Design and development of polymeric membrane and nanofiber with effective surface modification by incorporation of nanomaterials

Salient Achievements:

- Under this project, a novel face mask from composite polymeric membranes with suitable pore size, water permeability, air permeability and antimicrobial activity has been designed (Patent filed).

Project Title: **Study and Development of Performance Concrete Using Construction & Demolition (C & D) Waste Materials for Construction of Bamboo Reinforced Concrete Structures, Pervious Road Pavement and Concrete Armour for River Erosion Protection.**

Project No: OLP-2042

Funding Agency: CSIR, New Delhi

PI & Members: Dr Sanjay Deori (PI), Er Dipak Basumatari (Co-PI), Er Tapas Das, Dr Leon Raj J, Er Nibir P Borah, Er Rajib Das

Objectives:

- Study the Construction & Demolition (C&D) waste materials and Brahmaputra river bed sand for useful application in development of high performance concrete.
- Design and evaluation of high performance concrete using the C & D waste materials for use in Bamboo Reinforced Concrete Structures, Pervious Road Pavement and Concrete Armour for river bank erosion protection.
- Study the performance of models of Bamboo Reinforced Concrete Structures, Pervious Road Pavement and Concrete Armour constructed with C & D waste materials-based High Performance Concrete in field application.

Salient Achievements:

- Collection, segregation and characterization of C & D waste samples.
- Design and development of performance concrete using C & D waste and Brahmaputra river bed sand.
- Testing and evaluation of performance concrete used Pervious Road Pavement and Concrete Armour for river bank erosion protection.
- Development of concrete armour for river bank protection.

Project Title: **Design and Development of a Combined Gasification and Forced Draft Thermal Conversion Device**

Project No: OLP-2050

Funding Agency: CSIR, New Delhi

PI & Members: Dr Biswajit Gogoi (PI)

Objectives:

- To design, develop and test a combined gasification and forced draft thermal conversion device for domestic and commercial applications.

Salient Achievements:

- A combined gasification and forced draft thermal conversion device was designed and developed.
- The heat transfer analysis within the device is done.

Project Title: **Promoting Innovations in Individuals, Start-ups and MSMEs (PRISM) TePP Outreach cum Cluster Innovation Centre (TOCIC)**

Project No: GAP-0214

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

PI & Members: Er Dipankar Neog (PI), Dr. Jyoti Kumar Doley (Co-PI)

Objectives:

- Regular advertisement for scouting for project proposal.
- Counselling with the innovators across the table for the innovative idea thrown by the individual innovators for funding and helping the innovators for preparing the project proposal.

- ❖ Reviewing the proposals through the empanelled list of subject experts, providing all necessary supports to the innovators towards implementing their project proposals. These supports include technical guidance for design, mathematical calculations, fabrications of models and prototypes, report preparation, IPR protection etc.
- ❖ Continuous monitoring of the project implementation and timely review.

Salient Achievements:

- ❖ 18 numbers of proposals scouted, one project forwarded to DSIR and three successful projects are in commercial production.
- ❖ PRISM innovators of TOCIC-NEIST has participated in the Brain Storming Conclave on Atmanirbhar North East through S&T Intervention (@ Cotton University, Guwahati; 21-22 December 2021) and in the Conclave on Transforming Meghalaya State through S&T Intervention (@ Shillong, Meghalaya; 09-10 April 2021).
- ❖ Conducted the event Technodia: 2021-22 where 11 numbers of schools have participated as a part of PRISM activities and Azadi ka Amrit Mahotsav.

Project Title: **Design and construction of Low Cost & Eco-friendly Rural Housing/ Emergency Shelter/ Quarantine Center using Locally Available Materials under STINER Project**

Project No: GPP-347

Funding Agency: Ministry of DoNER, GoI, New Delhi

PI & Members: Dr Mantu Bhuyan (PI), Er Jayanta Jyoti Borah (PI), Er Dipak Basumatari (Co-PI), Er Dipankar Neog (Co-PI), Dr Sanjay Deori (Co-PI), Dr S P Saikia, Dr. Dipul Kalita, Er. Tapas Das, Dr. Leon Raj J, Er. Dhanjit Das, Mr. Ashok Kalita

Objectives:

- ❖ The main objectives of the project are to use locally available materials especially bamboo for construction of low-cost emergency cottage like quarantine centre/emergency shelter within short period.
- ❖ To apply different types of treatment for enhancement of durability of bamboo and other locally abundant materials.
- ❖ It also aimed at fabricating different furniture like bed, tables etc. from bamboo.
- ❖ Bamboo is one of the most promising naturally building materials in NE India. All the materials like bamboo, steel, cement, aggregate etc. used were tested for quality control check before construction.

Salient Achievements:

- 3 (Three) units of low cost & eco-friendly Rural Housing/Emergency Shelter/Quarantine Centre were designed and constructed at CSIR-NEIST Bio Diversity Eco Park using locally available materials specifically bamboo under STINER project which is a technology popularisation, implementation project through training demonstration and incubation.

Fig: Bamboo house

Project Title: **Development of Nanoparticles Incorporated Thin Film Nanocomposite Polymer Membranes for Effective Mixture Gas Separation**

Project No: GPP-357

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

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

Objectives:

- Synthesis of nanomaterials and use of nanoparticles to develop the polymer membranes.
- Development of new highly H_2-selective TFN membranes.
- Development of new highly CO_2-selective membranes from the mixture gas (CO_2/CH_4).

Salient Achievements:

- Thin-film nanocomposite (TFN) membranes used for gas separation at the industrial level are one of the best choices, because of nanoparticles, the higher surface area of the membranes gets enhanced gas permeance. In this project work, we found the novelty of preparing TFN membranes for the separation of various gases like H_2, CO_2, CH_4, water vapor, and N_2, etc. Under this project work, the prepared membranes are not only used for the separation of water vapor but also for different gases like H_2, CO_2, CH_4, and N_2. All prepared TFN membranes were well characterized using different physiochemical characterization techniques. The prepared TFN membranes show high permeance for all gases along with enhanced selectivity. The TFN membranes have selectivity for H_2/CO_2 is 4.41 and for CO_2/N_2 is 24.74 and for CO_2/CH_4 is 36.1 respectively.

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:

- CAD design of the 500 kg solar-biomass distillation plant and its analysis using CFD tools.
- Training and demonstration of the developed hybrid distillation plant to the potential farmers.
- Preparation of the training manuals on the developed hybrid distillation plant.
- Design and fabrication of laboratory scale (two different size 10 ltr. and 20 ltr capacity) distillation plant based on the solar-biomass hybrid system.
- Two numbers of training program organized in association three Non-Governmental Organisations, namely, NESSIA, Punjoy Organics and Snehpad participated in the program. Under these programs, Total 22 nos of trainees took part in the training.

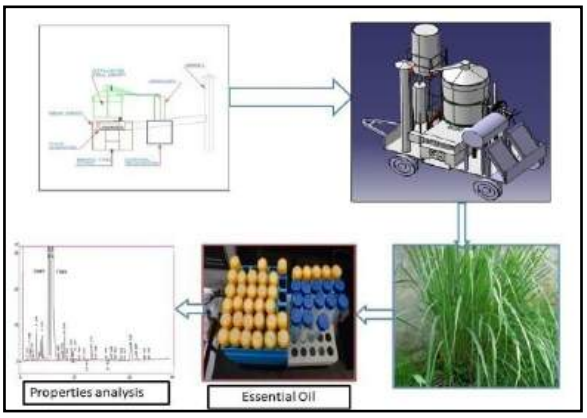


Fig: Flow diagram of mobile distillation unit.

Fig: Hands on training on essential oil distillation process.

Project Title: **Removal of Phenol drom 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

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:

- Designed novel membrane and adsorptive materials for treatment of phenolic waste water.

Project Title: **Structural Health Monitoring of Foundations of Towers and Chimneys at Silapathar, Assam**

Project No: **CNP-478**

Funding Agency: M/s Teams India Pvt. Ltd.

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:

- To carry out structural health monitoring by Non-destructive Test (NDT) of Foundations for Chimneys and Towers at Silapathar, Dhemaji, Assam
- To carry out quality check along with evaluation of compressive strength of foundations of newly constructed structure at site.

Salient Achievements:

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

Project Title: **Structural Health Monitoring of Plinth Beam of Control Room Building at 132/33 kV, Silapathar (New) Substation under NERPSIP, Assam, India.**

Project No: **CNP-480**

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:

- To carry out structural health monitoring by Non-destructive Test (NDT) of plinth beam and foundations Control Room Building at Silapathar, Dhemaji, Assam
- To carry out quality check along with evaluation of compressive strength of plinth beam and foundations of newly constructed structure at site.

Salient Achievements:

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

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 posses 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

III. Focused Based Research Projects

Project Title: **Earthquake Hazard Studies in Moderate and Severe Seismic Zones of India (EHIND)**

Project No: MLP-0005

Funding Agency: CSIR, Govt. of India

PI & Members: Dr Bijit Kumar Choudhury (PI), Dr Manoj Kumar Phukan (Co-PI), Dr Santanu Baruah (Co-PI), Dr Debasis D Mohanty (Co-PI), Dr Chinmoy Rajkonwar, Mr Sausthov M Bhattacharyya, Dr Timangshu Chetia

Objectives:

- Imaging the lithospheric structure beneath NER of India to study the degree of variation in lateral heterogeneity of the lithosphere by means of Lg tomography.
- To create a catalogue of moment magnitude (M w) from inversion of Lg spectra,
- To devise empirical ground motion prediction equation (GMPE) based Mw derived from Lg spectra and predict ground motion for the three seismic domains viz. Arunachal Himalaya, Indo-Burman Ranges and the Shillong-Mikir Plateau
- To carry out the numerical modeling of earthquake waves and the identification of physical mechanism based on 1D velocity model. To accomplish this objective, modeling of earthquake events will be carried out through waveform inversion to understand the physics of the earthquake process and to characterize the associated faults and lineaments.
- To investigate deformation and dynamics of lithosphere through detection and interpretation of seismic anisotropy and stress analysis.
- Mantle deformation pattern analysis by splitting measurements to understand the present tectonics of NE Himalaya and Indo-Burmese Range (IBR) and stress-strain pattern calculation to decipher and characterize potential hazards.
- Unified crustal model preparation from converted phases by 'Receiver Function Inversion' techniques to understand the crustal scale dynamics and its implications towards.

Salient Achievements:

- Identified Sites for the 09 New Broadband Seismic Stations Under CSIR MLP-0005 project.

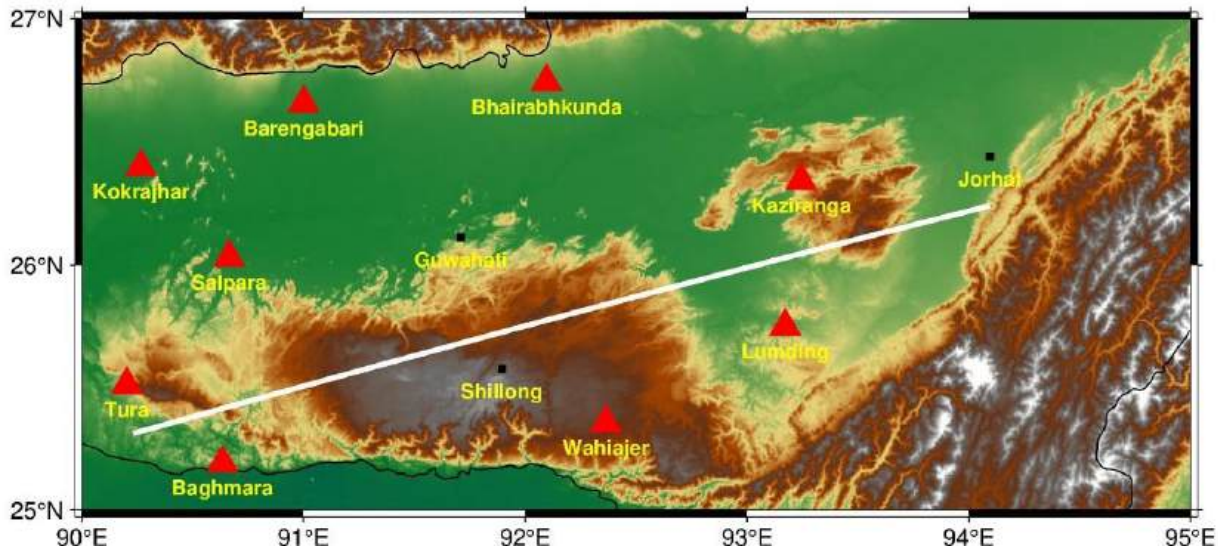


Fig : An E-W transect covering Shillong-Mikir hills plateau region showing the proposed nine broadband seismic stations under CSIR FBR-MLP-005 project through red coloured triangles.

- Reconnaissance Survey is being planned to be carried out in Assam and Meghalaya states of North East India in the months of August & September 2022 to select nine sites for establishment of 09 new broadband seismic stations under the CSIR FBR-MLP-0005 project. The proposed nine sites have been shown in the Figure 1 through red coloured triangles.
- Initiated the process for procurement of broadband seismographs and supporting devices to be deployed in the aforementioned proposed sites under the CSIR FBR-MLP-0005 project.
- Other computing devices are in the process of procurement to set up a seismic imaging laboratory for various seismological studies like seismic tomography, receiver function techniques, seismic anisotropy, waveform inversion etc.
- A tectonic domain based novel algorithm is being developed to compute average quality factor of Lg seismic wave (Q_{Lg}) using python programming language for Shillong-Mikir Hills Plateau.
- Determination of Hypocentral parameters of Kopili fault is being done.
- Preparation of the boundary parameters and conditions for future deformation analysis in crustal and mantle scale is being carried out.

IV. In-house, Grant in aid & Consultancy Projects

Project Title: **Seismotectonics of NE India and Adjoining Region with Emphasis on Seismic Hazard Assessment**

Project No: OLP-2039

Funding Agency: CSIR, Govt. of India

PI & Members: 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 Chinmoy Rajkonwar, Mr Pradip Kumar Dutta, Mr Sausthov M Bhattacharyya, Dr. Timangshu Chetia

Objectives:

- Seismic monitoring in the NE India region & earthquake source characterization. VSAT connectivity to 10 seismic stations.
- Geophysical mapping of Kopili fault area
- Characterization of tectonic stress pattern of the lithosphere with emphasis to the understanding of the regional seismic wave propagation
- Earthquake precursory study of active zones through monitoring of seismic and other geophysical parameters.
- Seismic Imaging, deformation & geodynamics of the Wadati-Benioff zone and understanding the oblique subduction characterization of IBW.

Salient Achievements:

- **Seismic Network**

  A network of 8 (eight) broadband seismograph is currently being operational. However, as seismic monitoring has been the sole responsibility of National Centre of Seismology (NCS) for entire India, CSIR-NEIST had to reorient its focus from seismic monitoring, and currently efforts have been centered on seismic zone specific earthquake recording so that enough data can be generated to identify the and characterize the active seismic zones. High quality earthquake data is also very important for seismic precursory studies. In view of above, efforts have been on to increase the number of seismic stations to cover the active earthquake source zones. To fulfill this objective the institute has decided to install 10 new seismic observatories across NE India region and process for purchasing 10 (ten) broadband seismographs is in progress.

- **Geophysical Mapping of Kopili Fault Zone**

  Conducted detailed geophysical surveys involving Proton Precession Magnetometer and Very Low Frequency (VLF) Electromagnetic surveys along the Kopili Fault zone as per suggestions from the Expert Committee of MoES, Govt of India. The surveys were conducted during December 2021- April, 2022.

Report on the field work :

First and second phase of Geophysical field survey involving VLF electromagnetic system (VLF EM), Proton Precession Magnetometer (PPM), Electrical Resistivitimeter (ERS) and Multi-channel seismograph (MASW)were carried out during 7th to 21st December 2021 and 17th to28thJanuary 2022, respectively. A total of 81 surveys were cumulatively carried out using the above-mentioned instruments during the said period; the sites were part of transect 1of the proposed 3 major transects along which the survey may be carried out across the Kopili Valley covering an area of 300 km X 100 km. Transect 1 covers the north bank areas of the Brahmaputra River and represents a zone of interaction between the Kopili Fault Zone and the Main Boundary Thrust of the Eastern Himalayan tectonics. The epicenter of the Mw 6.0 Sonitpur Earthquake which occurred on 28 April 2021 is located within the vicinity of the said transect.Surveys have been carried out in Darrang, Sonitpur, Udalguriand Nagaon districts of Assam.

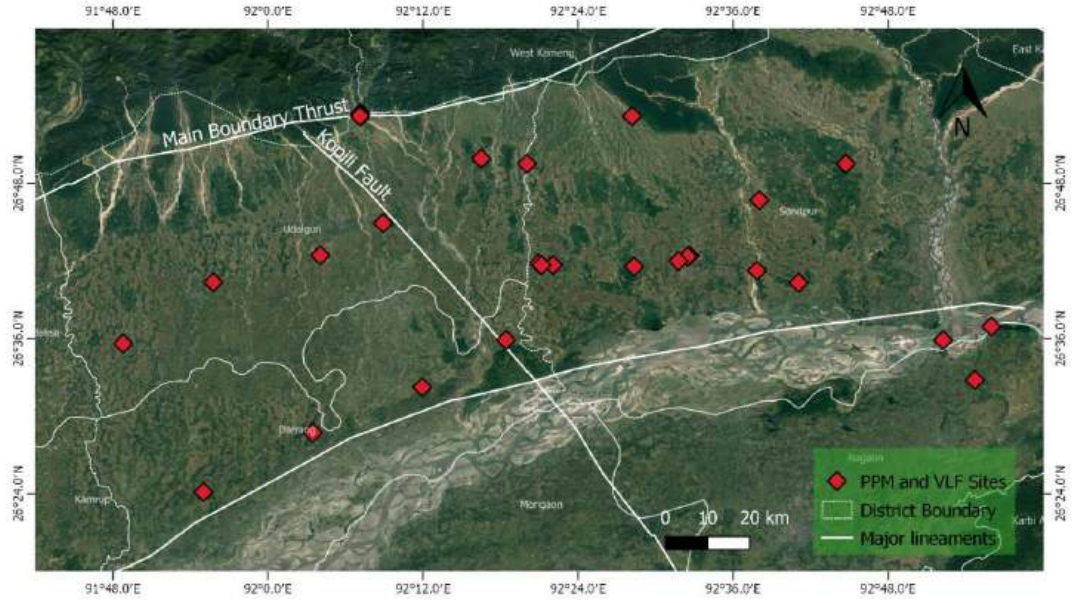
Due to the rapid and robust mode of operation as well as site adaptability PPM and VLF EM surveys were carried out in all the proposed transect sites with 30 surveys each as shown in Map 1. And the ERT and MASW surveys, consuming relatively higher amount of time and requiring extensive labor operations, were carried out at 13 and 8 sites as shown in Map 2 and 3, respectively.

Harvested paddy fields, locally known as *pathar*, community playgrounds and dry river flood plains, away from cultural noise and powerline activities, were chosen for the survey operations. Geomorphologically, the survey sites comprised of alluvial plains, mostly part of denuded flood plains of the great Brahmaputra Valley, and in the foothill regions of the Eastern Himalaya with moderate gradient. As streams and rivers are the surface manifestation of the Kopili Valley zone, most of the survey sites are located in the banks of small river and stream such as Dirrai, Tisso, Tiloi, Gabhoru, Neemtoli, etc. An oxbow was also observed at a site near Kharupetia in Darrang district and a few abandoned channels are observed in Nagaon district. At a site in Udalguri district, breach of embankment is observed suggesting turbulent flow during summer season. Kharupetia in Darrangdistrict of Assam, is host to a number of artificial and natural ponds, suggesting shallow water table depth.

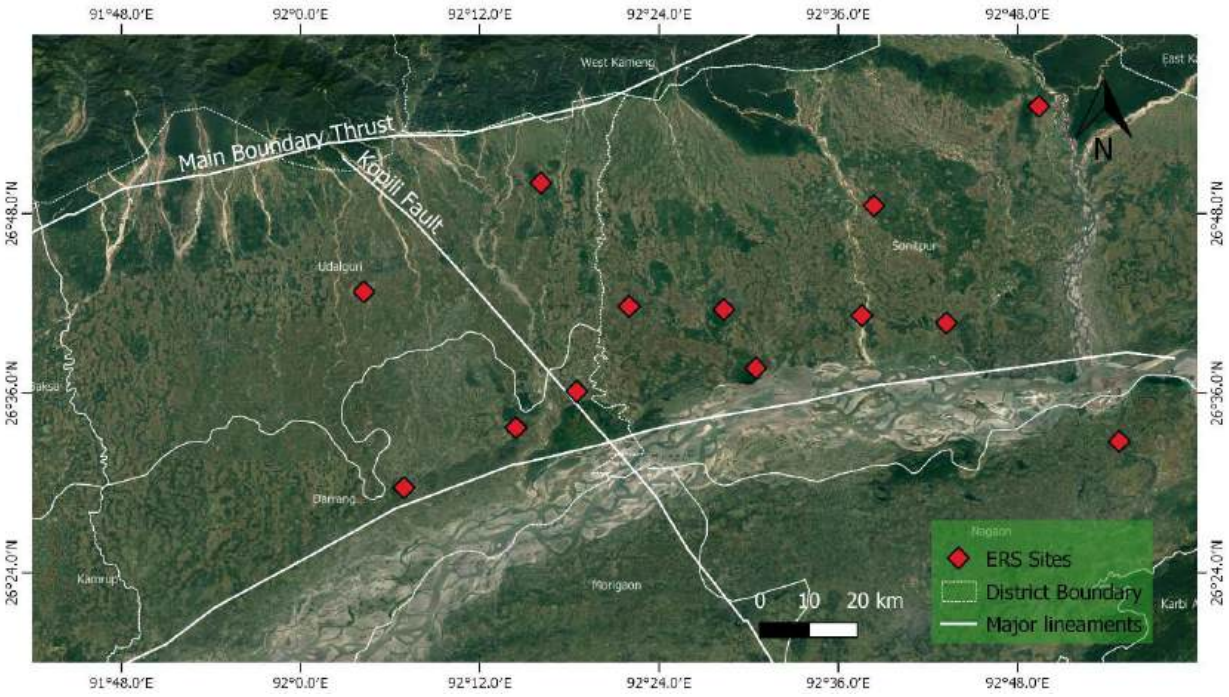
Apart from conducting surveys, attempts were also made to look out for digging and trenching activities in and around the survey sites to collect visual information of the subsurface lithology for future corroboration with the derived models (Photo 1 and 2). Besides, such trenches are often host to paleo-seismic evidence in the form of liquefaction tracts. However, no such evidence could be conclusively derived from the trenching sites visited. It was also commonly observed that a group of people gather to have an overview of the survey activities. Such groups were appraised

about the seismic vulnerability of the region along with suitable earthquake preparedness measures.

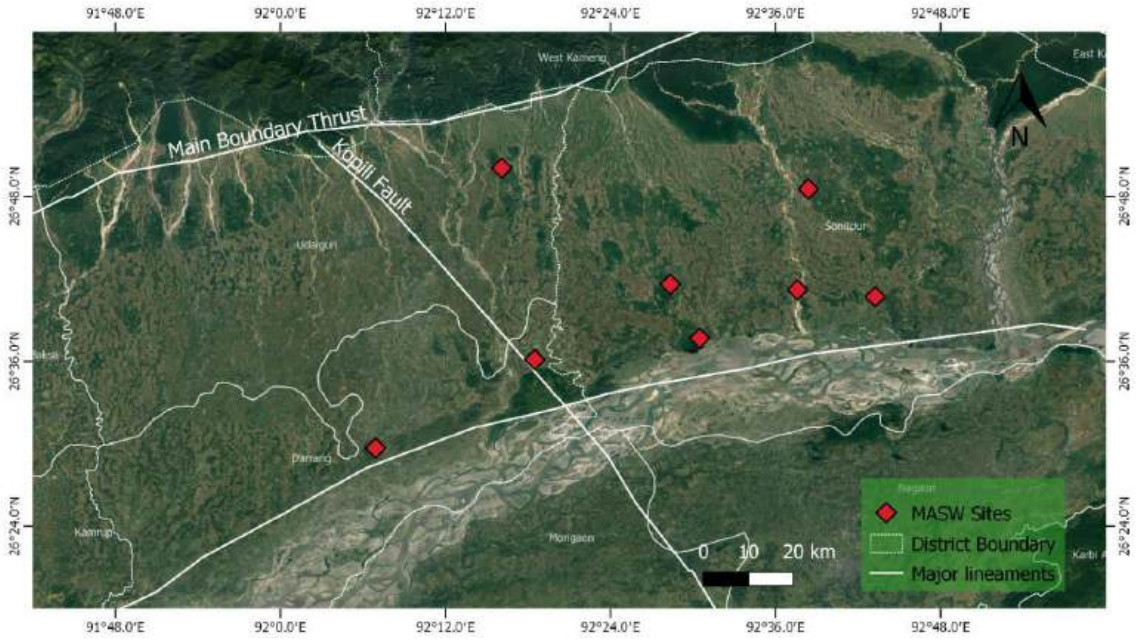
The third and fourth phase of the survey is proposed tobe undertaken in the month of February and March 2022, respectively, where in surveys at suitable sites in the mid transect and the southern terminal transects would be carried out



Map 1: Map showing PPM and VLF survey sites of phase 1 and phase 2of the proposed Kopili Zone Geophysical study.



Map 2: Map showing ERS survey sites of phase 1 and phase 2 of the proposed Kopili Zone Geophysical study.

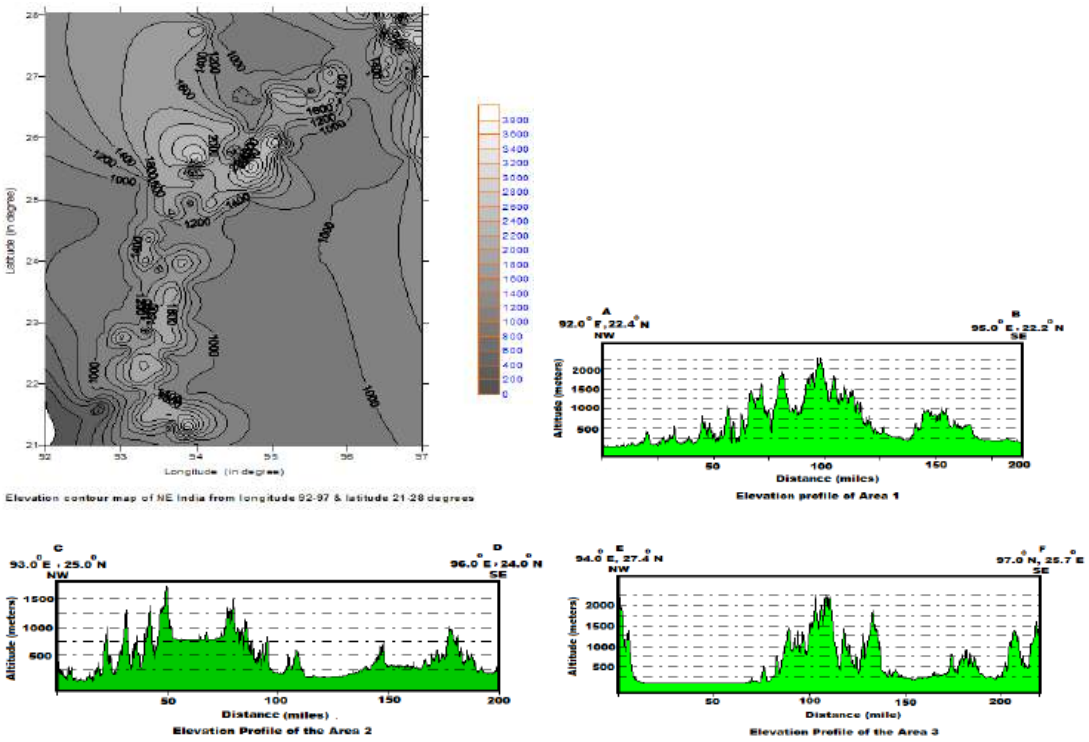


Map 3: Map showing MASW survey sites of phase 1 and phase 2 of the proposed Kopili Zone Geophysical study.

Photo 1: Survey team member at a trench location near Silpukhuri, Darrang district of Assam.

- **An attempt was made to ascertain whether terrain elevation offer any significant constraints on the seismic stress pattern in the Indo-Burma Range (IBR).**

  For this purpose selected elevation profiles were worked out for the IBR zone. Shuttle Radar Topography Mission (SRTM) elevation data were used elevation contour map for the area within longitude 92-97^{o}E and latitude 21-28^{o}N.



Elevation profiles at three sections were worked out. It was concluded that terrain elevation does not offer any significant constraints on the seismic stress pattern for the selected profiles.

- **Earthquake Monitoring & Seismo-Tectonic Studies in and around Mizoram**
  Installation of three BB-seismic stations in (i) Aizwal; (ii) Khawbung (iii) Lunglei for seismic monitoring and for source parameter determination. Training of technical person to locally maintain the seismic stations. The program was conducted in collaboration of CSIR NEIST with Pachunga University College
- An attempt has been made to preserve process and analyze the old analog seismograms. For the purpose 4 contract research workers were engaged for 6 months. Though it took time to calibrate and fine tuning the methods for digitizing the old analog seismograms, good success could be achieved in developing a method to preserve the seismogram digitally. Further efforts with financial supports are required to digitally preserve the large number of seismograms.
- **Electrical resistivity and other geophysical mapping of Indian Air Force Stations at Shillong and Jorhat**
  A geophysical mapping which includes: Electrical Resistivity Survey, Multi-channel Analysis of Surface Waves (MASW) survey and Ground Penetrating Radar (GPR) survey were conducted at the Indian Air Force (IAF) Base, Shillong to improve the earthing infrastructure. In the Shillong IAF base it was found that the ground is very resistive to electric current generating problem of proper earthing for very sensitive high-end equipment. On the other hand, at IAF base in Jorhat the ground is highly

conductive and causing direct connection between earthing grounded for different equipment.

- **Development of a geochemical map in an around Jorhat, district, Assam**
  Extensive field surveys has been done and worked out the general geology of the study area with help of previous works. The physical properties and occurrences of soil samples collected from various locations within the proposed study area has been documented and plotted on the map.

Project Title: **Seismic Microzonatin of Greater Dimapur, Nagaland**

Project No: GPP-326

Funding Agency: Dept. of Revenue & Disaster Management, Govt of Nagaland

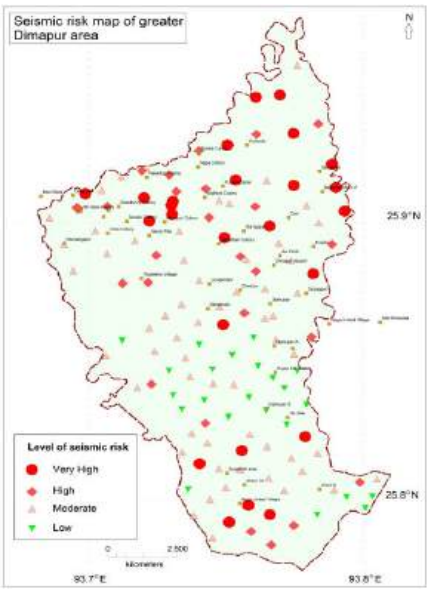
PI & Members: Dr Manoj Kumar Phukan (PI), Dr Santanu Baruah (Co-PI), Mr Sausthov M Bhattacharyya

Objectives:

- Preparation of seismotectonic map.
- Acquisition of seismic ambient noise data of entire Dimapur city at a grid interval of 1.0-1.5km.
- Processing, analysis and interpretation of ambient noise data.
- Estimation of H/V amplification ratio with fundamental frequencies and preparation of site amplification map.
- Comparison of seismic site amplification data with geological and geotechnical information for site characterization / classification.
- Estimation of strong ground motion parameters.

Salient Achievements:

- The project is completed and the final project completion report is submitted to the funding agency.
- Several products were developed from greater Dimapur from the products which include:
  a. Seismic risk map
  b. Soil liquefaction potential map
  c. Geomorphological map
  d. Soil predominant frequency map
  e. Seismic site amplification map
  f. Seismic vulnerability indices map
  g. Lithological map
  h. Hydrogeological map
  i. Overburden thickness map



Project Title: **Active Geodynamics, Evolution, Structure and Deformation Analysis of Indo-Burman Wedge**

Project No: GPP-352

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

PI & Members: Dr Debasis D Mohanty (PI)

Objectives:

- Mantle deformation and understanding the deep Earth process
- Crustal deformation and stress parameter evaluation to understand the contemporary tectonics Seismic Hazard estimation through seismicity analysis

Salient Achievements:

- Created by the oblique subduction of Indian plate beneath the Burma silver plate, the Indo-Burmese Wedge (IBW) is considered as one of the most active seismic wedge with high uplift and exhumation rates. The nature of subduction in the Indo-Burmese region is still a puzzle and the research and knowledge gained about this complex seismic zone is very limited. Although the role of indenting Indian Lithosphere, westward stress generated by Sunda and Burmese plate are major entity in the evolution and geodynamics of the critical Indo-Burmese arc, the deep lithospheric dynamics, mantle deformation patterns, complex Asthenospheric flow, presence of sharp and critical discontinuities of this region are still the mysteries and largely remain unexplored. A massive terrain with dense forest has been an obstruction for the seismological surveys in this area, which is a major constraint in discovering the actual present tectonic situation of this region due to lack of relevant data. The complex tectonics of this region is the major cause behind the larger seismicity of this region. The hour of the present need is to find out the actual complex tectonics, high resolution imaging of the activities of the crustal and mantle dynamics, simulating the present stress and strain patterns and estimating the futuristic predictions, which will be very useful for human mass of this particular region and the state.

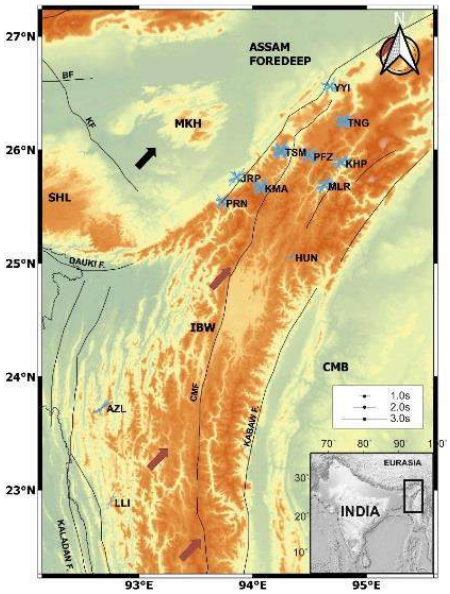


Fig: Representation of Mantle deformation pattern in IBR.

Project Title: **Effect of Change in Coulomb Stress on Guttenberg-Richter Law for the Seismicity of North East India Region**

Project No: GPP-368

Funding Agency: SERB-MATRICS

PI & Members: Dr Santanu Baruah (PI)

Objectives:

- To study the effect of change in Coulomb Stress on Gutenberg Richter law in the vicinity of North-East India.
- To establish possible empirical relationship between Coulomb stress changes and b-value for the selected regions of NE India.

Salient Achievements:

- The relationship between Coulomb stress changes & b-value was derived for Kopili Fault Zone (KFZ) considering a multi-source homogenized earthquake catalogue and GCMT documented $M_W \geq 6.0$ threshold events. The relation, b-value= -0.049 $\Delta\sigma_f$ - 0.009 with a correlation coefficient R2 ~ 0.804 perhaps represents the first empirically derived relationship between Coulomb stress changes & b-value. This relation could be an effective tool in seismic hazard analysis for the KFZ.

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 department has some unique features in the whole CSIR system e.g. Cellulose Pulp and Paper (CPP) is only laboratory in whole CSIR carrying R&D work on pulp and paper. Similarly, Polymer & Petroleum is involved in various activities, which cater the need of minerals and energy sector viz. coal, biomass, petroleum, polymers especially about the different aspects of the high organic sulfur coal of NE region. The Analytical Chemistry (AC) Group mainly supports the various sophisticated and high-end analytical equipments 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. The Advanced Materials (AM) Group is mainly involved in development of various high end nano materials and devices pertaining to environmental sensors, catalysts, catalytic devises and separation barrier for improvement of air and water quality, beneficiation, quality assessment and valorization of different mineral resources of NE region.

Ongoing Projects

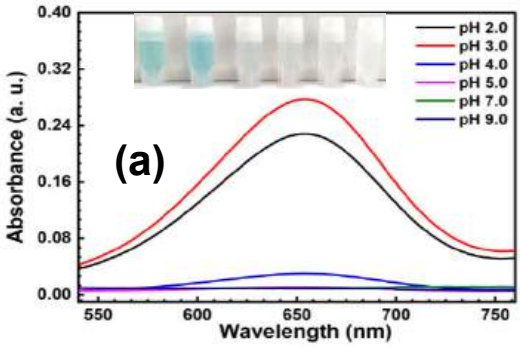
I. Focused Based Research (FBR) Projects

Project Title: **Plasmonic nanoparticle decorated 2D nanosheets for detection of the fluoride and arsenic in drinking water: Fabrication of a paper based analytical device**
Project No: **MLP-1009**
Funding Agency: CSIR, New Delhi
PI & Members: Dr Manash Ranjan Das (PI), Er Dipankar Neog (Co-PI), Dr Hemant S. Dutta (Co-PI)
Objectives:

- Synthesis and characterization of the plasmonic nanoparticles and their bimetallic counterparts on the exfoliated 2D nanosheets.
- The intrinsic peroxidase enzyme like catalytic behaviour of the plasmonic nanoparticle-2D nanocomposite materials through the oxidation of chromogenic substrate 3,3´,5,5´-tetramethylbenzidine(TMB), 2,2´-bis(3-ethylbenzothiazoline-6-sulfonic acid)(ABTS) and O-phenylenediamine (OPD) will be investigated.
- Finally, paper based analytical device(μPAD) will be fabricated for the visual and naked eye detection of the water contaminates like fluoride and arsenic using plasmonic monometallic/bimetallic nanoparticle decorated 2D nanosheets materials. Different existing fabrication techniques of (μPAD) will be used and some innovative techniques specific to the present application will also be used.

Salient Achievements:

- Four different type of the quantum dots (GQDs, g-CNQDs, h-BNQDs, MoS_2 QDs and WS_2 QDs) were synthesized. PL spectra were obtained after excitation of GQDs, g-CNQDs, h-BNQDs, MoS_2 QDs and WS_2 QDs at different wavelengths starting from 300 nm to 410 nm to determine the wavelength of maximum emission (λ_{max}). The peroxidase mimetic activity of the synthesized quantum dotes was demonstrated using peroxidase substrate TMB molecule in presence of the H_2O_2.



(b)

(c)

II. In-house, Grant in aid & Consultancy Projects

Project Title: **Analytical Instrumentation Facility and their Process Development**

Project No: **OLP-2030**

Funding Agency: CSIR, New Delhi

PI & Members: Dr Prakash Jyoti Saikia (PI), Dr Manash Ranjan Das (Co-PI), Dr Hemant S Dutta

Objectives:

- Development of affordable analytical platforms for determining specific toxins in edibles and herbal formulations.
- Development of co(polymeric) stabilizers in the preparation biocompatible polyester particles.

Salient Achievements

- Fabrication of paper based analytical devices has been carried out using wax-based and laser-based fabrication techniques. Colorimetric and fluorescence studies have been conducted to detect toxins in edibles. Synthesis and characterization of

nanomaterials such as GO, WS_2 and MoS_2 has been studied in order to improve the sensing capabilities of designed assays.

- Poly(eicosyl methacrylate-*co*-2-hydroxyethyl methacrylate) [poly(EMA-*co*-HEMA)] was synthesized *via* reverse atom transfer radical polymerization (ATRP) and used as copolymeric stabilizer in the preparation of polycaprolactone (PCL) and polylactic acid (PLA) particles. Synthesized different molecular weights of copolymer in the range of 15,000 to 1,00,000 $gmol^{-1}$ and assessed as stabilizer in the preparation of PCL and PLA particles. Surface morophology and stability of the PCL and PLA particles are dependent on the concentration of copolymeric stabilizer, reaction time and molecular weight of stabilizer.

Project Title: **Development of New Competitive, Environmental and Sustainable Bio-based Petroleum & Polymeric Nano-composite Materials**

Project No: OLP-2031

Funding Agency: CSIR, New Delhi

PI & Members: Dr Jayaramudu Jarugala (PI), Mr R Borah, Mr Koushik Dutta, Mr Lachit Phukan

Objectives:

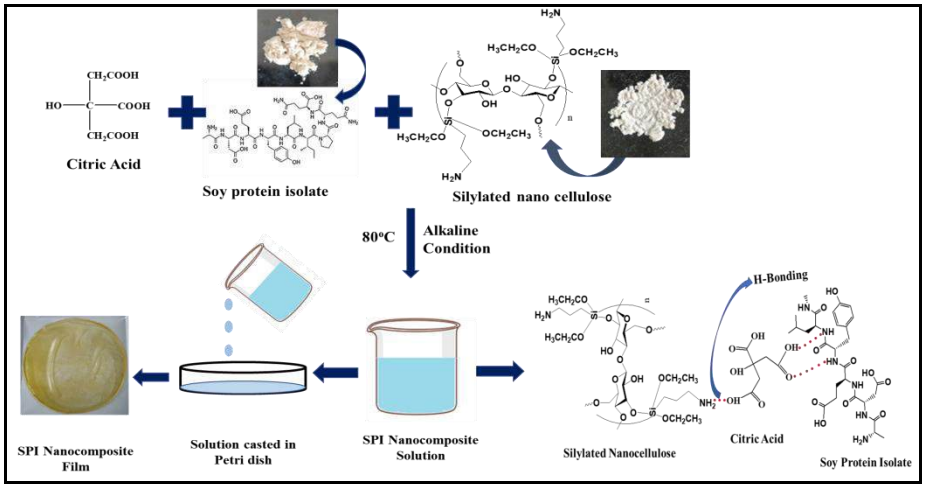
- Design and preparation of Nano Materials (NMs) based on coinage metal, base metal, clay, graphite, cellulose, carbon based materials, etc. and its modification for specific applications.
- Design and development of polymer/rubber nano-composite (P/RNC) with the inclusion of NMs as reinforcement required for its end application.

Salient Achievements:

- **Influence of silylated nano cellulose reinforcement on the mechanical, water resistance, thermal, morphological and antibacterial properties of Soy Protein Isolate (SPI)-based composite films.**

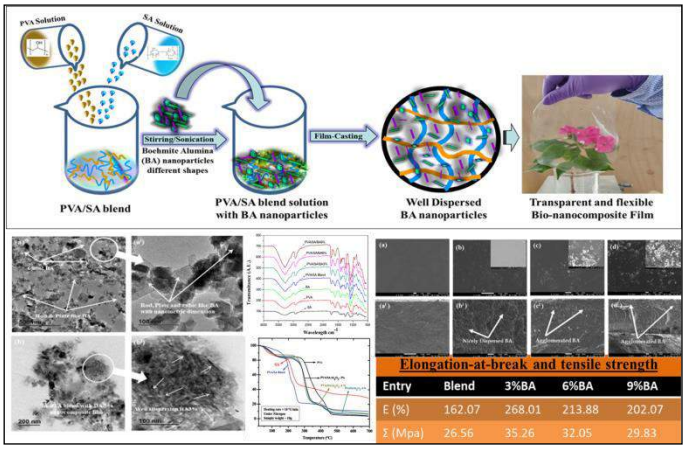
  The aim of the research work is to improve the mechanical and water-resistance properties of soy protein isolate (SPI) biofilm, 3-aminopropyltriethoxysilane (APTES) coupling agent modified nanocellulose was introduced into the SPI matrix in presence of citric acid cross-linker. The presence of amino groups in APTES made it effective to form cross-linked structures with soy protein. The incorporation of a citric acid cross-linker made the cross-linking process more productive, and the surface smoothness of the film was confirmed by a Scanning Electron Microscope (FE-SEM). From the study of the mechanical, thermal and water resistance strength of the film, it was confirmed that the results were highly satisfactory for the modified nanocellulose incorporated film compared to the non-modified one. Additionally, coating of citral essential oil onto SPI nanocomposite film displayed antimicrobial properties due to presence of various phenolic groups in the citral oil. The Tensile Strength and Young's Modulus of silane-modified nanocellulose films were enhanced by ~89% and ~112%, respectively. Consequently, this work may offer an effective way for silylated

nano-cellulose reinforcing soy protein isolate (SPI) based bio nanocomposite films for medical and packaging applications. (***International Journal of Biological Macromolecules, 2023, under*** **review)**



- **Sodium Alginate/Polyvinyl Alcohol- boehmite alumina Bio-nanocomposite Films**

  In the present work, bio-nanocomposite films of sodium alginate/polyvinyl alcohol (SA/PVA) blend with different loadings of boehmite alumina (BA) nanoparticles were developed *via* the film-casting technique. The bio-nanocomposite films obtained, containing boehmite alumina nanoparticles, are highly transparent and eco-friendly. The morphological characterization, by using TEM, AFM and SEM, indicate the fact that the BA nanoparticles showed a homogeneous dispersion at low BA loading, with rod-like features and plates with cubic crystal shapes morphology. Conversely, BA agglomeration was observed at higher BA loading. The mechanical properties indicate improvements in the tensile strength and elongation-at-break and flexibility in the 3 wt% BA nanoparticles loading. This (3 wt%) is stable with homogeneous dispersion of BA nanoparticles in the SA/PVA blend matrix, which is confirmed by SEM and TEM analysis. Additionally, the contact angle of the blend matrix was observed to be 34.7° and with the incorporation of boehmite alumina (BA) of between 3 to 9 wt % to the hydrophilic blend matrix, the results in contact angles of the nanocomposite films in increasing hydrophobic order of 47.9–67.9°, respectively. Furthermore, the incorporation of BA nanoparticles shows that the SA/PVA blend matrix have desirable thermal stability. From the present study, the novel ternary SA/PVA/BA bio-nanocomposite films could be a potential candidate to be used in the fields of biomedical (such as wound healing) and packaging applications. ***(International Journal of Polymer Analysis and Characterization, 27, Pages 236-251, 2022)***



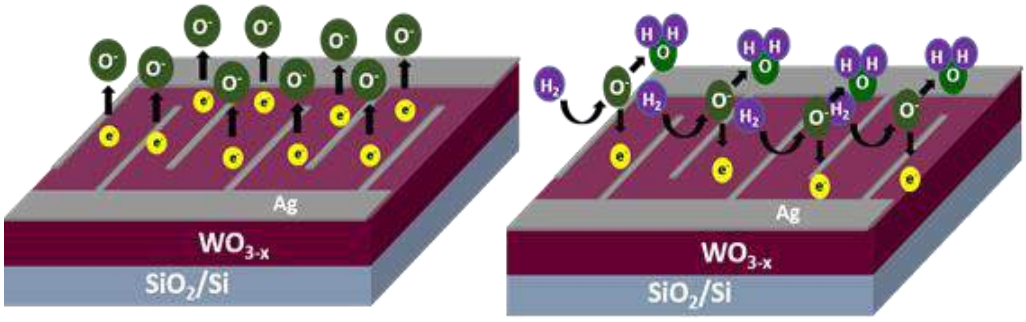
- **Mineralogical Control on Ash Fusion Temperatures of some High Sulfur Indian coals by oxides generated during combustion.**

  Four different sulfur-containing coals (from low to high) (A, B, C and D) obtained from three different geographical locations of the North Eastern Region (NER) of India were studied for the control of ash fusion temperature (AFT) by oxides, generated via in-situ process, during coal combustion. The Meghalaya (B and C) and Nagaland (D) coals were found to contain high ash content in comparison to that of Assam coal (A). Meghalaya coals (B and C) were found to be better as they produce ash in greater quantity of acidic components (Al2O3 and SiO2) and lower amount of basic components (Fe, Ca, Mg, Na and K oxides). This results in lower value of slagging and fouling indices of the Meghalaya coals, and hence increases their AFT. X-ray diffraction studies (XRD) and atomic absorption spectroscopy (AAS) were also performed for qualitative mineralogy and elemental analyses. Statistical tools. such as correlation coefficient and principal component analysis (PCA), confirmed that the low-to-medium AFTs of the coal samples are due to the presence of various fluxing agents (such as K, Fe, Mg and Ca). Ternary phase diagram indicates the fact that the Meghalaya coals (B and C) have higher amount of Aℓ2O3 with lower Fe2O3 contents, resulting in increased fusion temperature. ***(International Journal of Coal Preparation and Utilization, 2022)***

- **High porosity and oxygen vacancy enriched WO 3-x thin films for room temperature hydrogen gas sensors.**

  Due to the increase in demand for hydrogen in several fields, sensors that detect the presence of hydrogen gas more precisely even at room temperature are required for its safe use. In this work, we report the hydrogen gas sensing performance of the WO_{3-x} thin film deposited at different oxygen partial pressures (10%, 15%, and 20%) onto SiO_2/Si substrate using a radio frequency (RF) magnetron sputtering technique. To study the hydrogen gas sensing performance, Ag/WO_{3-x}/Ag test-device is fabricated by depositing interdigitated Ag electrodes onto the WO_{3-x} gas sensing layer via thermal evaporation. The performance of the obtained sensors is investigated at different hydrogen concentrations (100 ppm-300 ppm) and different operating temperatures (30°C-300°C). WO_{3-x} thin films deposited at 10% of pO_2 show

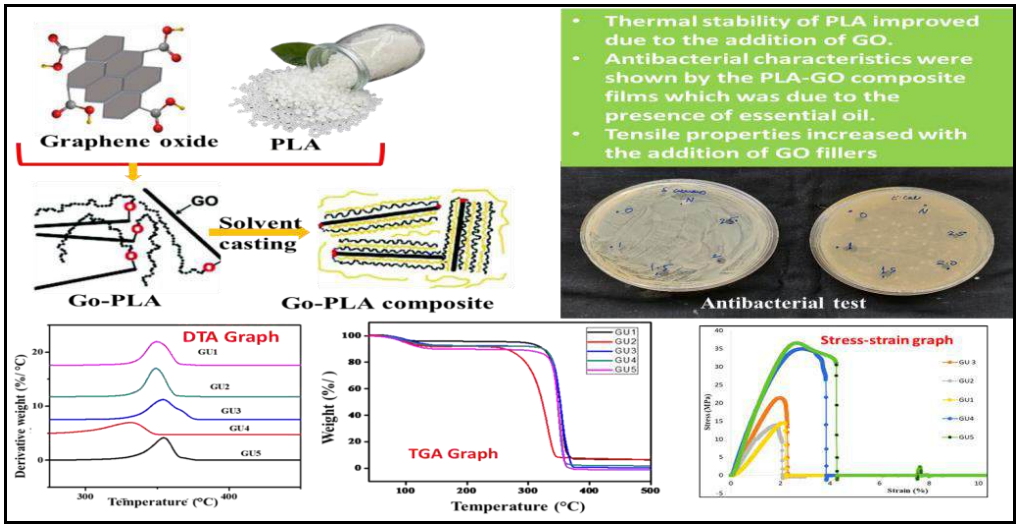
maximum sensitivity of 3.40% even at room temperature, which is due to the high crystallinity, high porosity, and the presence of more oxygen vacancies. The oxygen vacancies that are created during the reactive magnetron sputtering would enhance the hydrogen adsorption and hence superior hydrogen sensing results achieved. Herein, the response and recovery times are measured in most of the sensing conditions and the sensing mechanism has been discussed.



Gas sensing mechanism in the presence of dry air and hydrogen gas of WO_{3-x} sample.

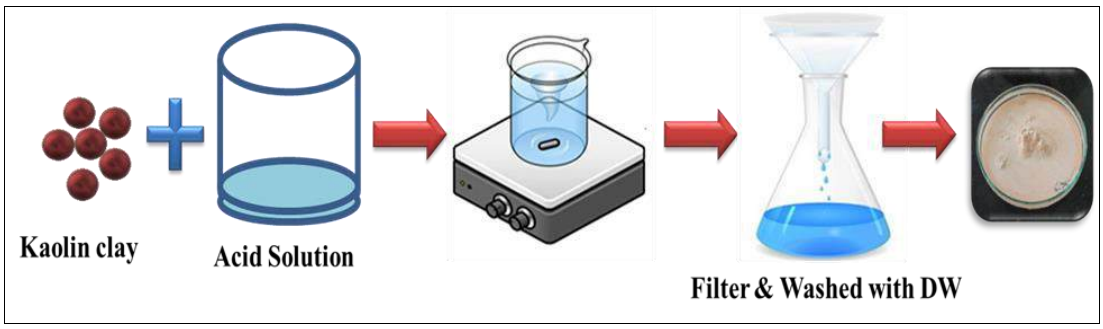
❖ **Tailoring of Physical and Antibacterial Properties of PLA Films by Infusing Graphene Oxide Nanoparticles and Coating with Essential Oil.**

In this work we have developed PLA-graphene oxide nanocomposites coated with essential oil (PLA-GO-EO). A stable dispersion of graphene in chloroform was obtained. A series of PLA-GO-EO were prepared using different content of GO and essential oil by solution casting method. Different characterization such as thermogravimetric analysis (TGA), differential scanning calorimetry (DSC), scanning electron microscopy (SEM), and optical microscopy were performed to study the properties of these composites. Antibacterial characteristics of the prepared composites against Escherichia Coli and Staphylococcus Aureus bacteria were also studied.



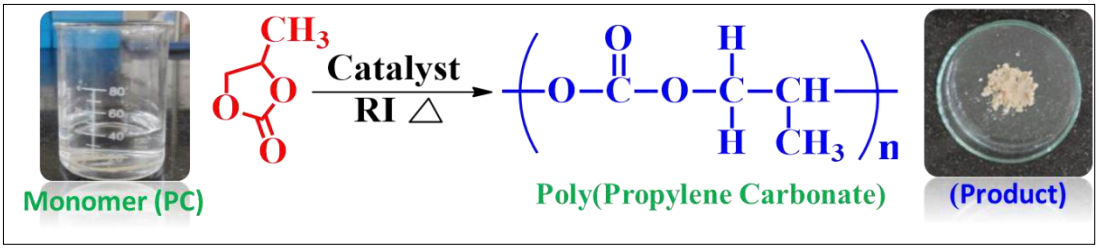
- **Tailoring the physico-chemical properties of North East India's region (NER) Kaolin clay via Acid Treatment**

  Valorization of natural or raw kaolin clay through acid treatment is one interesting way to enhance the physico-chemical properties, which played a major role in the design of new materials having a variety of applications. However, clay's structural deformation at high acid concentrations decreases these capabilities. In order to address this issue, this research examines the impact of an H2SO4:HNO3 combination with a 3:1 volume ratio on the surface area and surface porosity of NER kaolin clay that is readily available for use in a variety of applications, including composites and catalysts etc. Natural kaolin was subjected to a combination of H2SO4:HNO3 in a 3:1 volume ratio at concentrations of 1M, 3M, 5M, and 7M. The physico-chemical characteristics of acidleached kaolinite clay were studied by XPS, XRF, XRD, FTIR, TGA, SEM and N2 adsorption techniques.



- **Synthesis of Poly(Propylene Carbonate) PPC & its characterization**

  Polypropylene carbonate (PPC) is thermoplastic material. It is used as sacrificial binder in preparation of electro-ceramics viz. dielectric materials and piezoelectric ceramics. It can be blended with bio and synthetic polymers to make plastics or films. In this work, PPC have been synthesised from its monomer i.e. propylene carbonate over a catalyst. The polymerization of the monomer i.e. propylene carbonate is confirmed by the GPC analysis. The molecular weight of the PPC synthesized was found to be 13717 g/mol.



Project Title: **Pilot Scale Study of a Novel Nano-Functionalized Repurposable Bio Adsorbents Based Water Decontamination Process**

Project No: OLP-2037

Funding Agency: CSIR, New Delhi

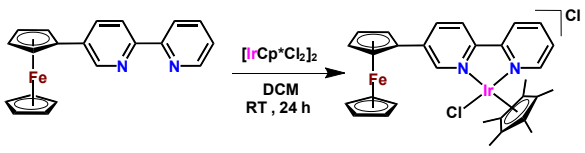
PI & Members: Dr Rajib Lochan Goswamee (PI), Dr Manash R Das (PI), Dr Lakshi Saikia, Dr Biswajit Saha, Dr Sandeep Dey, Dr Ashutosh Thakur, Mrs Dipa R Kachari

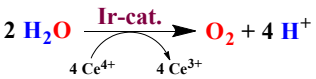
Objectives:

- Installation of minimum two demonstration plants each suitable for a community unit of approx. 50 adult persons for fluoride or arsenic removal from bore well water and evaluation of complete water quality.
- Intermediate toxic sludge immobilization at the plant site by lime-silica reactions for safe transportation to central sludge repository
- Immobilization of intermediately stabilized sludge through mortarisation in centralized repository to obtain commercial products
- Feasibility assessment and capacity building of the community for institutional sustainability of the technology on field conditions and expanding exposure of the technology through demonstration to multiple stakeholders and user groups in affected areas.

Salient Achievements:

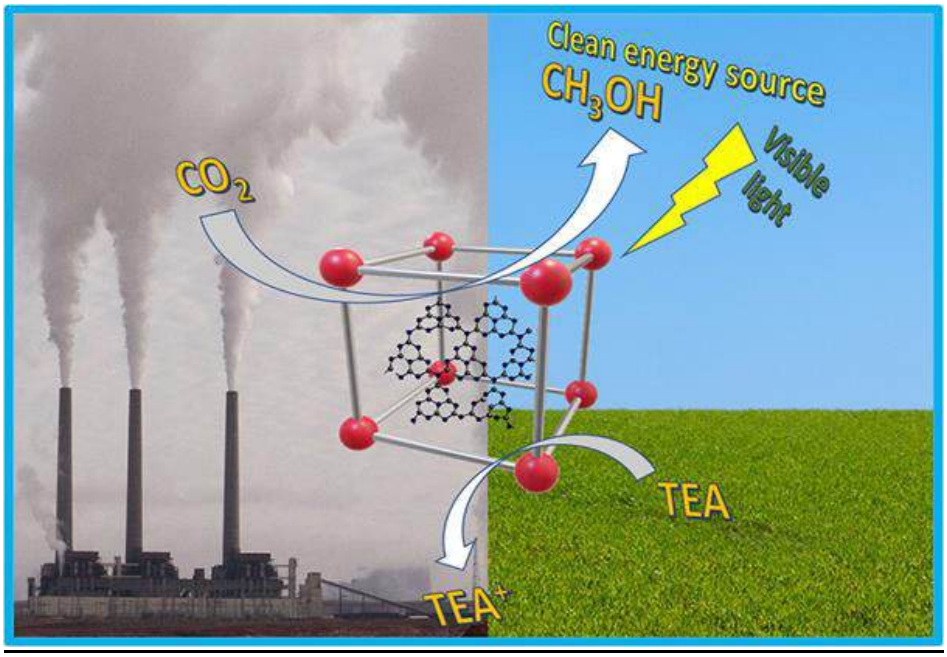
- **Defluridation and dearsenication of ground water.**
  A technology has been developed on defluridation and dearsenication of ground water using locally available resources. Demonstration of plant to institutional visitors. Prepared modified Paddy Husk Ash (PHA) based adsorbent for trials of minimum four nos of plants of capacity 1000 LPD started as well as s tarted preparation of columns and other framework. Started design of furnace for fixation of Al-nano particle over PHA to participating community members. Sample thermal activator crucibles for adsorbents designed that can be manufactured by village artisans. Started design of permanent and temporary immobilization set-ups.
- New iridium complex is designed and synthesized. The complex is characterized by available spectroscopy and molecular structure is established by single crystal x-ray. The iridium metal is in +3 oxidation state and oxygen is produced at room temperature from water in the presence of Ir(III) catalyst. Artificial photosynthesis is achieved in the laboratory at ambient conditions.





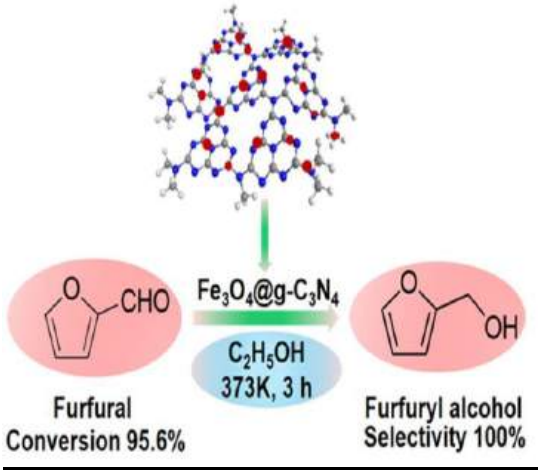
Graphical Abstract.

- Graphitic carbon nitride quantum dots coupled Zr (IV) based MOF composite (g-CNQDs@MOF) has been reported for the photoreduction of CO2 to methanol selectively under visible light irradiation. Graphitic carbon nitride quantum dots (g-CNQDs) in the synthesized Zr-based MOF composite play an important role for photocatalytic CO2 reduction due to its rich photo properties thereby improving the electronic conductance properties of the composite. g-CNQDs in the Zr (IV)-based MOF composite acted as co-catalyst which enhanced the electron-hole separation by elongating the lifetime of photogenerated charge carriers on the surface of MOF composite. These excess electrons accelerated the generation of catalytically active sites on the composite's surface to reduce CO_2 selectively into methanol with better selectivity and efficient methanol formation rate.



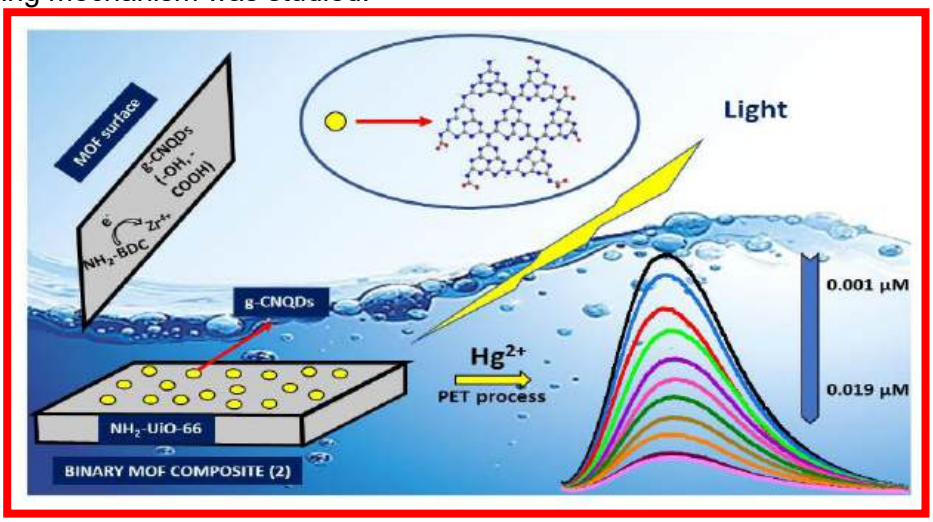
Graphical Abstract.

- A series of economic and environmental benign g-C3N4 supported magnetic ferrite nanoparticles (Fe3O4@g-C3N4) were synthesized for the catalytic transfer hydrogenation of furfural (FF) into furfuryl alcohol (FFA) using ethanol as a source of hydrogen donor and solvent. The unique feature of high nitrogen content and locally conjugated structure of the g-C3N4 have made it excellent support for loading of small sized ferrite nanoparticles. Excellent furfural conversion of 95.6% was obtained with 100% selectivity of the required product furfuryl alcohol over this Fe3O4@g-C3N4 nanoparticles having mass ratio 0.2 of Fe3O4@g-C3N4. The high surface properties, uniform dispersion of ferrite and very high ability of adsorption of furfural over g-C3N4 attributed to the effective catalytic activity. The effect of iron content, catalyst amount, solvent, temperature and reaction time on the CTH of furfural was studied. The synthesized catalysts were characterized by various physic-chemical, spectroscopic and microscopic techniques.



Graphical Abstract.

- A series of binary MOF composites were synthesized using in-situ solvothermal synthetic technique for fluorescence sensing of Hg2+ in water. The well-distributed graphitic carbon nitride quantum dots on porous zirconium-based MOF improve Hg2+ sensing activity in water owing to their great electronic and optical properties. The binary MOF composite (2) i.e., the sensor exhibited excellent limit of detection (LOD) value of 2.4 nM for Hg2+. The sensor also exhibited excellent performance for mercury (II) detection in real water samples. The characterizations of the synthesized materials were done using various spectroscopic techniques and the fluorescence sensing mechanism was studied.



Graphical Abstract.

- **Development of cheap and readily accessible adsorbent materials for removal of toxic ions such as arsenate, chromate, fluoride and iron(III) from ground water**

  The surface of commercially available silica (SiO2) particles have been modified with tannic acid (TA, a naturally occurring polyphenol compound) and the SiO2-TA (SiTA) adsorbent material mixed with sand and gravel has been used as an adsorbent

material for toxic ion removal from water. In a test experiment, 10 liters of arsenate solution (10 ppm) was passed through the adsorbent material over a short column and 99% of arsenate removal has been confirmed by atomic absorption spectroscopy (AAS) of the filtered water.

- **Synthesis of urea-based organic ligands for selective recognition and separation of arsenate and chromate from competitive aqueous media**
  A hydrogen bond donor (HBD) anion receptor with an inner amide cavity and an outer urea cavity can selectively and efficiently extract arsenate (AsO_4^{3-}) from water in the presence of competitive oxoanion and halide. X-ray structure showed encapsulation of an AsO_4^{3-} within a π−stacked dimeric capsular assembly of the receptor, the first crystallography-based example of pentavalent AsO_4^{3-} trianion recognition by a HBD receptor. Similarly, a HBD anion receptor has been synthesized which showed high selectivity for chromate in the presence of other competitive anions.
- **A Facile Preparation of Reduced Graphene Oxide Capped AuAg Bimetallic Nanoparticles: A Selective Nanozyme for Glutathione Detection**
  Over the last decade, artificial enzymes (nanozymes) have undergone substantial development in the field of sensing. In this study, Au-Ag bimetallic nanoparticles (NPs) decorated on reduced graphene oxide sheets (AuAg-rGO) nanocomposite has been developed as a novel colorimetric probe based on the peroxidase imitating activity of the nanozyme. AuAg-rGO nanocomposite proved to feature an intrinsic peroxidase mimic activity, facilitating the oxidation of a peroxidase substrate like 3,3′,5,5′-tetramethylbenzidine (TMB) with high efficiency to oxidised TMB (blue coloured product) with the aid of hydrogen peroxide (H_2O_2). The characteristic Michaelis-Menten kinetics study allowed the establishment of the catalytic performance of AuAg-rGO as an artificial enzyme. Glutathione (GSH) displays inhibiting effect on the oxidation of the peroxidase substrate, TMB. Therefore, AuAg-rGO nanozyme was applied for detection of GSH and exhibited exceptional selectivity and sensitivity with a low limit of detection (LOD) of 13.82 nM within the range of 0-200 μM concentration. The artificial nanozyme system reported here is simple, convenient, and straightforward for colorimetric sensing of GSH.

Project Title: **Approach towards tailoring the interfacial structure and property of lignin for flexible bio-polymer film application**

Project No: **GPP-330**

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

PI & Members: Dr Ajit Singh (PI)

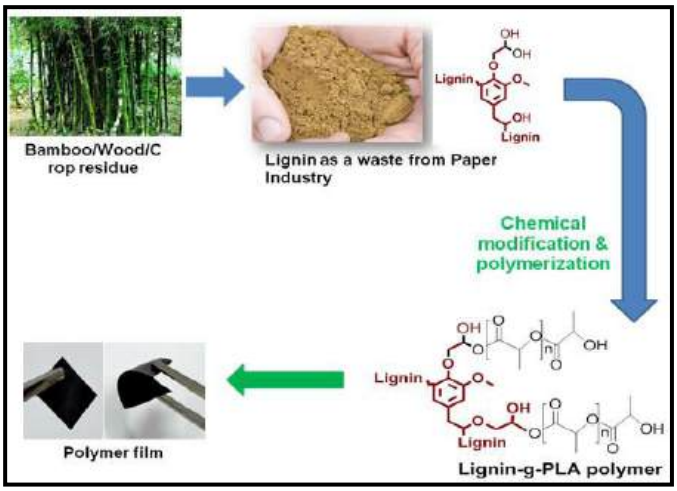
Objectives:

- Development of lignin-Polylactic acid copolymer film from lignin.

Salient Achievements:

- In the project work, development of biodegradable polymer film from paper industry waste lignin was the main objective. Therefore, lignin was isolated from black liquor

obtained from the paper industry. Isolalated lignin was firstly chemically modified with epichlorohydrin to enhance it's reactivity and later polylactic acid (PLA) was grafted in it to synthesize lignin-PLA copolymer. The copolymer was characterized and confirmed with various spectroscopic techniques such as FT-IR, XRD, TGA, DSC, GPC etc. Hydraulic hot press technique was used to prepare flexible polymer film from the developed lignin-PLA copolymer. Further, properties enhancement and biological properties evaluation of the above polymer film is in continuation.



Schematic diagram of the polymer film development from lignin

Project Title: **Red-Ox active ferrocene functionalized N-heterocyclic carbene-molybdenum complex for catalytic nitrogen triple bond reduction**

Project No: **GPP-333**

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

PI & Members: Dr Biswajit Saha (PI)

Objectives:

- Syntheses of ferrocene functionalized NHC ligands.
- Preparation of [Fe-Mo] catalysts.
- Ammonia synthesis from dinitrogen by [Fe-Mo] catalysts at ambient condition.

Salient Achievements:

- New ferrocene functionalized N-heterocyclic carebene ligands have been synthesized and characterized by NMR, IR, HRMS and CV. One molybdenum complex is prepared and used for nitrogen fixation. Another iridium complex is synthesized and structure is established by single crystal x-ray. This iridium complex is presently utilized for the oxygen and hydrogen production from water at ambient conditions.

Project Title: **Pilot scale demonstration and popularisation of some sustainable technology for the supply of safe water in fluoride and arsenic affected areas**

Project No: **GPP-372**

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

PI & Members: Dr Rajib Lochan Goswamee (PI), Dr Manash Ranjan Das (Co-PI), Dr Lakshi Saikia (Co-PI)

Objectives:

- Installation of minimum four demonstration plants each suitable for a community unit of approx. 50 adult persons for fluoride and arsenic removal from bore well water.
- Intermediate toxic sludge immobilization at the plant site by lime-silica reactions for safe transportation to central sludge repository
- Immobilization of intermediately stabilized sludge through mortarisation in centralized repository to obtain commercial products
- Feasibility assessment and capacity building of the community for institutional sustainability of the technology on field conditions and expanding exposure of the technology through demonstration to multiple stakeholders and user groups of two fluoride and arsenic affected areas.

Salient Achievements:

- The project execution has started recently. The raw materials required for the column preparation to decontaminate the water are being collected and initial physic-chemical analysis is in progress. Investigations on process parameters are initiated.

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 G N Sastry (PI), Dr J. Jayaramudu (Co-PI)

Objectives:

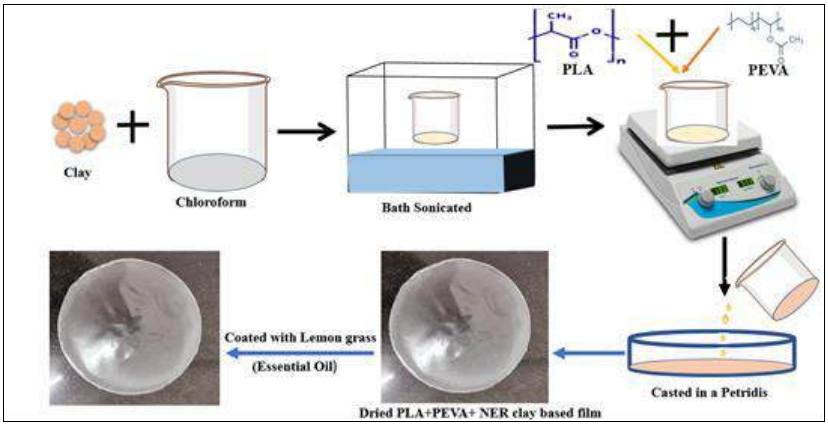
- Design and development of composite polymeric materials (based on synthetic and bio-based polymers) for packaging Applications.
- Recycling of polymer waste viz. PET, PP, PE, PS, etc. to produce non-woven fabric/fiber for PPE/green applications.

Salient Achievements:

- **Synthesis and Characterization of a Novel Nanocomposite Based on / Polylactic Acid (PLA)/ Poly (Ethylene-Co-Vinyl Acetate) (PEVA)/Northeast Region Kaolin (NER) Clay, Coated with Lemon Grass Essential Oil (Elemicin rich)**

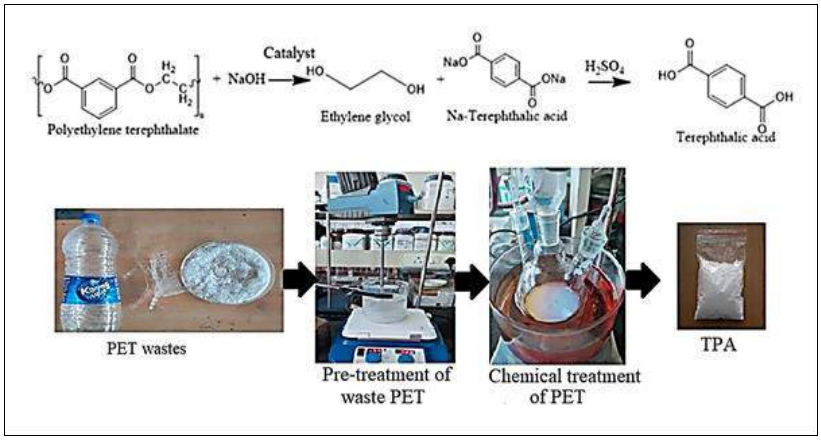
  In this study, PLA/PEVA/NER kaolin clay (0.5, 1, 1.5, and 2 wt%) nanocomposites were prepared via the solution casting method. Lemon grass essential oil (Elemicin rich) was used to coat the prepared composite films with a motive to enhance its antimicrobial property. The films were characterized by using different characterization methods, such as Fourier-transform infrared spectroscopy (FTIR) for the interaction of the different functional groups. X-ray diffraction (XRD) for crystallinity change, universal testing machine (UTM) for tensile strength young's

modulus and elongation at break investigation. The thermal stability of the films using thermogravimetric analysis (TGA) was carried out and the distribution of kaolin into the matrix and morphology of the nanocomposite films were observed from scanning electron microscopy (SEM) images. The tensile strength of the nanocomposite with 1.5 wt% of clay content increased by 12.30 % as compared to that of neat PLA. The developed nanocomposite based on these materials from a native source would play an important role in the field of packaging industries. The nanocomposites showed good antimicrobial property against *Staphylococcus aureus*, but was not effective against *Escherichia coli*.



❖ **Recycling of Waste Polyethylene Terephthalate into Terephthalic Acid**

Polyethylene terephthalate is one of the most important product that is used for the production of textiles to that as liquid packing. As a result, the chemical recycling of waste PET bottles into its monomer, terephthalic acid is of great importance. In this present work, waste PET bottle crushings was depolymerized into terephthalic acid by a modified alkaline hydrolysis method. The study was conducted in presence of four different catalyst, $Zn(OAc)_2$, $Zn(OAc)_2/SiO_2$, CTAB and Al_2O_3/SiO_2. It was observed that complete depolymerization of PET can be seen using CTAB as a catalyst. The Fourier transform infrared spectroscopy of the samples showed the presence of aromatic C-C bond at 1506 cm^{-1}, aliphatic C-H bond at 1341 cm^{-1}, aromatic C-H bonds at 871 cm^{-1} and 722 cm^{-1} indicating the formation of TPA.



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 G N Sastry (PI), Dr Prakash Jyoti Saikia (Co-PI)

Objectives:

- Development of Flow Improver for NE Indian Waxy Crude.

Salient Achievements:

- Development of poly(alkyl)methacrylate based polymers and copolymers of high molecular weight using different polymerization systems to be used as efficient flow improver/pour point depressant (PPD) for NE waxy crude. Synthesized poly(eicosyl methacrylate), poly(octadecyl methacrylate) and their copolymer with maleic anhydride and styrene using different polymerization technique to be used as PPD. Controlled radical polymerization is adopted for synthesizing polymers and copolymers of (alkyl)methacrylate with control molecular weight polymers for the evaluation as effective PPD for NE waxy crude.

Project Title: **Assessment of Air, Water and Soil Quality in Baghjan Oil Blowout Site and its Vicinity, Tinsukia, Assam**

Project No: **GPP-375**

Funding Agency: Central Pollution Control Board (CPCB), New Delhi

PI & Members: Dr Lakshi Saikia (PI), Dr Prakash Jyoti Saikia (Co-PI), Dr Prasenjit Saikia (Co-PI), Dr Sangeeta Sarma (Co-PI)

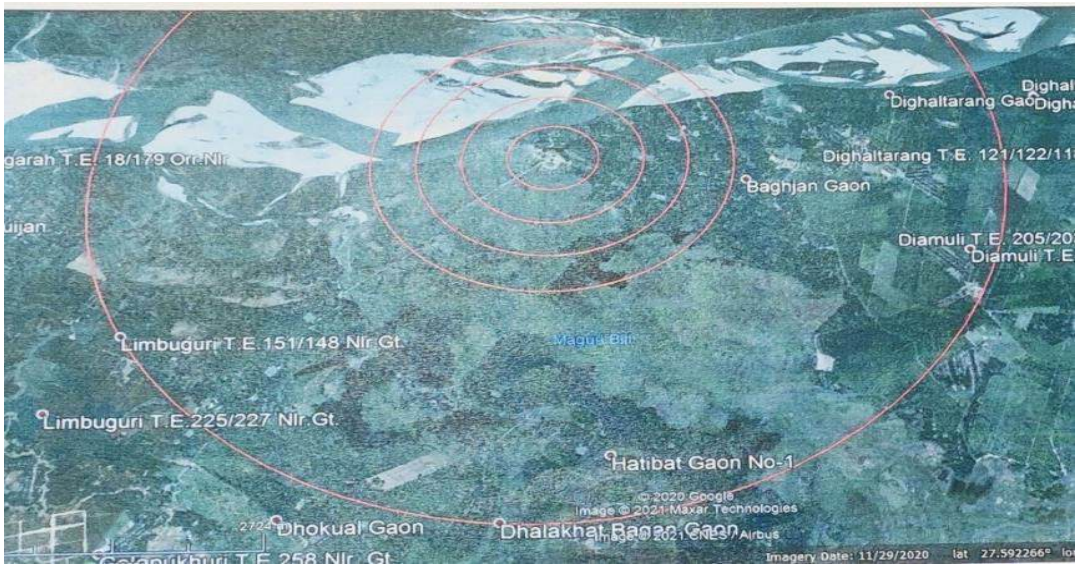
Objectives:

- *To collect and monitor ambient air, surface water, ground water and soil pollution parameters in Baghjan oil blow out site and its vicinity.*
- *To assess environmental conditions associated with blow out.*
- *To assess the interrelation between geo-bio-chemical processes in these areas.*
- *To quantify the pollution level in and around.*
- *To create environmental database in and around.*
- *To conduct Epidemiological study in and around the Baghjan site*
- Analysis of Ground and Surface water in Baghjan Oil Blowout site and Vicinity, Tinsukia, Assam (As per IS /APHA guidelines).

Salient Achievements:

- A number of parameters related to air quality nearby Baghjan oil well blowout site were studied for about 2-3 months. The air samples were collected in a area of 5 kilometers circle from the blow out site
- Effect of blow out and oil spillage in the vicinity of 5 kms area of baghjan was studied by monitoring the physico-chemical parameters of the soil. About 16-17 parameters including Sulphur content, toxic ion contents etc. were studied.

- The water quality both ground and surface area within the entire 5 kms circle of the baghjan area was studied. The effect of oil spillage on the aquatic body due to pollution level in water could be observed.
- The poisonous substances produced due to the oil spillage and blow out will have a tremendous impact on the soils and sediments, affecting not only present life circumstances but also posing a major long-term health danger due to their continued release over time. Also, in such a biodiversity-rich habitat and vital wetland area for water birds, a deep concern has been identified about the long-term effects of the oil leak. Not only is biodiversity important, but so is the livelihood of local communities. There has been a significant decline in the area's biodiversity, resulting in an inadequate habitat for aquatic and terrestrial life, as evidenced by the observed mortalities. Humans are also affected in this area. To recover the decline in diversity seen in mammals, birds, insects, and herpe to fauna, it will take time and significant restorative efforts.



- Analyzed the physical and chemical parameters of water samples (for both ground and surface water) collected from various location of Baghjan Oil Blowout site, Tinsukia, Assam. The parameters analysed for the collected water samples are: pH, Colour, Electrical Conductivity, Turbidity, Total Hardness, Calcium (Ca), Magnesium (Mg), Iron (Fe), Sulphate (SO_4), Chloride (Cl), Total Alkalinity, Total dissolved solids, Total suspended solids, Fluoride (F) and Nitrate (NO_3), Phosphorous (P). A significant result has been obtained in the project.

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, GoI

PI & Members: Dr Hemant Sankar Dutta (PI), Dr Manash R 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:

- Significant progress has been made in the project for exploring a simple fabrication process of the microtiter paper plate and estimating its functionality in analyte detection methodologies. The process used wax stamping using a commercially available 96-well polystyrene plate as a predefined stamp for hydrophobic patterning on paper. The methodology has been validated by executing colorimetric detection of glutathione (GSH) using the 3,3′,5,5′-tetramethylbenzidine–H_2O_2 redox system which employs high congeniality with ELISA detection techniques. Furthermore, the signalling effect has been analysed by reading the RGB values of the test wells for calculating the color values, which can be correlated with the concentrations of GSH.

Project Title: **Development of Advanced Hybrid Supercapacitor Operating with High Energy Density and Wide Operating Temperature Range**

Project No: **GAP-796**

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

PI & Members: Dr Dhrubajyoti Bhattacharjya (Ramanujan Fellowship)

Objectives:

- Fabrication of energy storage device from Northeast region bio-resources.

Salient Achievements:

- Newly sanction: Work in progress.

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

I. Focused Based Research Projects

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 are characterizing and determining metabolic pathways and elite genes in selective endophytes responsible for plant growth promoting activities and functional metabolites production.

Salient Achievements:

- Successfully isolated endophytes from the interior parts of rhizomes of selective medicinal plants. The isolated endophytes were characterized at phenotype level with emphasis on their role in plant growth promotion and functional metabolites production.

II. In-house, Grant in aid & Consultancy Projects

Project Title: **Augmentation of Bioresources for Environmental Care and Socio-Economic Development**

Project No: OLP-2043

Funding Agency: CSIR, New Delhi

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

Objectives:

- Survey, germplasm collection, identification & documentation of economically & environmentally significant plants.
- Chemical profiling of selected species.
- Formulation of some usable products from bioresources.

Salient Achievements:

- A survey was conducted for collection of ethnobotanical data on immune boosting herbs practiced by Meitei community of Manipur. A total of 55 plants belong to 35 families and 39 genera are collected. (It will be communicated to a research journal for publication).
- Planted 15 sapling of Agar (*Acquillaria malaccensis*), 7 sapling of soap nut (*Sapindus mukorossi*), 5 saplings of lipstick plant (*Bixa orellana),* 6 *Terminalia citrina,* 6 *Litsea cubeba,* 3 *Stixis suaveolens,* and 3 *Hiptis bengalensis* in the Experimental farm of BLIM on the occasion of Gandhi Jayenti.
- Two types of green tea are formulated and nutritional and other parameter profiling of 2 types of green tea in undergoing.

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-2044

Funding Agency: CSIR, New Delhi

PI & Members: Dr Chandan Tamuly (PI), Dr Natarajan Velmurugan, Dr Budhen Chandra Baruah, Ms Moushumi Hazarika, 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: 6
- 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 20 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 7-8 lakh rupees during the period.
- Organised 16 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: **Nutritional Enrichment of Agricultural Wastes with Essential Fatty Acids Producing Thraustochytrids as Improved Feed for Aquaculture**

Project No: GAP-369

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

PI & Members: Dr Natarajan Velmurugan (PI)

Objectives:

- The main purpose of this project related to characterizing the agricultural waste materials available in Arunachal Pradesh and enriching those agricultural waste materials with essential fatty acids producing Thraustochytrids cells.
- Characterizing the selective agricultural waste materials available in Arunachal Pradesh and optimizing the fermentation conditions for the growth of essential fatty acids producing Thraustochytrids in agricultural waste materials which to be used as direct feed for aquaculture farms in Arunachal Pradesh.

Salient Achievements:

- Analyzed the proximate composition of selective agricultural waste materials of Arunachal Pradesh. We are growing selective strains of essential fatty acids producin Thraustochytrids in agricultural wastes.

Project Title: **Expanding Endophytes of *Paris Polyphylla* as a Model to Study Co-Evolution Relationships with Emphasis on Functional Metabolites Production**

Project No: GPP-323

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

PI & Members: Dr Natarajan Velmurugan (PI), Dr B C Baruah

Objectives:

- Collection and identification of *Paris polyphylla* from high-altitude mountain forests of Arunachal Pradesh.
- Isolation and characterization of endophytes from *P. polyphylla*.
- Screening of endophytes for the production of saponins and other bioactive compounds along with phytochemical investigation of *P. polyphylla.*
- Transcriptomics analysis – Understanding the molecular mechanisms of co-evolution relationships with emphasis on functional metabolites production.
- Effect of selective endophytes on bioactive compounds production in *P. polyphylla.*

Salient Achievements:

- Documented the presence of endangered medicinal plant *P. polyphylla* in high altitude forest/mountain ranges of Bomdila region of Arunachal Pradesh. Major bioactive compound steroidal saponins was successfully isolated and characterized. Metabolic pathways responsible for bioactive compounds synthesis and transportation were determined. We have isolated 193 bacterial and 2 fungal endophytes from the rhizomes of *P. polyphylla*.

Project Title: **Anthropogenic Impacts and their Management Options in Different Ecosystems of the Indian Himalayan Region**

Project No: GPP-327

Funding Agency: GB Pant National Institute of Himalayan Environment & Sustainable Development, Ministry of Environment Forest & Climate Change, Govt. of India

PI & Members: Dr H B Singh (PI)

Objectives:

- To monitor snow melt and/or headwater contribution in total river water flow, their seasonal behavior and quality due to climate change.
- To assess the impacts due to erratic seasonal behavior of river/stream water flow on overall land use pattern, the developmental projects such as HEPs and riverine aquatic biodiversity.

- To enhance capacity building of the stakeholders including women in terms of increasing their resilience and adaptive capacity due to climate change for their sustainable livelihood options.
- To suggest mitigating measures and management options due to anthropogenic impacts.
- To provide policy guidelines for strengthening existing polices.

Salient Achievements:

- Survey of 15 villages completed to know the people perception about climate change, Head water contribution, people perception on climate change questionnaire survey.
- Baseline database about demographic status, livelihood options, climate change scenario, etc. in each study site was generated.
- 2 Consultative workshops/ seminars to minimize climate change impacts and conservation were organized.
- Capacity building programme and income generation program for 14 Days (2020) Capacity building and income generation program was conducted including 60 women out of 80 participants as source for livelihood options through Lemon grass cultivation, Essential oil distillation, banana fibre extraction and vermicomposting training.

Project Title: **Diastereoselective Synthesis of Lamellarin Alkaloid Natural Product Fused Spirooxindoles and its Analogues. A Series of Evaluation of its Biological Activities against Mycobacterium Tuberculosis and Other Bacterias**

Project No: GPP-334

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

PI & Members: Dr P Yuvaraj (PI)

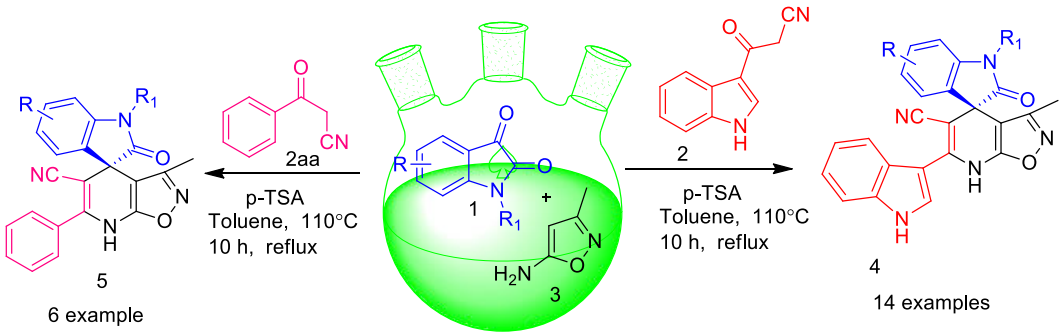
Objectives:

- Synthesis of focused natural products based libraries.
- Screening for a diverse range of biological activities.
- Structure-activity relationship studies (SAR).
- Iterative improvement of leads.
- In-depth studies of lead compounds.
- Commercialization of lead compounds.

Salient Achievements:

- ***Chemo-selective Synthesis of [indoline-3,4'-isoxazolo[5,4-b]pyridine Fused spirooxindole Derivatives via Brønsted Acid Catalysed Three–Component Tandem Knoevenagel/Michael Addition Reaction***
- ***Experimental procedure* for the Synthesis of spiro[indoline-3,4′-isoxazole[5,4-b]pyridines] derivatives:** In a 50 mL round bottom flask, suitably substituted isatin (0.5 mmol) was dissolved in toluene (5 mL) and then 33-cyanoacetyl indole (0.5

mmol) and 5-amino-3-methylisoxazole (0.5 mmol) was added to it. To the stirring reaction mixture, *p*-TSA (30 mol %) was added and stirring was continued under reflux condition for 10 h at 110 °C. Next, the reaction mixture was concentrated under reduced pressure and extracted with ethyl acetate/water. The organic layer was dried over anhydrous sodium sulphate and concentrated in vacuum to yield crude product which was purified by column chromatography using ethyl acetate/n-hexane (7:19) as eluent.



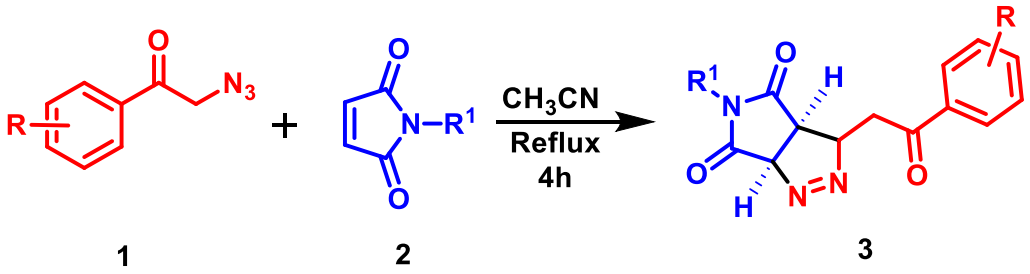
R= H, Me, OMe, NO_2, Cl, Br, I, F, CF_3, OCF_3
R1= H, Bn, Me

- **Design, synthesis via a one-pot approach and molecular docking studies of novel pyrrolo[2,1-a]isoquinoline derivatives**

  ***Experimental* Procedure for the Synthesis of Pyrrolo[2,1-a]isoquinoline derivatives:** In a 50 mL round bottom flask, substituted isatin (0.5 mmol) was dissolved in toluene (5 mL) followed by the addition of 1,2,3,4-tetrahydroisoquinoline (0.5 mmol) and the mixture was stirred at room temperature for half an hour. After that, substituted chalcones (0.5 mmol) was added to the reaction mixture and stirring was continued at reflux condition for 10 hrs. Next, the reaction mixture was concentrated under reduced pressure and extracted with ethyl 3 acetate/water. The organic layer was dried over anhydrous sodium sulphate and concentrated in vacuum to yield the crude product which was purified by column chromatography using ethyl acetate/n-hexane (3:17) as eluent.

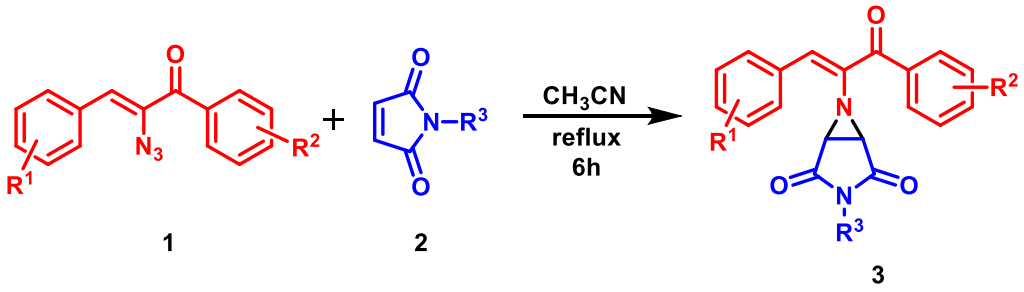
- **One-pot Synthesis of 1,2,3-Triazole derivatives: A [3+2] Cycloaddition Approach under Catalyst-free Condition and Their Lung Cancer Inhibition Property by In Silico Studies**

  ***Experimental* Procedure for the Synthesis of 1,2,3-triazole derivatives derivatives:** In a 50 mL round bottom flask, substituted phenacyl azides (0.5 mmol) was dissolved in acetonitrile (5 mL) followed by the addition of substituted maleimides (0.5 mmol) and the mixture was stirred at reflux temperature for 4 hrs. Next, the reaction mixture was concentrated under reduced pressure and extracted with ethyl acetate/water. The organic layer was dried over anhydrous sodium sulphate and concentrated in vacuum to yield the crude product which was purified by column chromatography using ethyl acetate/n-hexane (1:4) as eluent.



- **Synthesis of aziridine derivatives from α-keto vinyl azides and maleimides *via* one-pot approach under catalyst-free condition.**

  ***Experimental* Procedure for the Synthesis of aziridine derivatives:** In a 50 mL round bottom flask, substituted vinyl azides (0.5 mmol) was dissolved in acetonitrile (5 mL) followed by the addition of substituted maleimides (0.5 mmol) and the mixture was stirred at reflux temperature for 4 hrs. Next, the reaction mixture was concentrated under reduced pressure and extracted with ethyl acetate/water. The organic layer was dried over anhydrous sodium sulphate and concentrated in vacuum to yield the crude product which was purified by column chromatography using ethyl acetate/n-hexane (1:4) as eluent.



Project Title: **Chemical Investigation and Therapeutic Evaluation for Linking Marker Compound(S) with Anti-Diabetic Potential of Young Shoots of *Wendlandia Glabrata* D.C. and Fruits of *Phoebe Cooperiana,* Used by Indigenous ST People of Arunachal Pradesh**

Project No: GPP-340

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

PI & Members: Dr Chandan Tamuly (PI), Dr J Bora

Objectives:

- To deliver effective phytopharmaceuticals and/or potentially novel lead molecule(s).
- Identification, characterization and validation of active constituents to define molecular signatures of active extract and or fraction components that correlate with the degree of biological activity.

Salient Achievements:

- Significant results were found in the young shoot of *Wendlandia glabrata* D.C. in water extract and usable part with anti-diabetic properties followed by Methanol

fraction. Samples of *Wendlandia glabrata* have been sent to IASST, Guwahati in order to carry out the further *in-vivo* evaluations.

- Published two nos. of paper under the project.

Project Title: **Chemical Profiling, Quantification of Bioactive Constituents of Ethno-Medicinal Plant of Arunachal Pradesh**

Project No: GPP-342

Funding Agency: National Medicinal Plants Board, Govt. of India, New Delhi

PI & Members: Dr Chandan Tamuly (PI), Dr Budhen Ch Baruah, Ms Moushumi Hazarika

Objectives:

- Chemical profiling, quantification of constituent with seasonal variation of the selected plant**.**
- Formulation of spice products from the selected plant which is widely use by the people of Arunachal Pradesh.
- Awareness programme regarding promotion, sustainable utilization of the spice plant for mass cultivation to conservation of biodiversity and socio-economic development of the tribal people.

Salient Achievements:

- Organized 8 nos. of awareness programme for cultivation, promotion, sustainable utilization of the spice plant for conservation of biodiversity and socio-economic development in different locations of Arunachal Pradesh like Mariyang, Darak, Liromoba, Kamba, Yamcha etc.
- Developed a herbal tea product using the fruit of the plant.
- Three molecules were isolated from leave of the plant and evaluated anti-urease and ant diabetic activities. The molecular docking and MD stimulation study was done.

Project Title: **Empowerment of ST People of Arunachal Pradesh through Income Generation Exploring Under-Utilized Food Item 'Tashe'**

Project No: GPP-345

Funding Agency: SEED Division, Department of Science and Technology (DST), New Delhi

PI & Members: Dr Chandan Tamuly (PI)

Objectives:

- To explore and utilization of edible food 'Tashe' which is very popular among ST people of Arunachal Pradesh.
- To organize training awareness programme for conservation, sustainable utilization, cultivation of 'Tashi' for socio economic benefit of local people of Kurung Kumey district.

- To evaluate the sustainability, market value and established different food items from 'Tashe'.

Salient Achievements:

- Organized 6 nos. of awareness programme regarding sustainable utilization, nutritional value, development of value added products for income generation and socio-economic development of Arunachal Pradesh.
- The nutritional value, mineral content, antioxidant activities were evaluated for the economic plant. Three nos of bioactive molecules were identified accordingly.
- Development of value added product from "Tashe"-an economic plant of Arunachal Pradesh and evaluation of nutraceuticals and bioactive compounds.
- Cake, biscuits and cookies were prepared from the Tashe. These value added products are selling in the market by entrepreneur.

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)

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.
- The traditional preparation method for preparation of 'Tapyo, Pila" has been observed and recorded at the Hari villages of Ziro, A.P. The details of other food product has been collected and recorded.
- 3 nos of paper has been published under the project.

Project Title: **Synthesis of Analogues of Natural Products Having Anticancer Potential And Investigation on their Chemico-Therapeutic Potential to Mitigate Lung Cancer**

Project No: **DBT-RA**

Funding Agency: Department of Biotechnology, New Delhi, Govt. of India

PI & Members: Dr P Yuvaraj (PI), Dr Kh Nongalleima Devi

Objectives:

- To synthesise the other derivatives of Apigenin and its purification. Also, to synthesise new compounds from Chrysin, thymoquinone, resveratrol. Purification and structure elucidation of derivatives synthesized.
- To study their anticancerous effects using cell line study. And also to check their co-relation with pro-inflammatory cytokines.

Salient Achievements:

- Literature survey on phytoactive compounds; Apigenin, thymoquinone, Chrysin, resveratrol. Completed writing a review paper on Apigenin, its derivatives and anticancer activities.
- Derivatives of Apigenin synthesis was done following Mannich reaction reported by Lin et al., 2012 with slight modification.
- Nitric oxide reducing assay of thymoquinone and resveratrol.

Fig. TLC of Apigenin and its new product in solvent system methanol: ethylacetate:2:8 observed under UV (254 nm).

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 2021-22, the group organized/participated in 2 nos. of exhibitions on various occasions.

Publications:

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

- ***Annual Report 2020-21*** - Annual report of the institute was brought out and released on the CSIR Foundation Day celebration on 26 September, 2022.

- ***INFOWATCH*** (*Monthly Bulletin*)

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. During the year 2021-22, 3 Patents were filed in India while 2 Patents were filed abroad.

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. Ten (3) nos of technologies were transferred to 4 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:

Sl.No	MoU/ Agreement	Party	Purpose/Technology	Date of signing
1	MoU	Saciwater, Andhra pradesh	Research Collaboration pertinent to project titled the *"Pilot Scale Demonstration and Popularisation of some Sustainable Technology for the Supply of Safe Water in Fluoride and Arsenic Affected Areas".*	16/06/2021
2	MoU	Dibang Farmers Producers Cooperative Society, Arunachal Pradesh	For the implementation of *the "CSIR-Aroma Mission"* in 500 hectares of land in the state of Arunachal Pradesh.	17/08/2021
3	MoU	Assam Petrochemical Limited, Namrup,	For working together in the field of	27/08/2021

		Assam	catalysis, waste management, human resource development and any other areas of mutual interest.	
4	MoU	Jorhat Institute of Science and Technology, Jorhat Assam	Academic and Research Collaboration	17/10/2021
5	MoU	The Royal Global University, Guwahati, Assam	Academic and Research Collaboration	18/10/2021
6	Technology Transfer Agreement	M/s Vista Naturals Guwahati, Assam	For technology transfer of Patchouli variety, Jor Lab P-1	24/08/2021
7	Technology Transfer Agreement	M/s Sansys Enterprise, Dibrugarh, Assam	For technology transfer of OP-12 biofertilzer'	20/09/2021
8	Technology Transfer Agreement	M/s Finite Technologies, Ambala Cantt, Haryana	For technology transfer "'Design Know-How for Fabrication of Essential Oil Distillation Unit'"	07/10/2021
9	Technology Transfer Agreement	M/s Axom Agro Chemicals, Moranhat, Dibrugarh, Assam	For technology transfer of OP-12 biofertilzer'	30/03/2022

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., 31 SRF, 37 JRF, 01 Women Scientist Scheme (WSS), 01 DST Inspire Faculty, 01 DST Ramanujan fellow, 02 DST-NPDF, 02 DBT-RA, 02 CSIR-RA and 187 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 38 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.

Planning and Project Monitoring Activities

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 2021-22 was 2819.387 lakhs which comprised receipts from Govt. Deptts/Ministries, Public Sector Industries and Private Sector organizations to the extent of **94.48%, 1.65% and 3.87%** respectively. ECF of the institute from different projects and services are shown below:

EXTERNAL CASH FLOW (ECF) FOR THE YEAR 2021 - 2022
(Rs. In Lakh)

Sl No	Category	Govt	Indian Industry	*CPSE	**SPSE	Foreign Company	Foreign Agency	Others	Total 01/04/2021 To 31/03/2022
1	Collaborative	0.000	0.000	9.456	0.000	0.000	0.000	0.000	9.456
2	R&D Consultancy	11.211	2.497	3.144	0.000	0.000	0.000	0.000	16.852
3	Grant-in-aid	2635.999	0.000	0.000	0.000	0.000	0.000	0.000	2635.999
4	Premia	1.120	2.800	0.000	0.000	0.000	0.000	0.000	3.920
5	Sponsored R&D	0.000	85.000	0.000	0.000	0.000	0.000	0.000	85.000
6	Technical Service	15.351	18.860	28.752	5.197	0.000	0.000	0.000	68.160
	Total:	2663.681	109.157	41.352	5.197	0.000	0.000	0.000	2819.387

* 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	131.30
Agrotechnology and Rural Development	1930.94
Biological Science and Technology	76.59
Chemical Science and Technology	135.56
Coal and Energy	198.04
Engineering Science and Technology	96.76
Extension Centres (Branch Laboratory Itanagar & Branch Laboratory Imphal)	26.65
Geo-Science Science and Technology	10.64
Materials Science and Technology	96.36
Research Planning and Business Development	116.55
Total	**2819.39**

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 2021-22 is Rs**. 28.49** Lakhs.

Project Status: Status of Project Contracted and Completed during 2021-22 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	1644.30	18	5152.33	20
2.	Collaborative	0	0	0	0
3.	Consultancy	12.03	3	28.76	3
4.	Sponsored	238.0	1	0	0
Total		**1894.33**	**22**	**5181.09**	**23**

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

The Knowledge Resource Centre (KRC) continued to provide library and information services to R&D divisions, Research Fellows, outside students and individuals such as from universities of NE region and R&D institutes. During the period, the KRC added 72 numbers of scientific books, 97 numbers of Hindi books to its stock and subscribed 6 numbers of print journals and 2 numbers of foreign print journals. Apart from these E-resources subscribed through NKRC are Scifinder, WoS, American Chemistry Society Journals, iThenticate Antiplagiarism Software and ASTM DL and other 4 numbers of online journals individually subscribed from Elsevier which are available at NEIST IP address for the users. KRC also subscribed the Bureau of Indian Standards to supplement the testing facilities of the institute.

As a repository KRC continues to maintain a database on publications of papers by scientists and researchers of the institute and on the basis of this, various reports with Bibliometric analysis of laboratory's publication were out as and when required by the management for analysis and external submission. The KRC also collected Annual reports from various R&D and academic institutions.

संस्थान में राजभाषा गतिविधियां

RAJBHASHA HINDI ACTIVITIES IN THE INSTITUTE

हिन्दी दिवस समारोह का आयोजन

कोविद महामारी संक्रमण से पूर्णतः मुक्ति नहीं होने के कारण प्रोटोकॉल का पालन करते हुए सीएसआईआर-उत्तर-पूर्व विज्ञान तथा प्रौद्योगिकी संस्थान, जोरहाट ने राजभाषा हिंदी को कार्यालयीन कार्य में उत्तरोत्तर वृद्धि करने के लिए संस्थान में विभिन्न प्रतियोगिताओं को हाइब्रिड मोड के साथ 6-14 सितंबर के दौरान राजभाषा हिंदी सप्ताह का आयोजन किया एवं 14 सितंबर को सभा कक्ष में वृहद प्रतिभागिता के साथ प्रोटोकॉल का अनुसरण करते हुए पुरस्कार वितरण समारोह का आयोजन किया । निदेशक डॉ जी नरहरी शास्त्री ने हिंदी दिवस के अवसर पर देश की एकता एवं अखंडता के लिए स्वदेशी एवं स्वभाषा अपनाने पर बल दिया । उन्होने क्षेत्रीय भाषा अथवा अपनी मातृभाषा में विज्ञान के प्रसार की आवश्यकता की ओर ध्यान आकृष्ट किया ।

हिन्दी सप्ताह का शुभारंभ 6 सितम्बर 2021 को 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 ऑनलाइन हिन्दी कार्यशालाएँ आयोजित की गयी, जिसमें हिन्दी अधिकारी ने केंद्र सरकार के राजभाषा नियमों का विवरण प्रस्तुत करते हुए उन्हें अनुपालन के उत्तरदायित्व से अवगत कराया । महामारी के समस्या को ध्यान में रखते हुए इसी विषय पर हिन्दी में लेख लेखन प्रतियोगिता आयोजित कराया गया । गूगल की सहायता से ऑनलाइन हिन्दी क्विज किया गया जिसमें काफी संख्या में स्टाफ सदस्यों ने भाग लिया । श्रुत लेखन प्रतियोगिता के अंतर्गत वॉयस फ़ाइल मेल किया गया जिसे सुनकर प्रतिभागियों ने लिखा । सप्ताह का समापन 14 सितम्बर 2021 को हिन्दी दिवस समारोह के रूप में किया गया । कोरोना प्रोटोकॉल का अनुसरण करते हुए निर्धारित समय के अनुरूप इस कार्यक्रम का शुभारंभ हिन्दी अधिकारी एवं सचिव, नगर राजभाषा कार्यान्वयन समिति श्री अजय कुमार ने भारत सरकार के गृह मंत्री के हिन्दी दिवस संदेश पढ़कर किया । समारोह में केवल प्रतियोगिता के विजेता को ही प्रत्यक्ष रूप से आमंत्रित किया गया जबकि अन्य सभी स्टाफ सदस्यों को ऑनलाइन जोड़ा गया । सादगी के साथ पुरस्कार वितरण करते हुए ई-प्रमाणपत्र जारी किया गया । संस्थान के निदेशक डॉ शास्त्री ने अपना विचार व्यक्त करते हुए हिन्दी के प्रयोग को बढ़ाने का अपील किया । नवीन राजभाषा प्रावधान के अनुसार केंद्र सरकार के सभी अधिकारियों एवं कर्मचारियों 14 सितबर के दिन एक शपथ लेना है, तदनुसार सभी उपस्थित एवं ऑनलाइन स्टाफ सदस्यों ने शपथ लिया । इस अवसर पर संस्थान के प्रशासनिक अधिकारी श्री जे एल खोंगसई, वित्त एवं लेखा नियंत्रक श्री रमाशंकर शर्मा ने भी हिन्दी के विकास हेतु प्रयोग पर बल दिया । कार्यक्रम के अंत में पुरस्कार वितरण समारोह का संचालन श्री कुमार ने किया एवं धन्यवाद ज्ञपित किया ।

हिन्दी सप्ताह के दौरान आयोजित प्रतियोगिता के विजेताओं के बीच हिन्दी दिवस आयोजन कार्यक्रम की झलक

संस्थान में राजभाषा हिंदी सप्ताह का आयोजन

महामारी काल के प्रोटोकॉल का पालन करते हुए हिन्दी सप्ताह के दौरान अधिकारियों/ कर्मचारियों के प्रोत्साहन हेतु प्रत्येक कार्यदिवस में निम्नलिखित ऑनलाइन प्रतियोगिताएं एवं कार्यशालाएँ आदि आयोजित की गयी ताकि उनमें एक प्रेरणा और उत्साह की उत्पत्ति हो सके :

6एवं7/9/2021 : प्रथम सत्र में हिन्दी सप्ताह का शुभारंभ कार्यक्रम आयोजित हुआ जिसमें संस्थान के सभी स्टाफ सदस्य, विशेष रूप से नव-नियुक्त वैज्ञानिक एवं चिकित्सक ने ऑनलाइन भाग लिया । प्रथम दिवस के प्रथम सत्र में "राजभाषा नीति एवं कार्यालय में प्रयोग" एवं द्वितीय सत्र में "कार्यसाधक हिन्दी ज्ञान एवं परीक्षा" विषय पर श्री अजय कुमार, हिन्दी अधिकारी ने अपनी प्रस्तुति दी । द्वितीय दिवस के प्रथम सत्र में "कंप्यूटर पर हिंदी यूनिकोड एवं गूगल हिंदी का प्रयोग" एवं द्वितीय सत्र में अभ्यास कराया गया ।

8/9/2021: "कोविद-19 महामारी के दौरान निस्ट, जोरहाट का योगदान**"** विषय पर ऑनलाइन हिन्दी लेख लेखन प्रतियोगिता आयोजित किया गया ।

9/9/2021 : 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 । असम डोन बोस्को यूनिवर्सिटी**,** गुवाहाटी के बी सी ए छात्र श्री नमन कुमार सिन्हा ने **'**कौन बनेगा कारोड़पति**'** के तर्ज पर क्विज का संचालन किया । प्रतिभागियों ने खूब आनंद उठाया ।

13/9/2021 : 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 ।

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 में विशेषज्ञ

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 :

नुमालीगढ़ रिफाइनरी लिमिटेड,गोलाघाट (भारत सरकार के प्रतिष्ठान): 23 फरवरी 2022 को आयोजित हिन्दी कार्यशाला के मुख्य अतिथि एवं व्याख्याता के रूप में "हिन्दी व्याकरण की सामान्य कठिनाइयाँ एवं समाधान " पर व्याख्यान हेतु आमंत्रित किया गया ।

केंद्रीय विद्यालय, आरआरएल, जोरहाट (शिक्षा मंत्रालय, भारत सरकार): 22 फरवरी 2022 को संविदा शिक्षक की नियुक्ति के साक्षात्कार हेतु समिति के विषय विशेषज्ञ एवं शिक्षाविद सदस्य के रूप में को आमंत्रित किया गया ।

ऑयल एवं नेचुरल गैस कारपोरेशन लि., असम एवं असम अराकान बेसिन, जोरहाट : 27 दिसंबर 2021 को आयोजित हिन्दी कार्यशाला के मुख्य अतिथि एवं व्याख्याता के रूप में "हिन्दी लेखन में व्याकरण संबंधी त्रुटियों का निराकरण"पर व्याख्यान हेतु आमंत्रित किया गया । दुबारा 26 अगस्त 2021 को ऑनलाइन हिन्दी कार्यशाला में "कार्यालय में हिन्दी के प्रयोग" विषय पर व्याख्यान हेतु आमंत्रित किया गया । इस कार्यशाला में विषय विशेषज्ञ एवं विशिष्ट अतिथि के रूप में के रूप में आमंत्रित किया गया, तदनुसार प्रस्तुति दिया ।

यूको बैंक, अंचल कार्यालय, जोरहाट : 18 नवंबर 2021 को बैंक के प्रशिक्षु अधिकारियों के लिए आयोजित यूको भाषा सेतु कार्यशाला में असमियाँ-हिन्दी भाषा के सहजता पर व्याख्यान हेतु आमंत्रित किया । ग्राहक सेवा को उन्नत करने के लिए स्थानीय भाषा की आवश्यकता विषय को केन्द्रित करते हुए प्रस्तुति दी ।

भारतीय जीवन बीमा निगम, मण्डल कार्यालय, जोरहाट : 28 सितंबर 2021 को आयोजित हिन्दी कार्यशाला के मुख्य अतिथि एवं व्याख्याता के रूप में राजभाषा हिन्दी पर व्याख्यान हेतु आमंत्रित किया गया ।

आकाशवाणी जोरहाट केंद्र : 8 सितंबर 2021 को आयोजित हिन्दी पखवाड़ा के मुख्य अतिथि के रूप में राजभाषा हिन्दी पर व्याख्यान हेतु आमंत्रित किया गया, जिसका रेकॉर्ड एवं प्रसारण भी किया जा सके ।

केंद्रीय मुगा एरी अनुसंधान एवं प्रशिक्षण सस्थान, केंद्रीय रेशम बोर्ड, वस्त्र मंत्रालय भारत सरकार : 23 दिसंबर 2021 को आयोजित हिन्दी कार्यशाला के मुख्य अतिथि एवं व्याख्याता के रूप में राजभाषा कार्यान्वयन पर व्याख्यान हेतु आमंत्रित किया गया ।

सीएसआईआर-मानव संसाधन विकास केंद्र, गाजियाबाद : 24 नवंबर 2021 को निस्ट, जोरहाट में नव-नियुक्त वैज्ञानिकों के लिए संगठन के विजन एवं मिशन संरेखित करने के लिए प्रशिक्षण कार्यक्रम में "राजभाषा का सहज उपयोग" पर व्याख्यान के लिए आमंत्रित किया गया ।

नेशनल ब्यूरो ऑफ सॉयल सर्वे एण्ड लेण्ड यूज प्लानिंग (भारतीय कृषि अनुसंधान परिषद) : 20 सितंबर 2021 को आयोजित हिन्दी कार्यशाला के मुख्य अतिथि एवं व्याख्याता के रूप में राजभाषा कार्यान्वयन पर व्याख्यान हेतु आमंत्रित किया गया ।

भारत सरकार, वित्त मंत्रालय, प्रधान आकार आयुक्त कार्यालय, जोरहाट : 16 सितंबर 2021 को आयोजित हिन्दी सप्ताह समापन एवं पुरस्कार वितरण समारोह में मुख्य अतिथि एवं व्याख्याता के रूप में राजभाषा कार्यान्वयन पर व्याख्यान हेतु आमंत्रित किया गया ।

पूर्वाशा हिन्दी अकादमी, जोरहाट: 9 अप्रैल 2021 को आयोजित स्थापना दिवस समारोह के मुख्य अतिथि एवं व्याख्याता के रूप में हेतु आमंत्रित किया गया ।

हिंदी शिक्षण योजना द्वारा हिंदी भाषा प्रशिक्षण पाठ्यक्रम केंद्र का संचालन

हिंदीतर भाषी अधिकारियों/ कर्मचारियों के लिए निर्धारित स्तर के हिंदी भाषा पाठ्यक्रम प्रबोध/ प्रवीण / प्राज्ञ परीक्षा पास करना अनिवार्य होता 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 । वर्ष के दौरान कोविद महामारी के संक्रमण के कारण दो के स्थान पर केवल एक सत्र संचालित एवं परीक्षा आयोजित हुआ :

जनवरी 2021 सत्र : मई 2021 को आयोजित होने वाली परीक्षा कोविद महामारी के कारण रद्द कर अगले सत्र में स्थानांतरित कर दिया गया ।

जुलाई 2021 सत्र : इस सत्र में पिछले सत्र के प्रशिक्षार्थी संयुक्त रूप से नवंबर 2021 के दौरान आयोजित परीक्षा में भाग लिया 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 पावर ग्रिड कार्पोरेशन ऑफ इंडिया, ओएनजीसी लिमिटेड, जोरहाट, वर्षा वन अनुसंधान संस्थान, जोरहाट एवं यूको बैंक, जोरहाट से प्रशिक्षण हेतु नियमित / प्राईवेट नामित किए गए तथा नवम्बर 2021 को आयोजित परीक्षा में जनवरी-जुलाई दोनों सत्र के परीक्षार्थियों ने भी भाग लिया । कुल प्रशिक्षित आकड़े दर्शाए गए हैं ।

	परीक्षा फॉर्म भरे	परीक्षा में बैठे	परीक्षा में उत्तीर्ण	पुरूस्कृत परीक्षार्थी
प्रबोध	01	01	01	01
प्रवीण	28	22	22	22
प्राज्ञ	05	05	05	05

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 उल्लेखित तिथि 11/05/2021, 18/08/2021, 7/10/2021 एवं 16/03/2022 को बैठक 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 उद्देश्य 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 38वीं बैठक : नगर राजभाषा कार्यान्वयन समिति, जोरहाट की 38वीं बैठक ऑनलाइन मंगलवार 30 मार्च 2022 को संपन्न हो गया । डॉ जी नरहरि शास्त्री, अध्यक्ष नराकास सह निदेशक, सीएसआईआर-उत्तर पूर्व विज्ञान तथा प्रोद्योगिकी संस्थान, जोरहाट की अध्यक्षता में बैठक संस्थान के मुख्य वैज्ञानिक डॉ सौरभ बरुआ ने किया । भारत सरकार, राजभाषा विभाग, गुवाहाटी कार्यालय के प्रधान श्री बदरी यादव एवं जोरहाट अवस्थित लगभग सभी केंद्रीय कार्यालयों के प्रधान/ प्रतिनिधि बैठक में ऑनलाइन उपस्थित हुए एवं राजभाषा हिन्दी के कार्यालयों में प्रचालन पर चर्चा किया ।

ऑनलाइन 38वीं बैठक में (बाएँ) डॉ जी नरहरि शास्त्री, (दायें) ओएनजीसी के ईडी एवं बेसिन प्रबन्धक एवं राजभाषा विभाग से श्री बदरी यादव

बैठक ऑनलाइन 3.00 बजे आरंभ किया गया । कार्यक्रम का संचालन समिति के सचिव श्री अजय कुमार ने किया। उपस्थित कार्यालयों के प्रधान एवं प्रतिनिधियों ने अपना परिचय दिया । तत्पश्चात समिति के अध्यक्ष ने उपस्थित कार्यालय प्रधान एवं प्रतिनिधियों का हार्दिक स्वागत किया एवं समिति के लक्ष्य को दोहराया । इस दौरान सभी कार्यालयों ने अपने-अपने प्रयास, प्रोत्साहन गतिविधियां एवं आने वाली समस्याओं को समिति के सामने रखा । प्रावधान के अनुसार सभी कार्यालय को प्रत्येक तिमाही में राजभाषा हिन्दी के प्रगामी प्रयोग का रिपोर्ट निर्धारित प्रपत्र में भरकर राजभाषा विभाग, भारत सरकार को भेजने दायित्व है । विदित हो कि राजभाषा विभाग प्रत्येक वर्ष सभी कार्यालयों को राजभाषा हिन्दी अनुपालन के लिए वार्षिक कार्यक्रम में दिशा निर्देश के अंतर्गत एक लक्ष्य तय करती है, तदनुसार वार्षिक कार्यक्रम 2021-22 पर चर्चा के साथ अनुपालन का सुझाव दिया गया । सभी केंद्रीय कार्यालयों में कर्मचारियों का हिन्दी ज्ञान एवं प्रशिक्षण, हिन्दी टाइप/आशु/ कम्प्युटर कार्य, हिन्दी टाइप/कम्प्युटर की स्थिति, धारा 3(3) के अंतर्गत जारी किए गए कागजात की स्थिति, हिन्दी में प्राप्त पत्रों की स्थिति,पत्राचार की स्थिति, हिन्दी कार्यशालाओं के आयोजन की स्थिति, हिन्दी पदों की स्थिति,

कार्यालयों के प्रयोग में आनेवाली सामाग्री – फॉर्म, मोहरें, नामपट्टों की स्थिति पर विचार विमर्श हुआ । कार्यालयों ने अनुपालन की अपनी वचनबद्धता को दोहराया । राजभाषा विभाग द्वारा निर्धारित मानदंडों के अनुरूप नाराकास के सदस्य कार्यालयों में वर्ष के दौरान उत्कृष्ट राजभाषा कार्यान्वयन कार्य के प्रावधान के तहद तीन कार्यालय को चयनित किया गया । प्रथम : ओ एन जी सी, असम एवं असम अराकान बेसिन, जोरहाट द्वितीय : भारतीय जीवन बीमा निगम, मण्डल कार्यालय, जोरहाट एवं तृतीय : क्षेत्रीय सेरीकल्चर अनुसंधान केंद्र, केंद्रीय रेशम बोर्ड, जोरहाट को पुरस्कार से सम्मानित किया गया । कार्यक्रम ऑनलाइन होने के कारण पुरस्कार के रूप में प्रशंसा पत्र एवं शील्ड बाद में प्रदान किया गया । साथ ही कार्यक्रम में नगर राजभाषा कार्यान्वयन समिति, जोरहाट द्वारा प्रकाशित पत्रिका "अनुनाद" ई-पत्रिका के आठवाँ अंक के प्रिंट वर्जन का ऑनलाइन लोकार्पण किया गया ।

"अ एवं डिजिटल वर्जन का लोकार्पण

बैठक में ओएनजीसी, जोरहाट के ईडी एवं बेसिन प्रबन्धक, भारतीय विमानपत्तन प्राधिकरण जोरहाट हवाई अड्डा भारतीय जीवन बीमा निगम, आयकर आयुक्त कार्यालय, वर्षा वन अनुसंधान संस्थान, राष्ट्रीय मृदा सर्वेक्षण एवं भूमि उपयोग नियोजन ब्यूरो के वैज्ञानिक, केंद्रीय विद्यालय, जवाहर नवोदय विद्यालय, पंजाब नेशनल बैंक, केंद्रीय विद्यालय ओएनजीसी, डाक विभाग, चाय बोर्ड, यूनाईटेड इन्शुरेंस कंपनी, के प्रतिनिधियों ने भाग लिया एवं अपने कार्यालय के हिन्दी प्रगति को प्रस्तुत किया ।

अंत में ओएनजीसी के राजभाषा अधिकारी श्री अभिनव कुमार ने अपने वक्तव्य के साथ धन्यवाद ज्ञापित किया ।

INAUGURATION AND S&T FACILITIES INSTALLED

Inauguration of the 'Gene Bank of Endangered & Endemic Plant Species of North East India'

Prof. Pulok Kumar Mukherjee, Director, Institute of Bioresources and Sustainable Development (IBSD), Imphal, Manipur inaugurating the 'Gene Bank of Endangered & Endemic Plant Species of North East India' at CSIR-NEIST, Jorhat on 28 September 2021, in presence of Dr. G Narahari Sastry, Director, CSIR-NEIST, Jorhat.

Inauguration of the BioNEST Bioincubator

Dr Shekhar C Mande, Director General CSIR & Secretary DSIR inaugurated the "CSIR-NEIST BioNEST Bioincubator" in presence of Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat; Dr Mrutyunjay Suar, Director General R&D and CEO, KIIT-TBI, Bhubeneswar; Dr KRS Sambasiva Rao, Vice Chancellor, Mizoram University and Dr Arun Bandyopadhyay, Director, CSIR-IICB, Kolkata and Dr Siddhartha P Saikia, CEO, CSIR-NEIST BioNEST Bioincubator on 18th October 2021.

Inauguration of the Open Air Stage & STINER Training and Skill Development Centre

Dr Shekhar C Mande, Director General CSIR & Secretary DSIR inaugurated the Open Air Stage (Left) & STINER Training and Skill Development Centre (Right) upon his visit to CSIR-NEIST, Jorhat during 16-19 October 2021.

Inauguration of the G Thyagarajan Sabha Griha

Dr T Ramasami, Former Secretary, DST, Govt. of India; DG CSIR and Director CSIR-CLRI visited CSIR-NEIST, Jorhat and Dr G Narahari Sastry, Director, CSIR-NEIST welcomed him. Dr. Ramasami delivered the first Diamond Jubilee Lecture of CSIR-NEIST, Jorhat on "Diamond to Platinum: A Path Perspective" and inaugurated the 'G Thyagarajan Sabha Griha' in presence of Dr Madhu Dikshit, RC Chairperson, CSIR-NEIST and many other dignitaries on 25th November 2021. Our beloved Ex-Director of CSIR-NEIST, Dr. G Thyagarajan and Madam Thyagarajan also graced the occasion virtually.

Inauguration of the Regional-cum-Facilitation Centre (RCFC)


The Regional-cum-Facilitation Centre (RCFC) for North Eastern Region at CSIR-NEIST was inaugurated by Dr PG Rao and Dr D Ramaiah, Former Director's of CSIR-NEIST on 13 February 2022 In the presence of Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat. Other dignitaries present on the occasion were Dr. Madhavi Sastry, Senior Director, Schrodinger, Hyderabad and President, CSIR-NEIST Ladies Club; Dr. V. Subramanian, Outstanding Scientist, CSIR-CLRI, Chennai and Prof. B. M. Reddy, Former Chief Scientist, CSIR-IICT, Hyderabad.

Inauguration of Multi Locational Trial Cum Experimental farm


Dr G.Narahari Sastry, Director CSIR-NEIST, Jorhat inaugurated the sixth 'Multilocational Trail & Regional Research Experimental Farm' at Bokajan, Karbi Anglong Assam on 6 August 2021.


Dr G Narahari Sastry, Director,CSIR-NEIST,Jorhat inaugurated the seventh 'Multilocational Trail & Regional Research Experimental Farm' established by CSIR-NEIST under the CSIR AROMA MISSION at Dhemaji, Assam,19 August 2021.

Establishment of the eighth 'Multilocational Trail & Regional Research Experimental Farm' by CSIR-NEIST under the CSIR AROMA MISSION at Innao, Changlang, Arunachal Pradesh. 64 acres are brought under Lemongrass plantation at Innao, Arunachal Pradesh.

Dr. G Narahari Sastry, Director, CSIR-North East Institute of Science & Technology (CSIR-NEIST), Jorhat inaugurated the ninth Multi-locational Trail & Regional Research Experimental Field at Khehoyi, Dimapur, Nagaland today, and 18 September 2021.


Inauguration of 12th Multi-locational Trial and Regional Research Experimental Farm established by CSIR-NEIST, Jorhat at Bumtia, Agartala by Dr.G.Narahari Sastry, Director,CSIR-NEIST,Jorhat on 17 February 2022.

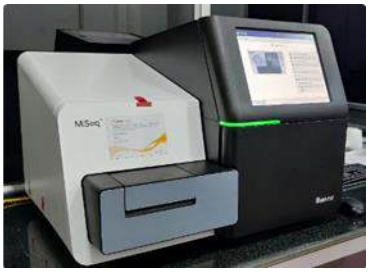
Installation of Essential Oil Distillation Unit

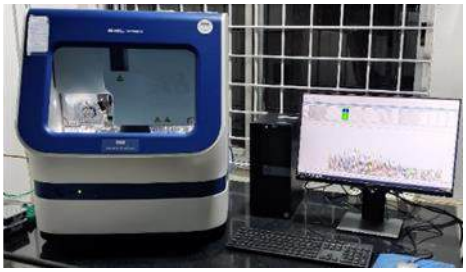
Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat inaugurated the Essential oil Distillation Unit installed under the CSIR AROMA MISSION Phase-II at Oyun, East Siang District,Arunachal Pradesh on 19 August 2021.

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat inaugurated the Essential Oil Distillation Unit installed under the CSIR-AROMA MISSION PHASE II AT Runne, East Siang District, Arunachal Pradesh on 20 August 2021.

Major Testing Facilities/equipments installed

State-of-the-art Next Generation Genomics Facility (NGGF)





The facility harbors Sanger sequencer, NGS platforms (Illumina MiSeq), and 3rd Generation Sequencing platform (Oxford NanoporeMinION) for carrying out genomic studies.

Melt Flow Index

The melt flow index (MFI) is a measure of the ease of flow of the melt of thermoplastic polymers.

Heat Deflection Temp.

Heat Distortion Temp., is a measure of a polymer's (polyolefins) resistance to alteration under a given load at an elevated temperature.

Density Tester

Density Tester is an instrument that measures the density of a sample liquid & solid. Digital density meters are used in the polymer samples, and chemical industries for quality control and in research and development.

Non-IBR Boiler with water treatment plant

NON-IBR reverse flue combustion system boiler steam generation capacity of 850 kg/h is used in Solvent extraction plant to generate heat at the reactor.

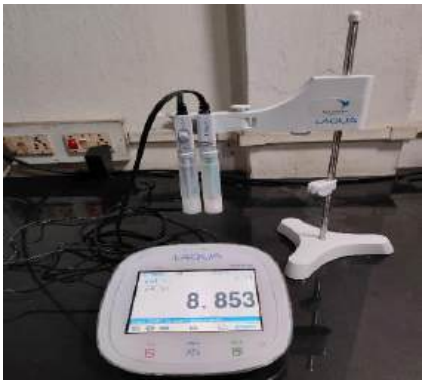
Solvent Extraction Plant

Pilot scale Solvent Extraction Plant capacity of 500 L is used to extract value added products from natural resources in North Eastern Region.

Forward Osmosis Test Skid

Forward Osmosis Test Skid is used to evaluate membrane performance.

Multiparameter Electrochemistry Meter



To determine the quality parameters of water such as pH, electrical conductivity, total dissolved solids (TDS), resistivity, Salinity, Ions etc.

Spray dryer

Spray dryer is used to dry powder from a liquid or slurry by rapidly drying it.

Electrospinning machine

Electrospinning equipment is used to design micro and nano scaled fibers.

BOD System

To determine the biological oxygen demand (BOD) of wastewater.

COD System

Forward Osmosis Test Skid is used to evaluate membrane performance.

Melt Flow Index Tester

Provides the necessary data of mass flow rate of the polymer with respect to time.

Specific Gravity Measurement KIT

To weight different solid and liquid samples along with the measurement of their densities.

Electrospin for Polymer Composites

Utilized to generate nanofibers/ films from various types of materials.

Triple Quadrupole LCMS/MS System Connected With UHPLC System

The Triple Quadrapole LCMS/MS system provides analytical capabilities for applications such as chemical, food, forensic, pharmaceutical, and herbal product testing and allow users to achieve sensitive, robust, and reliable MS/MS analysis.

ATOMIC ABSORPTION SPECTROMETER

Atomic Absorption Spectrometer has many applications in different areas of chemistry and also used in in pharmacology, archaeology, mining, forensics etc. Basically it is used to determine the concentration of metal atoms/ions in a sample. Atomic absorption spectrometry can be used in qualitative and quantitative analysis.

WORKSHOP/WEBINAR/SEMINAR/CONFERRENCE/MEETINGS ORGANIZED

Webinar on "2G Ethanol Plants: Challenges and Opportunities "

Dr G Narahari Sastry, Director, CSIR NEIST, has delivered a talk on "Biofuels: Then, Now and Beyond" in the Webinar on "2G Ethanol Plants: Challenges and Opportunities "organized by Numaligarh Refinery Limited on 28th May 2021. The Webinar has organized to mark "Azadi ka Amrit Mohotsav" celebrating 75 years of India's independence. Dr Sastry has mainly focused on opportunities and major bottlenecks in 2G Bioethanol production. He has also emphasized on short, medium and long term planning's where Industry and Academia can come together to solve the problems which may provide solutions and increase the glory of the nation.

During the webinar Discussion

Meeting on "North East India SARS-CoV-2 Genome Sequencing under INSACOG"

A meeting on "North East India SARS-CoV-2 Genome Sequencing under INSACOG" was conducted by CSIR-NEIST, JORHAT on 11 June 2021 among the three Regional Genome Sequencing Laboratories (RGSLs) of INSACOG (CSIR-NEIST Jorhat, ICMR-Regional Medical Research Centre, Dibrugarh, and DBT-IBSD, Imphal). The meeting was organized to discuss collaborative strategies and planning for concerted genome surveillance of SARS-CoV-2, the virus causing COVID-19, in North East India. Dr. G. Narahari Sastry highlighted about the state-of-the art genome sequencing facility created in CSIR-NEIST, Jorhat and its

recently established Centre for Infectious Diseases to lead the genome surveillance of SARS-CoV-2 in the region. Dr Sastry appreciated the facilities of ICMR-RMRCNE and DBT-IBSD for sequencing of SARS-CoV-2 and sought for better collaboration for increased research in the area of infectious diseases, in general, and genome surveillance of pathogens in particular. He also mentioned about the advanced computational facility of CSIR-NEIST that will play a pivotal role in the sequence data analysis. The meeting was attended by Prof. Pulok Mukherjee, Director, DBT-IBSD, Imphal, and Dr. Biswa Jyoti Borkakoti, Scientist E, ICMR-RMRCNE, Dibrugarh, along with the team of core scientists for SARS-CoV-2 genome sequencing of the three RGSLs.

During the meeting

Webinar under CSIR Floriculture Mission

A webinar was organized under "CSIR-Floriculture Mission in North East India" on 12 June 2021 by CSIR-NEIST, Jorhat under the leadership of Dr G Narahari Sastry, Director, CSIR-NEIST. The basic idea was to stimulate an interaction between farmers and scientists on prospects of floriculture crops, production of quality seedlings, value added products, field to market and prospects of apiculture in North East India. In his speech, Dr Sastry emphasized on the reduction of import of floriculture materials from the neighboring countries like Thailand, Indonesia etc. as there are scopes galore for production of quality floriculture products in North East India as a global biodiversity hot spots to cater towards the local market. Other key persons who shared their experiences and addressed the webinar were, Dr Triranga Bharatiya Borah, Director, Directorate of Horticulture & Food Processing, Assam, Dr Dhrubajyoti Sharma, Proprietor Daffodil Nursery, Kamrup and Shri Chiranjeet Baruah, Proprietor Chrome Hydroponic Nurseries, Dibrugarh. The webinar saw the participation of 120 farmers from all across the NE India, apart from scientists from CSIR-NEIST and other resource persons as well as the students.

Webinar session under "CSIR-Floriculture Mission in North East India"

International Virtual Workshop on Global Seismology & Tectonics (IVWGST-2021)

Geoscience & Technology Division of CSIR-NEIST, Jorhat is organized the 2nd International Virtual Workshop on Global Seismology & Tectonics (IVWGST-2021) during 20-30 September 2021. Globally renowned personalities from the field graced the occasion as speakers. The Live Events were conducted through Microsoft Teams Application.

Valedictory Session of IVWGST- 2021 featuring (in Clockwise direction starting from upper left) Dr. Andrew J. Michael, USGS; Dr. Santanu Baruah, CSIR-NEIST; Prof. Dapeng Zhao, Tohoku University, Japan; Prof. J. R. Kayal, Ex-DDG GSI; Dr. Sarah E. Minson, USGS, USA and Dr. G Narahari Sastry, Director, CSIR-NEIST

Drug Discovery Heckathalon

The Drug Discovery Hackathon 2020 Mentorship Program culminated on 30 Sep, 2021 in presence of Dr. G. Narahari Sastry, Director CSIR NEIST and Chairman, DDH Mentorship

Program, Mr Abhay Jere, Chief Innovation Officer, MoE, Ms Pooja Rawat, Innovation Officer, Dr. Girinath Pillai, Nyro Research and all the mentors and participants. Dr. G. Narahari Sastry interacted with all the students and highlighted the objectives of the mentorship program along with all the facilities available at CSIR NEIST, Jorhat for carrying out their project. The training sessions in the mentorship program were classified into three categories – ACDS lectures, CADD lectures and Special lectures. The ACDS lectures were devoted towards state-of-the-art topics in advanced computation and data sciences like artificial intelligence and machine learning, text mining etc. whereas CADD focused on specific areas of computer aided drug design. For the special lectures, eminent speakers were invited to deliver talks as well as interact with the students and give them insights on new areas of research.

The DDH 2020 mentorship program had 26 participants across the country from diverse academic backgrounds. These participants were selected through an interview conducted by the selection committee under the guidance of the Chairman, DDH Mentorship Program.

As an objective of the DDH mentorship, the participants had to undergo 6 months project work for which all the participants were divided into 6 groups according to their choices in the areas where they wanted to continue their project. The broad areas for carrying out the projects were –

- Text mining and Natural Language Processing
- Protein-Protein Interaction
- Chemoinformatics and Machine Learning
- Diagnostics
- SARS-CoV2 versus other viruses
- Epidemiology Modeling

Apart from the lectures the students were categorised into different groups based on diverse methodologies with a focus on viral diseases. Hands-on sessions and talks on relevant topics were given by the mentors to each of the groups. From 30th September, 2021 till 29th March, 2022, a total of 325 DDH sessions were conducted by the mentors and students. All the activities were guided and monitored by Dr. G. Narahari Sastry, Chairman, DDH.

Seminar on Status and need of Bioinformatics in North East Region

A seminar on the Status and need of Bioinformatics in the North East Region was organized during 15–16 March 2022. The seminar aims to bring the experts in Bioinformatics from different parts of India. The eminent speakers have shared their research findings. The

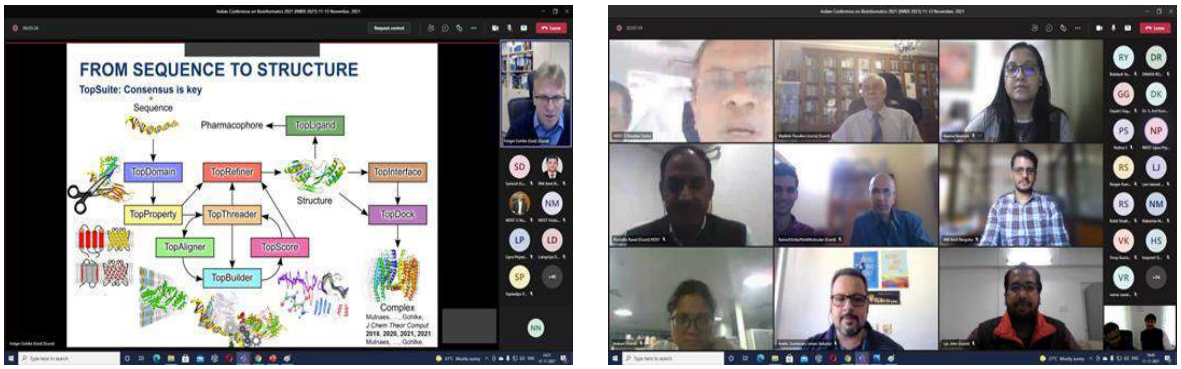
seminar also stressed the importance of developing open source computational drug discovery software in India. The students have been exposed to novel computational techniques and the application of machine learning in computational drug discovery.

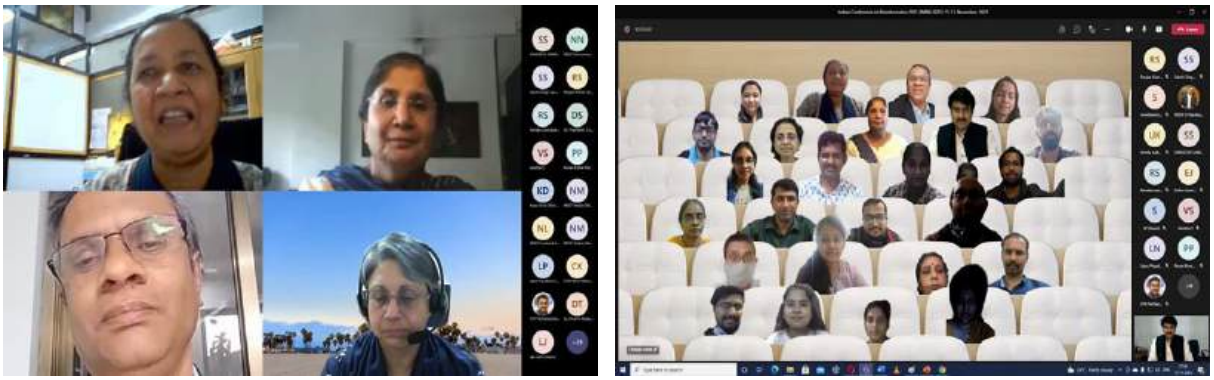
(Left) Dr G Narahari Sastry, Director, CSIR-NEIST addressing the participants during the Seminar. (Right) Participants during the seminar

Indian Conference on Bioinformatics

The Indian Conference on Bioinformatics was held from 11-13 November 2021 and hosted by CSIR-North East Institute of Science and Technology, Jorhat, Assam in virtual mode (through Microsoft Teams). The theme of the conference was "***Strengthening Computational Drug Discovery***". The conference intended to bring the eminent scientists, technologists and young researchers together in the area of bioinformatics and computational biology across the globe to provide a common platform for discussing their achievements and newer directions of cutting-edge research. A total of 141 participants registered for the conference and 3 participants were from abroad and a total of 92 abstracts were submitted.

The participants of INBIX 2021 were addressed by three keynote and fourteen invited speakers who delivered their talks in diverse fields of drug discovery and allied areas. Apart for the keynote talks, other invited talks were delivered in six different sessions which are as follows–Advances in Biotechnology, Advances in Structural Biology, Frontiers in Biosciences and Machine Learning, Advances in Translational Omics, and Advances in Bioinformatics.





Glimpses of online session

Biomedical and Health Research Ethics Certificate Training Course

CSIR-NEIST organized a Biomedical and Health Research Ethics Certificate Training Course on the occasion of Diamond Jubilee Year Celebration to spread awareness about the principles and recent guidelines of biomedical and health research ethics, which has been participated by scientist and faculties of different organizations such as RMRC Dibrugargh, Jorhat Medical College, Dibrugargh University etc on 10 March 2022. Dr G Narahari Sastry, Director, CSIR-NEIST extended a warm welcome to all the participants emphasizing the importance of adhering to the ethical guidelines during pursuit of R&D and the necessity of risk versus benefit analysis, following the ethical principles. Dr. BR Das, HOD, Community Medicine Department, JMCH, Jorhat being the Resource person for the programme delivered valuable insights on basic principles of biomedical research ethics, challenges and possible ways for troubleshooting. He completed an exhaustive and interactive deliberation on national guidelines on biomedical research including roles & responsibilities of ethical committees and their members.

During the meeting

CSIR-NEIST organized Stakeholders' Meet on Promotion and Conservation of Medicinal Plants Sector in North Eastern Region India

Stakeholders Meet on "Promotion and Conservation of Medicinal Plants Sector in North Eastern Region India" was organized by Regional-cum-Facilitation Centre for North Eastern Region (RCFC-NER), CSIR-NEIST on 14 March, 2022 which was sponsored by NMPB,

Ministry of AYUSH, Govt. of India. Dr P G Rao, Former Director, CSIR-NEIST graced the occasion as Guest of Honour for the programme. Mr Saurabh Sharma, Manager (Marketing & Trade), NMPB in his address emphasised on various aspects relating to medicinal plants, support policies and programs for growth of trade, export, conservation and cultivation.


From Left: Mr Saurabh Sharma, Manager (Marketing & Trade), NMPB and Dr P G Rao, Former Director, CSIR-NEIST speaking on the occasion.

EVENTS ORGANISED

Ms Sonia Laul, United States Consul for Political and Economic Affairs and MR Rakeeb Hossain, Assistant, Plitical and Economic Affair

Ms Sonia Laul, United States Consulate for Political and Economic Affairs and Mr Rakeeb Hossain, Assistant, Political and Economic Affairs visited CSIR-NEIST and had a meeting with Dr G Narahari Sastry, Director, CSIR-NEIST and Women Scientists of the institute on 12 April 2021. The team discussed about various programs to encourage women scientist sponsored by US Government and type of collaboration that may be established between scientific organisations of US and other countries like India specifically for Women under 'Women in Science' program.


(Left) Dr G Narahari Sastry, Director, CSIR-NEIST Felicitating Ms Sonia Laul, United States Consulate for Political and Economic Affairs. (Right) During the meeting with women scientists.

CSIR-NEIST celebrated 75rd Independence Day

CSIR-NEIST celebrated the 75rd Independence Day on 15 August 2021 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. Bi-Cycle rally and poem recitation competition has been organized on the occasion and certificates have been distributed to the winners and participants of the event.

Glimpses of Independence day celebration

Meeting with officials of ICMR-Regional Medical Research Centre, Dibrugarh

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat along with a team of Scientists visited ICMR-Regional Medical Research Centre, Dibrugarh on 18 August 2021. Dr Sastry had a meeting with the Director, ICMR-RMRC and with the core scientists involved in SARS-CoV-2 genome sequencing. The 3 institutions of North East, CSIR-NEIST, ICMR-RMRC and DBT-IBSD, Imphal geared up for genome sequencing of SARS-CoV-2 variants. Dr Sastry and

team also visited the Regional VRDL Laboratory at ICMR- RMRC where Screening & Confirmatory tests for COVID-19 are done.

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat along with a team of Scientists visits to ICMR visited ICMR-Regional Medical Research Centre, Dibrugarh

Meeting with officials of Health Services, Arunachal Pradesh

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat and a team of Scientists from CSIR-NEIST had a meeting with Dr Raina Dukhum, Joint Director, Health Services, Pasighat, Arunachal Pradesh on 21 August 2021. The meeting was regarding Screening & Confirmatory tests for COVID-19 samples of Pasighat being undertaken at CSIR-NEIST, Jorhat and further discussed about sequencing of SARS-CoV-2 genome to be jointly carried out by CSIR-NEIST along with ICMR-RMRC and DBT-IBSD and JDHS, Pasighat and future health care of people of Arunachal and to work together.

Dr G Narahari Sastry, Director, CSIR-NEIST along with a team of Scientists from CSIR-NEIST at Health Services, Pasighat, Arunachal Pradesh

Meeting with the officials of Numaligarh Refinery Limited (NRL), Golaghat

CSIR-NEIST organized a meeting with the officials from Numaligarh Refinery Limited, Golaghat to review the ongoing industry sponsored research project under the area Petroleum Research and brainstorming discussions on 13 September 2021. The NRL officials handed over the safety kits for CSIR-NEIST Research Fellows to the Director, CSIR-NEIST, Jorhat.

(Left) Meeting with the NRL Officials at Dr M. S Iyengar hall, CSIR-NEIST. (Right) handing over of safety kits by NRL officials.

Dr G Narahari Sastry, Director CSIR-NEIST visited M/s Nagi Trading and Company Limited, Tinisukia. Assam

Dr G Narahari Sastry, Director, CSIR-NEIST along with a team of Scientists on 21 September 2021 visited the workshop of M/s Nagi Trading and Company Limited, Maklum, Tinisukia. The visit was made to inspect and check the quality of materials and quality of Oil Distillation Units that are being under fabrication in the workshop. The distillation unit was designed in CSIR-NEIST will be provided to different beneficiaries under Aroma Mission.

Glimpses of visit to M/s Nagi Trading and Company Limited, Tinisukia. Assam

Meeting with the officials of Indian Oil Corporation Ltd (IOCL), Digboi

Dr G Narahari Sastry, Director, CSIR NEIST, and a team of Scientists of CSIR NEIST visited IOCL Digboi on 21st September 2021 and discussed about various issues of the refinery and collaborative research work. In a brainstorming discussion, Shri N K Barua, CGM (TS&HSE)

and other top officials of the refinery presented various activities of the refinery and have shown interest to work together for the mutual benefit of both the organizations.


Dr G Narahari Sastry, Director, CSIR NEIST, and a team of Scientists of CSIR NEIST visited IOCL Digboi

Dr G Narahari Sastry, Director, CSIR-NEIST visited High Mountain Arid Agriculture Research Institute (HMAARI), Ladakh

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat along with Dr. Siddhartha P Saikia, Principal Scientist & Principal Investigator, and Dr Mohan Lal, Senior Scientist & Co-Investigator, CSIR AROMA MISSION visited High Mountain Arid Agriculture Research Institute (HMAARI) under Sher-e-Kashmir University of Agricultural Sciences & Technology, Kashmir at Leh, Ladakh on 22 September 2021. Dr Sastry had a meeting with Dr D Namgyal, Associate Director (R&E), HMAARI, Leh and his team on CSIR-NEIST initiatives for S&T led development in J&K and also on human resource development through training the farmers, farm women, unemployed youths and Extension Workers and to involve them in the process of technology generation in agriculture and allied fields. Dr Sastry stretched on imparting learning through "work experience" to those who are engaged in farming and also emphasised on Teaching by doing and Learning by doing to be the main methods of imparting skill training.

Dr G Narahari Sastry, Director, CSIR NEIST, and a team of Scientists of CSIR NEIST visited HMAARI, Leh

Dr G Narahari Sastry, Director, CSIR-NEIST visited DRDO-Defence Institute of High Altitude Research (DIHAR) Leh, Ladakh

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat along with Dr Siddhartha P Saikia, Principal Scientist & Principal Investigator, and Dr Mohan Lal, Senior Scientist & Co-Investigator, CSIR AROMA MISSION visited DRDO-Defence Institute of High Altitude Research (DIHAR) Leh, Ladakh on 23 September 2021. Dr Sastry along with his team of Scientist had a meeting with Dr Om Prakash Chaurasia, Director, DRDO-DIHAR, and his team. The discussion focused mainly on screening and identifying the medicinal and aromatic plants in Leh-Ladakh region to exploit them for use for defence purposes and also on greenhouse technologies for high altitude and cold desert areas. Dr Sastry stretched mainly on R&D work in frontier areas of food and agriculture and biomedical science for well being of soldiers deployed in high altitude cold desert and also to develop scientific agricultural technology interventions to enhance and benefit the farming community in their net agricultural income in a sustainable manner.

Dr G Narahari Sastry, Director, CSIR NEIST, and a team of Scientists of CSIR NEIST visited DRDO-Defence Institute of High Altitude Research (DIHAR) Leh, Ladakh

CSIR Director General (DG) visits Northeast to trigger scientific temper

Dr. Shekhar C Mande, Director General, Council of Scientific And Industrial Research (CSIR), New Delhi and Secretary, Department of Scientific and Industrial Research (DSIR), Government of India visited Northa East to trigger scientific temper during 16-19 October 2021. Dr Mande inaugurated Eleventh Multi-locational Trial & Regional Research Experimental Field at Bomdila, Arunachal Pradesh on 16 October 2021 in presence of Dr G. Narahari Sastry, Director, CSIR-NEIST, Jorhat and a team of scientists from CSIR-NEIST, Jorhat.


Inauguration of the Eleventh Multi-locational Trial & Regional Research Experimental Field at Bomdila

Dr Mande also inaugurated the 'Essential Oil Distillation Unit' installed under the CSIR Aroma Mission under the aegis of CSIR-NEIST at Balijan, Golaghat, which is a step towards promoting rural entrepreneurship and enhancing the livelihood of rural people.


Inauguration of “Essential Oil Distillationj Unit” Balijan, Golghat, Assam

On October 17, Dr Mande paid a visit to CSIR-NEIST, Jorhat and had a one-to-one interaction with the young scientists of CSIR-NEIST and offered his suggestions to them in executing their R&D assignments.


Dr Mande’s interaction with scientists of at M S Iyengar Hall, CSIR-NEIST.

Dr Mande also interacted with the research scholars of CSIR-NEIST. Dr Mande motivated and urged them to bring about novelty and innovation in their research.


Dr Mande's interaction with research scholars at Dr J N Baruah auditorium, CSIR-NEIST.

On 18 October 2021, the STINER Hub & Spoke interactive meet was started in Dr J N Baruah Auditorium. In the meeting delegates from all spokes i.e. Arunachal Pradesh, Assam, Meghalaya, Manipur, Mizoram, Nagaland, Sikkim and Tripura were present. Dr. Shekhar C Mande, Director General, CSIR addressed the gathering and spoke about the responsibility of working for the people. He suggested identifying 50 numbers of major problems of the North East India and submitting those major problems to him for further course of action. Dr G. Narahari Sastry, Director, CSIR-NEIST, Jorhat assured that the institute is committed to deliver tangible outcome for the people through STINER. The meeting was addressed by several dignitaries like Dr Madhu Dikshit, Former Director of CSIR-CDRI, Lucknow & Chairman, Research Council, CSIR-NEIST, Jorhat; Dr Dinabandhu Sahoo, IBSD, Imphal; Dr Mrutyunjay Suar, Professor & Director General, R & D, KIIT University, Bhubaneswar, Prof. K.R.S. Sambasiva Rao, Vice Chancellor, Mizoram University, Dr. Arun Bandyopadhyay, Director, CSIR-IICB, Kolkata, Dr Saurabh Baruah, Chief Scientist, CSIR-NEIST, Jorhat and suggested valuable comments and advices.

STINER Hub & Spoke interactive meet

The R&D-Academia-Industry meet was also held on 18 October 2021. The event commenced with the inauguration of the STINER Training and Skill Development Centre by Dr Mande. This was followed by the industry meet which was attended by the industry heavy weights from the Oil and Gas industry sector operating in NE India along with entrepreneurs who availed the technologies of CSIR-NEIST. Dr G. Narahari Sastry, Director CSIR-NEIST, addressed the august gathering and mentioned in his opening remarks that Dr Mande's presence was a big morale booster. He urged upon the scientific fraternity and the industry partners to work on S&T intervention for the economic prosperity of the NE India region. During the R&D-Academia-Industry meet, an MoU was signed with the Royal Global University, Guwahati for Research and Academic Collaboration.

Inauguraton of STINER Training and Skill Development Centre by Dr. Shekhar C Mande, Director General


During the R&D-Academia-Industry meet

On 18 October 2021, a Student Scientist Connect Program under CSIR-JIGYASA was organized at CSIR-NEIST, where around 104 students studying in classes viii to xii of Jorhat district, 7 teachers and 11 out of 18 child scientists adopted by CSIR NEIST had participated offline and more than 2000 students and teachers from all around NE India had participated online. 18 bright students from different districts of Assam belonging to economically weaker backgrounds were selected through an exam conducted by Assam Science Technology& Environment Council (ASTEC) and were considered as CSIR-NEIST Child Scientists. Dr. Mande also inaugurated the “CSIR-NEIST BioNEST Bioincubator and released a booklet on the Bioincubator during the programme.


Dr Mande Student Scientist Connect Program under CSIR-JIGYASA


(Left) Dr Mande inaugurating the CSIR-NEIST BioNEST Bioincubator. (Right) release of a booklet on the Bioincubator

During the visit to Assam Dr Mande also attended the Bhagwat Bhraman' procession of 573 Shri Shri Shankardeva Janmotsav and Bhaona organised by CSIR-NEIST, Jorhat Assam. Bhaona is a traditional form of entertainment, with religious messages, prevalent is Assam, India. A friendly cricket match was played between DGs 11 vs. Directors 11 on 18 Oct. 2021 in CSIR-NEIST playground. Dr Shekhar C Mande, DG CSIR; Director CSIR-NEIST Dr G. Narahari Sastry; Dr Dinabandhu Sahoo, IBSD, Imphal; Dr Mrutyunjay Suar, Professor & Director General, R & D, KIIT University, Bhubaneswar, Prof. K.R.S. Sambasiva Rao, Vice Chancellor, Mizoram University, Dr. Arun Bandyopadhyay, Director, CSIR-IICB, Kolkata along with the research scholars and staff members of CSIR-NEIST, Jorhat enjoyed the game together.


Glimpses of Bhagwat Bhraman




Glimpses of Bhaona


Glimpses of friendly Cricket Match

Meeting with the officials of Numaligarh Refinery Limited, Golaghat

A meeting was organised at CSIR NEIST on 9 November 2021 between the officials of Numaligarh Refinery Limited (NRL), Golaghat and scientists from CSIR NEIST for a brainstorming discussion on collaborative project in the area of Catalysis and Enzyme useful for upcoming NRL Biorefinery which is expected to be commissioned very soon. Shri Ghanashyam Hazarika, GM, Shri Bipul Kalita, DGM and Shri Rupam Talukdar, SM took part in the discussion with a number of scientists from CSIR NEIST.

Meeting at M S Iyenger Hall, CSIR-NEIST

Meeting with the officials of Indian Oil Corporation Ltd., Digboi

A meeting between the officials of IOCL, Digboi and a team of scientist from CSIR-NEIST was organized at CSIR-NEIST on 12 November 2021 in connection with some of the CSIR-NEIST technologies related to their plant operations. The team discussed with the concerned scientists of the institute for possible collaboration on the areas. Mr. B Saha, Senior Manager, Mr. B Kalita, SM, Engineering Department, Mr. Monojit Chowdhury, Senior Manager, Health Safety and Environment Control, IOCL, Digboi attended the meeting.

Meeting with the officials of IOCL, Digboi

Dr G Narahari Sastry, Director, CSIR-NEIST visited Pachhunga University College

Dr G Narahari Sastry, Director, CSIR-NEIST and a team of scientist from CSIR-NEIST visited Pachhunga University College, Aizawl, Mizoram for the Inauguration Program of Broadband Seismic Station in the college campus as Guest of Honour today on 12 November, 2021. The Hon'ble Chief Minister of Mizoram Shri Zoramthanga inaugurated the

station. Three numbers of seismic monitoring stations has been set up in Mizoram with the initiative and effort of CSIR-NEIST in collaboration with Pachhunga University College. Dr. G Narahari, Director, CSIR-NEIST and the team of scientist also interacted with the Students and faculty members of Pachhunga University College, Aizwal.


Dr G Narahari Sastry, Director visited Pachhunga University College, Aizawl, Mizoram

Assam Health Minister Keshab Mahanta, accompanied by a team of virologists, visited CSIR-NEIST, Jorhat

Honorable Shri Keshab Mahanta, Minister Health & Family Welfare, Information Technology, Science and Technology, Government of Assam along with MD of National Health Mission Assam, Dr Purnima Boruah, superintendent of JMCH and Dr Ajanta Sharma, HOD Department of Microbiology, GMCH visited CSIR-NEIST, Jorhat on 29 December 2021. They had a meeting Dr. G Narahari Sastry, Director, CSIR-NEIST and other Scientists of the institute to understand the Covid whole Genome Sequencing facility and processes in CSIR-NEIST and discussed about setting up another Genome Sequencing Lab in GMCH in collaboration with CSIR-NEIST. CSIR-NEIST is the only Laboratory providing genome sequencing facility in the North East. The minister and virologists also visited the advanced molecular laboratory of CSIR-NEIST.



Visit of Honorable Shri Keshab Mahanta, Minister Health & Family Welfare

Meeting with the officials of Rajiv Gandhi Institute of Petroleum Technology (RGIPT)

A meeting with officials of Rajiv Gandhi Institute of Petroleum Technology (RGIPT) was organized at CSIR-NEIST on 30 December 2021. Professor A S K Sinha, Director, Rajiv Gandhi Institute of Petroleum Technology (RGIPT) along with Mr Chinmoyjit Sarmah, Incharge, RGIPT-Sibsagar attended the meeting and interacted with Dr G Narahari Sastry, Director, CSIR-NEIST and Scientists, Centre for Petroleum Research of the institute for possible collaboration in the area of downstream and upstream research related to petroleum industry.

Meeting with the officials of Rajiv Gandhi Institute of Petroleum Technology (RGIPT)

National Science Day Celebration

National Science Day celebrated at CSIR-NEIST, Jorhat in a different note by organising a Students- Scientists Connect Program at Kendriya Vidyalaya to inculcate the scientific temper among the students on 28 February 2022. Dr G Narahari Sastry, Director CSIR-NEIST handed over laboratory apparatus, glasswares and books to the Kendriya Vidyalaya

Science Laboratory. Further, he illuminated the students by delivering a science popular talk. Various Science experiments were also demonstrated by the Research Scholars and Scientist.

Glimpses of Science day celebration at Kendriya Vidyalaya.

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 G Narahari Sastry, Director, CSIR-NEIST delivered welcome address on the occasion. Prof. Nashreen S Islam, Dept. of Chemistry, Tezpur University graced the occasions as chief guest and delivered a talk on Women Empowerment. Dr Sarala Balachandran, Chief Scientist & Head, RAB, CSIR; Mrs. P. Yasodhara, Former president NEIST ladies club; Dr. Madhavi Sastry, Senior Director, Schrodinger & President, NEIST ladies Club and Dr. Pranabika Mahanta, Dept of O&G, JMCH, attended the program as guest of honor and delivered their respective views on “Gender equality today for a sustainable tomorrow" and discussed about women health, nutrition and lifestyle. An interaction session- "Hear out to the participants on gender equality for sustainable tomorrow" has also been organized moderated by Dr G Madhavi Sastry and all other invitees.

Glimpses of International Women's day celebration

Meeting with the officials of Oil and Natural Gas Corporation ltd. (ONGCL), Cinnamara, Jorhat

CSIR-NEIST organized a brainstorming meeting with ONGCL, Cinnamara on 19 March, 2022. Ms. Sushma Rawat, Executive Director & Basin Manager, ONGCL, Cinnamara was present along with other officials namely Dr Sanjoy Bhutani, Shri S K Singh, Dr B C Dutta and Dr Vivek Kumar Singh. The meeting focused on various issues and problems faced by oil industries like ONGC and possible collaboration between the two organizations to address these issues.

Meeting with the officials of Oil and Natural Gas Corporation ltd. (ONGCL), Cinnamara, Jorhat

CSIR-NEIST teams visited ONGC, Assam and Assam Arakan Basin, Cinnamara, Jorhat

A team of Scientists from CSIR-NEIST, Jorhat visited ONGC, Assam and Assam Arakan Basin, Cinnamara, Jorhat on 24 March, 2022 in connection with the proposed collaboration work in AI and ML aspects for classifications and prediction data of oil wells in nearby areas. The team of Scientist consisting of Dr Swapnali Hazarika, Dr Hriday J Mahanta, Dr S Nagamoni, Dr Supriya Saha and Dr Yadu Kondolu, discussed about the work including collection of data from the drilling site with the concerned officials from the industry. The team also visited the central computational facilities in the industry.

Dr Swapnali Hazarika, Pr Scientist along with the team of scientist meeting with official of ONGCL, Jorhat

CSIR-NEIST concluded its year-long Diamond Jubilee celebration

CSIR-NEIST has traversed 60 years long saga of glorious journey. The institute commemorated its Diamond Jubilee celebration with various events in a befitting manner from 12 to 17 March, 2022. The main programme commenced on 16 March, 2022 with the garlanding of the statue of Jananayak Late Debeswar Sarmah. Diamond Jubilee address was delivered online by Chief Guest Dr Shekhar C Mande, Director General, CSIR. He appreciated CSIR-NEIST on the scientific feats achieved by the institute especially on the laurels achieved by the institute like the Shanti Swarup Bhatnagar award. Dr Mande made a categorical mention about the ambitious programmes that the institute has undertaken which are of regional and national interests viz. Drug Discovery Hackathon (DDH)-an open source drug discovery, Summer Research Training Programme (SRTP) for the students, the new COVID testing lab of the institute, genome sequencing research connected to COVID virus, Jigysa programme meant to connect the lab with the schools through both virtual and real mode to develop scientific temperament among the school children etc. to name a few from a host of others. Dr Mande highly applauded the new research and development (R&D) benchmark the institute has set in, which is a quintessential example and standard for others to follow. Dr Mande mentioned that the institute since its inception as RRL-Jorhat has come a long way to CSIR-NEIST and played a pivotal role in contributing immensely to the economic, industrial and societal upliftment of the North Eastern Region in particular and the

country as a whole, and opined that a golden era of science and technology (S&T) has ushered in for the institute.

Padmashri Dr Harsh Kumar Gupta garlanding of the statue of Jananayak Late Debeswar Sarmah

In his welcome address Dr G Narahari Sastry, Director, CSIR-NEIST, highlighted on the recent scientific collaborative understanding the institute has entered and the R&D expansion the institute is undergoing was elaborated. Dr Sastry highlighted on the fact that in the recent years the institute has undergone a sea change in terms of creating state-of-the-art R&D infrastructure and venturing into the realm of cutting-edge technological development with thrust on frontier areas of research like genome sequencing pertaining to COVID-19 virus, petroleum research, and also highlighted the notable contributions of the laboratory viz. the VSK mini Cement Plant, Development of Pesticides during Green Revolution, Hydroxychloroquine with Bengal Chemicals, Anti-arthritis and other formulations, besides developing and propagating Medicinal and Aromatic plants in North East and other parts of the country. He also mentioned about the recent scientific honours in terms of publications, patents besides the institute being the recipient of Shanti Swarup Bhatnagar Award 2021, honorific like FNASc, FRSC, the newly established divisions of Advanced Computation and Data Sciences involved in machine learning and artificial intelligence, molecular modeling etc, the Centre for Infectious Diseases responsible for COVID testing, genome sequencing etc and for the first time in the country the SRTP was organized by the institute on a PAN India basis covering all the CSIR labs.

Dr G Narahari Sastry, Director, CSIR-NEIST is seen addressing the audience and Dr Shekhar C Mande, DG, CSIR gracing the occasion as Chief Guest online. Other dignitaries seen on the dais are (from right), Dr Madhavi Sastry, Senior Director, Schrodinger; Dr P G Rao, Former Director, CSIR-NEIST; Dr Sharmila Mande, Distinguished Chief Scientist, TCS and Padmashri Dr Harsh Kumar Gupta.

The inaugural function was attended by a host of dignitaries including Padmashri Dr Harsh Kumar Gupta and Dr P G Rao, Former Director, CSIR-NEIST. CSIR-NEIST Diamond Jubilee Album and NEIST Annual Report 2020-21 was released by Director, CSIR-NEIST, as well as a Souvenir by NEIST Ladies Club was also released on this occasion. Prize and certificate distribution ceremony was held connected to various sporting events organized during the Diamond Jubilee celebration of the institute.

Dr G Narahari Sastry, Difrector CSIR-NEIST, Padmashri Dr Harsh Kumar Gupta and Dr P G Rao, Former Director, CSIR-NEIST and other dignitaries releasing the Diamond Jubilee Album.

A cultural programme was held in the evening of 16 March, 2022 which saw the participation of staff members of the institute and their children.

Glimpses of Cultural programme

On 17 March, 2022 an Ex-employees Meet was held followed by session on oil and petroleum research which was attended by industry professionals such as Shri Bhaskar Jyoti Phukan, MD, NRL, Dr Arup Kumar Mishra, Chairman PCB, Assam, Ms Sushma Rawat, ED-BM, ONGC, Cinnamara, Jorhat. Dr Sastry mentioned that the meet is focused on recent advances in petroleum research from lab to industry for sustainable future. Dr Sastry emphasized on the potentiality and capability of CSIR-NEIST for solving the problems of oil and petrochemical industries. Dr Sastry also called the young researchers to gather relevant knowledge and get ready to solve the needs and problems of the industries of North Eastern region (NER) of the country to avoid dependence external agencies. Moreover, Dr Sastry explained the importance of growth of downstream industries in this region so as to increase the value of petroleum based raw materials in our own country to fulfil the needs, and hence augment the profit of the petrochemicals based exportable items. Dr Sastry also informed about the plans of CSIR-NEIST to produce human resource through industry sponsored PhDs. Dr Sastry mentioned that the entire CSIR-NEIST family is ready to dedicate the diamond to platinum journey of the institute for solving the problems of petroleum industries.

The Ex-employees Meet. Dr G Narahari Sastry, Director, CSIR-NEIST seen felicitating the ex-employees of the institute.

The selected theme of the session II was “Oil & Petroleum Industries and Environmental Care”. The aim was to bring the eminent scientists, technocrats and young researchers from the area of Petroleum Research as well as from hydrocarbon and petrochemical industries. The meet deliberated upon the latest developments in the field of Oil and Petroleum Research in entire North East as well as in India. In presence of the leaders of environmental protection agency, a critical analysis on environmental issues of oil and petrochemical industries came out which was informative and eye-opening as well. This session saw the participation of prominent personalities from industry like Shri Pranjal Changmai, GM (P), BCPL, Shri Ghanashyam Hazarika, GM (SC), NRL, Shri Chinmoyjit Sharma, In-charge, Rajib Gandhi Institute of Petroleum Technology (RGIPT), Sibsagar, Dr Nayan Medhi, HoD, Petroleum Engineering, Dibrugarh University (DU) was present.

As a part of the Diamond Jubilee celebration a Regional-cum Facilitation Centre (RCFC) for NER of India was inaugurated at CSIR-NEIST on 13 March, 2022. One-day training-cum-demonstration on “Biofertilizer Production for Entrepreneurship Development” was also conducted as a part of the celebration. Skill Development Initiative for an Atmanirbhar Future: An awareness programme” was organized on 15 March, 2022.

One-day training-cum-demonstration on “Biofertilizer Production for Entrepreneurship Development”

The distribution of 'honeybee colony with box' has been organized under CSIR-Floriculture Mission at CSIR-NEIST on 16 March, 2022. A similar event was held at Vihoshe Village of Nagaland, on 17 March 2022 in presence of Dr Sharmila Mande, Distinguished Chief

Scientist, TCS; Dr Madhavi Sastry, Senior Director, Schrodinger; Dr Y Soujanya, Principal Scientist, CSIR-IICT; Dr Vijaymurthy, specialized in Process Instrumentation & Expert to optimize pilot plant for chemical along with a group of Scientists and technical personnel from CSIR-NEIST. A stakeholders' meet on "Promotion and Conservation of Medicinal Plants Sector in North-Eastern Region, India" was also organized as a part of CSIR-NEIST Diamond Jubilee Celebration under the aegis of RCFC-NER.


(Left)Dr P G Rao, Former Director, CSIR-NEIST delivering lecture during the stakeholders' meet. (Right) Participants during the meet.

A One-day seminar on "Status and Need of Bioinformatics in North East region" was also organized as a part of CSIR NEIST diamond jubilee celebrations. "Awareness Program for Young Entrepreneurs" was held in the presence of Dr Mrityunjay Saur, CEO KIIT-TBI, Dr Danish Tamuly, Director, NEATHUB, AAU and Assam Gaurab Er Akash Jyoti Gogoi, Founder NE Agro Product and Services and other eminent Scientist & Entrepreneurs.


"Awareness Program for Young Entrepreneurs"

CSIR-NEIST has hosted Jigyasa Chintan Shivir on 12 & 13 March, 2022, both offline and virtual mode. The program was followed by the brainstorming session with the external stakeholders like NCSM, NITI Aayog-ATL, Karnataka Science and Technology Academy, IIT Bombay, Royal Society of Chemistry. Parallelly, the invited students were taken to Kids' World of Science where some experiments were demonstrated and given hands on training to the students by the research scholars of CSIR-NEIST in Passion wings. In Excellence wings, videos on ancient temples, autobiography of various Indian Scientists and some success stories of CSIR-NEIST of recent past were shown. Various prototype models were also demonstrated to the students in the Kid's World of Science.


Students visit to the Kid's World of Science of CSIR-NEIST, Jorhat

CSIR-NEIST organized Student-Scientist Connect Program in Nagaland

CSIR-NEIST organized Jigyasa, a student-scientist connect programme in Nagaland state from 17-19 March, 2022. On Day-1, the team Jigyasa comprising of Anshuman Goswami, Nandan Kumar, Himangshu Lekhak and Ravi Kumar Sahu reached Livingstone Foundation International School, Dimapur to conduct the programme.

Livingstone Foundation International School has become one of the few schools in Nagaland to collaborate with CSIR-Jigyasa programme. Firstly, the team from CSIR-NEIST visited the school during which they had a formal interaction with the students, faculty and the school management led by its chairman, Dr Andrew Ahoto Sema. During the interactive session with the students, Anshuman Goswami from team Jigyasa explained the various aspects of the programme whereby the students would be aided in communicating with scientists from across the country through online platforms. He also mentioned that the primary objective of the programme was to create a scientific temperament among the students community of India, especially the North East students. Later, laboratory apparatus comprising of glass wares and CSIR-NEIST's books & leaflets were donated to the school.

It may be mentioned that the Jigyasa programme has been initiated at CSIR-NEIST since 2017 after its launch by Govt. of India. The programme is being implemented by the Council of Scientific and Industrial Research (CSIR) in collaboration with Kendriya Vidyalaya Sangathan (KVS). It is one of the major initiatives taken up by CSIR at national level, during its Platinum Jubilee Celebration Year.


Left: Students of Livingstone Foundation International School, Dimapur attending the CSIR Jigysasa programme. Right: Jigyasa team handing over the laboratory items to the school chairman, Dr Andrew Ahoto Sema (centre).

On Day-2, the Jigyasa team visited Loyola Higher Secondary School in Zakhama Village, Kohima. More than 200 students were present in the auditorium hall where Dr Anjum Dihingia addressed the students and the faculty members of the school and briefed them about CSIR. This was followed by a presentation on “CSIR-NEIST Jigyasa initiative” by Mr Anshuman Goswami. He mentioned that the CSIR-Jigyasa programme is a unique platform for bringing scientists and teachers for nurturing young minds. The programme envisaged opening up the national scientific facilities to school students, enabling CSIR scientific knowledge base and facility to be utilized by school-students, he informed. He also discussed the other activities of the programme which included laboratory visit, popular lecture series, summer vacation programmes, teachers’ workshop, student residential programme, visit of students to schools, lab specific activities/onsite experiments and many more. The team Jigyasa then presented some laboratory equipments to the school. Later the on that day, the team reached out to other rural schools at Khonoma Village.


Left: Jigyasa programme at Loyola Hr. Secondary School, Zakhama village. Right: Jigyasa team with the students & staff of the school.

On the third day, the Jigyasa team visited St. Paul’s School at Phesama, Kohima which is a sister school of Loyola Franchise. More than 150 students from class 8 to 12 gathered in the auditorium. Firstly, Dr Anjum Dihingia addressed the students by his introductory speech and gives a brief about CSIR followed by Dr Nandan Kumar who interacted with the students. Later, Anshuman Goswami explained the students and teachers about the CSIR-NEIST Jigyasa initiative and the past history about the programme. He also added that CSIR-NEIST Jigyasa programme is going to onboard maximum number of schools from North Eastern States of India to create scientific temperament among the students. The team also interacted with nodal teachers of the school for further communication in the future. The team Jigyasa then presented some laboratory equipments to the school.


Left: Students of St. Paul’s School, Phesama village attending the CSIR Jigysasa programme. Right Mr Anshuman Goswami presenting “CSIR-NEIST Jigyasa initiative” during the programme.

EXHIBITIONS PARTICIPATED

"Brain Storming Conclave on ATMANIRBHAR NORTH EAST through Science and Technology Interventions"

Dr G Narahari Sastry, Director, CSIR-NEIST and a team of Scientists from CSIR-NEIST, Jorhat at the "Brain Storming Conclave on ATMANIRBHAR NORTH EAST through Science and Technology Interventions" organized by North East Centre for Technology Application & Reach (NECTAR), at Cotton University, Guwahati during 21-22 December, 2021

Visit of Shri. Jayant Sahasrabudhe, National Organizing Secretary, Vijnana Bharati to the CSIR-NEIST exhibition stall.

"SARKAR APKE DUWAR" at Jollang village, Itanagar

Participated in "SARKAR APKE DUWAR" at Jollang village, Itanagar with exhibition stall of Branch Laboratory Itanagar. Several distinguished person like local MLA, DC, EAC, govt officer of various dept visited our stall and highly appreciated about our activities

CSIR-NEIST Exhibition stall

SOCIETAL ACTIVITIES

Activities under Jigyasa

Visit to three schools at Moran, Assam

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat and a team of Scientists and Students visited three schools at Moran, Assam namely Batamara High School, Nehru Hindi Vidyalaya, Moran Higher Secondary School and Dibrugarh Govt. Girls HS & MP School, Dibrugarh VKV, Dibrugarh Bengali High School at Dibrugarh on 18 August 2021. The team distributed books, laboratory plastic wares and saplings of different medicinal plants under the JIGYASA programme, which is one of the major initiative taken by CSIR in widening and deepening its Scientific Social Responsibility to connect school students and scientists as well as to extend the student's classroom learning to a very well-planned research laboratory based learning.

Glimpses of visit to 3 schools at Moran, Dibrugarh and distribution of books, laboratory plastic wares and saplings of different medicinal plants

Student-Scientist Connect Webinar

A Student-Scientist Connect Webinar, conducted by CSIR-NEIST, Jorhat under JIGYASA on 10 September 2021. Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat and Dr Jatin Kalita, Principal Scientist, addressed the participants. Dr. Lakhi Saikia, Principal Scientist, CSIR-NEIST has delivered a popular Science talk. Teachers and students from various schools of North-Eastern India participated in the program.

Online meeting session

Science Motivational programme conducted at CSIR-NEIST Branch Naharlagun

CSIR-North East Institute of Science & Technology Branch Itanagar Naharlagun organized one day science motivation programme under the project JIGYASA at institute premises on 03 March 2022. About 30 nos of students along with teacher from Donyi Polo Vidya Bhawan, Itanagar School of class XII attended the day long programme. The basic objective of the programme was to develop the scientific temper, motivation, awareness, enhancement of curiosity, knowledge, and sprit of research and appreciation of the science among the students. Dr Chandan Tamuly, Sc In Charge CSIR-NEIST Br. Itanagar addressed the gathered and briefly introduced about the programme and explained about the objective of the institute. Dr Natarajan Velmurugan Senior Scientist delivered a talked on “Invention and Innovation”. Further, Mr Nirangkush Borah, Research Scholar delivered a talked on “Think like a Scientist”.

Participants during the training programme

Activities under under AROMA Mission

Training programme at Udalguri, Assam

CSIR NEIST conducted a Training cum Awareness Program on Cultivation and Processing of Aromatic Plants, Apiculture and Value Added Products from Banana Pseudostem in Udalguri on 02 February 2022 in collaboration with Udalguri Farmers Cooperative Society. About 100

farmers and young entrepreneurs participants attended the program. Dr Mantu Bhuyan, Dr Dipankar Neog, Dr Dipul Kalita and Dr Jatin Kalita conducted the Training Program.

Participants during the training programme

Training programme at 134 INF BN (TA) ECO, Tezpur, Assam

CSIR-NEIST One day Training cum Awareness Programme on "Cultivation and Processing of Medicinal and Aromatic Plants" organised under the CSIR AROMA MISSION at 134 INF BN (TA) ECO, Tezpur, Assam on 02 February 2022, where 66 Army Eco Warriors were trained.

Participants during the training programme

Training programme at Raha, Nagaon, Assam

One day Training cum Awareness Programme on "Cultivation and Processing of Medicinal and Aromatic Plants" was also organised under the CSIR AROMA MISSION at Raha, Nagaon, Assam on 4 February 2022, which was attended by 94 farmers.

Participants during the training programme

Training programme at Modai, Changlang, Arunachal Pradesh

One day Training cum Awareness Programme on "Cultivation and Processing of Medicinal and Aromatic Plants" was organised under the CSIR AROMA MISSION at Modai, Changlang, Arunachal Pradesh on 6 February 2022, which was attended by 64 farmers.

Participants during the training programme

Training programme at Modai, Changlang, Arunachal Pradesh

One day Training cum Awareness Programme on "Cultivation and Processing of Medicinal and Aromatic Plants" organised under the CSIR AROMA MISSION at Ukiam, Boko, Assam today, 3rd day of February 2022, which was attended by 54 farmers.

Participants during the training programme

Training programme at Dhemaji, Assam

A one-day farmers' training cum awareness programme on "Cultivation and processing of medicinal and aromatic plants with special reference to NE India" was conducted on 5

March, 2022 at Leimekuri village, Dist- Dhemaji, Assam. The programme was attended by more than 60 farmers and rural youths from nearby areas.

Participants during the training programme

Activities Floriculture Mission

Awareness and Training programme/skill development

A total of 23 awareness cum interactive meets and trainings were conducted under the "CSIR-Floriculture Mission" at respective states of NE India (table 3). The events were held with young entrepreneur, start-ups, students and progressive farmers to motivate and increase their interest in floriculture business.

Sl. No.	Place where training conducted	Date	No. of participants
Arunachal Pradesh			
1.	Tezu,Lohit	20/09/2021	65
2.	Roing,Lower Dibang Valley	21/09/2021	73
3.	Dambuk, Lower Dibang Valley	21/09/2021	40
4.	Namsai	19/09/2021	43
5.	Sivaji Nagar, Tezu, Lohit	07/12/2022	23
Assam			
1.	Dhola, Tinsukia	19/09/2021	45
2.	Merapani, Golaghat	07/10/2021	50
3.	Titabor, Jorhat	04/11/2021	41
4.	Hilikhabari, Jorhat	06/01/2022	35

5.	Udalguri	02/02/2022	80
6.	CSIR-NEIST, Jorhat	14/03/2022	80
Nagaland			
1.	District Floriculture Association, Dimapur	06/08/2021	44
2.	Bade village, Chümoukedima	07/08/2021	30
3.	Hozukhe village, Dimapur	17/03/2022	36
4.	Vihoshe village, Chümoukedima	17/03/2022	42
5.	Thipuzu village, Phek	18/03/2022	37

Training and awareness programme conducted at Assam

Interactive cum awareness meet in Jowai of Meghalaya.

Interactive cum awareness meet conducted at Nagaland.

Seminar cum awareness meet conducted at Sungratsu village of Nagaland.

Awareness programme on Biofertilizer

Training on Biofertilizer Production at CSIR-NEIST

A Hands-on training program on Biofertilizer Production for Entrepreneurship Development was conducted by Biological Sciences and Technology Division, CSIR-NEIST, Jorhat, Assam on October 21, 2021 Twenty numbers of participants including farmers have attended the training program. Preparation, method of production and relevant techniques for Biofertilizer production were demonstrated during the training. Around five experts have delivered the lectures on different relevant topics. The outcome of the training program was very much fruitful which was reflected by the trainees in their feedback inputs.

A view of inaugural speech of Director, CSIR-NEIST and biofertilizer production training.

Training on Biofertilizer Production at Jajimukh, Teok, Assam

An awareness programme on 'Biofertilizer of CSIR-NEIST for Sustainable Agriculture' was organized by Biological Sciences and Technology Division, CSIR-North East Institute of Science and Technology (CSIR-NEIST), Jorhat, Assam in support with Department of Biotechnology, Ministry of Science and Technology, Govt. of India in association with NESSIA (North Eastern Small Scale Industries Association) and ANKUR at Jajimukh, Teok, Assam on 1 November 2021. About 172 numbers of farmers attended the awareness programme from nearby villages. Dr Ratul Saikia, Er. Jayanta Jyoti Bora, Dr Rituraj Konwar (Principal Scientist, Dr Mantu Bhuyan, Dr Himangshu Kousik Bora and Mr Madhujya Saikia of CSIR-NEIST and Mr Niren Sharma (NESSIA), addressed the farmers in the programme and provided the technical guidance on the safe use of Biofertilizer in agriculture. The various skill and technical knowledge like an advantage, efficiency, method of application, future scope, the market value of organic products etc. related to biofertilizer were discussed.

Awareness programme on Biofertilizer

Training on Biofertilizer Production at Mudoijan, Teok, Assam

A one-day awareness programme on Biofertilizer of CSIR-NEIST for Sustainable Agriculture was organised by Biological Sciences and Technology Division, CSIR-NEIST in association with Seva Bharati, Purbanchal, supported by Department of Biotechnology, Ministry of Science and Technology, Government of India, at Mudoijan, Teok on 09 February 2022. Dr G Narahari Sastry, Director, CSIR-NEIST, addressed the farmers. The meeting was attended by Dr Ratul Saikia, Er J J Bora, Dr Rituraj Konwar, Dr J J Mahanta, Dr Himangshu K Bora, Dr Pankaj Bharali and Dr Monti Gogoi. Nearly 200 local farmers were present at the programme. The Assamese translation of Honorable Director's speech was given by Dr Rituraj Konwar. The main objective of the meeting was to emphasize on OP-12 Biofertilizer Mediated Plant Health Improvement in Normal and Water Deficit Condition. Training on the use of OP-12 Biofertilizer and sustainable agriculture practices and methods was provided by the scientists of CSIR-NEIST present at the programme. As a token of gratitude from the CSIR-NEIST family, the Director distributed anti-arthritis, anti-fungal ointments among the attendees.

Awareness programme on Biofertilizer

Awareness and training programme on Development of value added product from 'Tashe' of Arunachal Pradesh

CSIR-North East Institute of Science & Technology Branch Itanagar Naharlagun has organized one day Training and Awareness program on Development of value added product from Tashe on 06 October 2021. About 50 nos of participant from different SHG/NGO/entrepreneur etc attended the day long programme. Mr Bamang Mangha, Chairman, Arunachal Pradesh State Council of Science & Technology, Itanagar, Govt of Arunachal Pradesh attended the programme as Chief Guest. He delivered a wonderful and important talked on entrepreneurship development and utilization of natural resources like Tashe, management and protection of biodiversity. He requested all entrepreneur, unemployed youth to come forward and take the advantage of the activities for sustainable income generation. Karia Bagang, Chairman, Arunachal Pradesh State Medicinal Plant Board, Itanagar attended the program as Guest of Honour in the programme.

Further, Mrs Moushumi Hazarika along with research scholar provided the practical training and demonstration regarding preparation of cake, biscuits, cookies from Tashe to the entrepreneur, local youth and farmers. All participants enjoyed the taste of 'Tashe' cake in the meeting

Participants during training programme

Awareness and interaction programme on conservation, nutrition of ethnic food of Apatani Tribe of Arunachal Pradesh

CSIR-North East Institute of Science & Technology Branch Itanagar Naharlagun has organized awareness and interaction program on conservation, nutrition of ethnic food of Apatani Tribe of Arunachal Pradesh in four villages viz Hari, Hong, Mudang Take and Michii village, Ziro, Lower Subansiri dist, Arunachal Pradesh on 20 November 2021. About 150 nos of participant from different SHG/NGO/entrepreneur etc attended the programmes. Dr Chandan Tamuly, Principal Scientist, CSIR-NEIST Branch Itanagar delivered wonderful and important talked scientific evaluation of ethnic food like Tapyo, pila, peru yaan, salio etc. The programme was organized in collaboration with HAO (PLF), Hong Farmers Club, DOLYANG CHANZANG PLF, SONYO MIJA (SHG). All the participant were actively participant the programme and share their idea and knowledge. The old age people share their different knowledge and provide valuable suggestion in this regards. The research scholar Hage Sonia and Maga Nana Kaka demonstrated the process and preparation method of Tapyo and other ethnic food items for further scientific evaluation. They further explained that there is tremendous scope for nutritional analysis, evaluation of bioactive compounds of ethnic food and can be developed some value added products for sustainable income generation.

Participants during training programme

AWARDS/RECOGNITIONS

Shanti Swarup Bhatnagar Award 2021

Dr. Binoy Kumar Saikia is an Indian Chemist and Principal Scientist, CSIR-NEIST Jorhat awarded with the Shanti Swarup Bhatnagar Prize, one of the highest Indian science awards, in 2021, by the Govt. of India for his extraordinary contribution-Development of fluorescent "carbon quantum dots" (CQDs) from Indian coal. His indigenous patented CQD technology for diverse applications falls under "Atmanirbhar Bharat" leading to import substitution. Dr Saikia got the award in the field 'Earth, Atmosphere, Ocean, and Planetary Sciences'

Hon'ble Governor of Assam Prof. Jagdish Mukhi felicitated the Shanti Swarup Bhatnagar (SSB) prize winner Dr Binoy K Saikia at Rajbhavan on 05/01/2022 (Right) Dr G Narahari Sastry, Director, CSIR-NEIST, felicitating the Hon'ble Governer at the proramme. Dr G Narahari Sastry had also received SSB prize chemical science in the year 2011.

Fellow of the prestigious National Academy of Sciences, India

Dr Mantu Bhuyan, Principal Scientist, CSIR- NEIST (Council for Scientific and Industrial Research - North East Institute of Science and Technology), Jorhat has been nominated as a fellow of the prestigious National Academy of Sciences, Allahabad, India

Rajbhasha implementation Award

CSIR-North East Institute of Science and Technology, Jorhat received award for remarkable work performance in the field of Rajbhasha implementation in office. The award as Rajbhasha Shield and Appreciation Certificate presented by the secretary of Ministry of Home Affairs, Govt. of India on 18 December 2021 at Dibrugarh in a “Joint Rajbhasha Conference for the East and Eastern Region”. On behalf of CSIR-NEIST, Jorhat Mr Ajay Kumar, Hindi Officer received the award. Appreciation letter presented to Mr Kumar for his immense contribution in Rajbhasha implementation.

Best Paper/Poster/Oral Presentation Awards

Best Oral Presentation Award

- Ms Monti Gogoi, Technical Assistant and Ms Alimpia Borah, Reseach Scholar, CSIR-NEIST awarded the best oral presentation in the International virtual conference on “Current Scenario in Chemical Sciences”(CSCS-2021), organized by Moolji Jaitha College, Maharashtra on 6th and 7th September, 2021. Ms Gogoi presented her work on "CNT based hollow fibre membranes for chiral separation of amino acids" and Ms Borah presented her work on “Thin film nano composite membrane for separation of tea polyphenols".

RECOGNITIONS

NABL Accreditation

- Coal & Energy Division is recognized as the NABL accredited coal testing laboratory (Quality Control & assurance laboratory, CSIR-NEIST) under ISO/IEC 17025:2017.

NABL coal testing lab inaugurated by Prof. H K Gupta in presence of Dr GN Sastry, Director, CSIR-NEIST

- Dr Prasenjit Saikia, Principal Scientist, CSIR-NEIST has been nominated as an “Executive Council Member” of renowned National Environmental Science Academy (NESA), New Delhi.
- Dr Binoy K Saikia, Principal Scientist, CSIR-NEIST has been ranked among Top 2% scientist in the field of Energy by Stanford University in 2021-22.
- Dr Binoy K Saikia, Principal Scientist, CSIR-NEIST has been ranked among Top 100 Asian Scientist recognition by Asian Scientist Magazine, Singapore.
- Dr Binoy K Saikia, Principal Scientist, CSIR-NEIST has been selected as a Programme Advisory Committee (PAC) member of DST-SERB in Earth & Atmospheric Sciences category.
- Dr Binoy K Saikia, Principal Scientist, CSIR-NEIST has been selected as a Senate member, AcSIR, Ghaziabad, Uttar Pradesh.
- Dr Jayaramudu .J, Principal Scientist, CSIR-NEIST has been nominated as Associate Member of International Society for Development and Sustainability (ISDS), ISDS Society, Japan.
- Dr Jayaramudu .J, Principal Scientist, CSIR-NEIST has been recognized as Outstanding Reviewer of Journal of Biomedical Materials Research: Part A,

Carbohydrate Polymers, Journal of Korean Chemical Society, International Journal of Biological Macromolecules.

- Dr HB Singh, Senior Principal Scientist, CSIR-NEIST Branch Lab, Imphal has been awarded Certificate of Appreciation & Shawl on Sept 18, 2021 by Coalition Against Drug & Alcohol (CADA – *a Civil Society Organization*) on its 15th Foundation Day for being published regularly his articles on Medicinal Plants on their quarterly journal "Health for Future".
- Dr HB Singh, Senior Principal Scientist, CSIR-NEIST Branch Lab, Imphal has been nominated as External Expert Member of Green Audit of Manipur University for 3 year (2021-24).
- Dr HB Singh, Senior Principal Scientist, CSIR-NEIST Branch Lab, Imphal has been nominated as Nominee Chairman of Kendriya Vidyalaya, Imphal for 3 years (2022-25).
- Dr HB Singh, Senior Principal Scientist, CSIR-NEIST Branch Lab, Imphal has been nominated as External Expert Member of Board of School of Life Science, Manipur University for 3 years (2022-25).
- Dr HB Singh, Senior Principal Scientist, CSIR-NEIST Branch Lab, Imphal has been nominated as Expert Member of Entrepreneurship & Incubation Cell of Manipur University for 3 years (2022-25).
- Dr Debasis D Mohanty, Senior Scientist, CSIR-NEIST has been selected as the Member, Editorial Board for one of the oldest Earth Sciences journals, All Earth from Taylor & Francis (IF: 3.25).
- Dr Debasis D Mohanty, Senior Scientist, CSIR-NEIST chaired as the main convener in the Solid Earth Session for the prestigious international conference "Asia Oceania Geosciences Society (AOGS), Singapore, 2022".
- Dr Debasis D Mohanty, Senior Scientist, CSIR-NEIST has been selected as the Guest Editor for the prestigious journal Remote Sensing (MDPI), IF 5.60, in a special issue named as: 'Earthquake Disaster Monitoring using Remote Sensing Image processing and Geophysical techniques'.
- Dr Santanu Baruah, Senior Scientist, CSIR-NEIST has been nominated as Guest Editor of Physics & Chemistry of the Earth (Elsevier): IF: 2.712
- Dr Santanu Baruah, Senior Scientist, CSIR-NEIST has been nominated as a member of Editorial Board of Geometrics, Natural Hazards and Risk published by Taylor and Francis Group, UK. IF: 3.528

TRAINING ATTENDED 2021-22

Sl. No	Title of Programme	Organizers details & duration / date	Name & Designation of the staff member
1.	National e-Workshop on Innovation & Intellectual Property Rights	Organized by InTEC, CSIR-IMMT 14-19 June, 2021	Dr. Biswajit Gogoi Scientist
2.	FDP program on "Power System Design Simulation and Analysis using DIgSILENT PowerFactory Software"	DIgSILENT GmbH, Germany in association with M/s DELLSOFT Technologies Pvt. Ltd., New Delhi 17-18 Aug, 2021	Dr. Biswajit Gogoi Scientist
3.	CSIR Induction Training Program	CSIR-HRDC, 22- 27 November 2021	Dr Hridoy Jyoti Mahanta, Scientist
4.	CSIR Induction Training Program	Organized by CSIR-HRDG, 22-27 November, 2021	Dr. Biswajit Gogoi Scientist
5.	SUFRITI Workshop, Guwahati	Organized by MSME 20-21 March, 2022	Dr. Biswajit Gogoi Scientist
6.	Capacity Building Programme for Empanelled Nodal/Technical Agencies of Assam to Implement SFURTI Scheme	Industries & Commerce Department, Govt. of Assam and Tool Room & Training Centre (TRTC), Guwahati, Ministry of MSME, Govt. of India, 21-23 March, 2022	Dr. Chinmoy Rajkonwar, Scientist

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	40 "Rural Development Society", Naharlagun	Hands on training on mushroom cultivation	Organised by CSIR-NEIST Branch Itanagar on 19 April 2021	Inhouse project (OLP-2044)
2.	Training on cultivation of mushroom technology	15 Unemployed Educated youth of Itanagar locality	Hands on training on mushroom cultivation	Organised by CSIR-NEIST Branch Itanagar on 21 December 2022	Inhouse project (OLP-2044
3.	Training on cultivation of mushroom technology	10 Unemployed Educated youth of Itanagar locality	Hands on training on mushroom cultivation	Organised by CSIR-NEIST Branch Itanagar on 21 December 2022	Inhouse project (OLP-2044
4.	Training on cultivation of mushroom technology	35 Border area multi purpose co-operative Society ltd Itanagar	Hands on training on mushroom cultivation	Organised by CSIR-NEIST Branch Itanagar on 11 January 2022	Inhouse project (OLP-2044
5.	Training on cultivation of mushroom technology	20 "Hakum Hapa SH Group" Naharlagun	Hands on training on mushroom cultivation	Organised by CSIR-NEIST Branch Itanagar on 04 February 2022	Inhouse project (OLP-2044
6.	Training on cultivation of mushroom technology	10 "Mothers SH Group" C-Sector, Naharlagun	Hands on training on mushroom cultivation	Organised by CSIR-NEIST Branch Itanagar on 04 March 2022	Inhouse project (OLP-2044
Activities under Cultivation and Processing of Medicinal and Aromatic Plants					
1.	Cultivation and Processing of Aromatic Plants	49 farmers, Khehoyi village, Dimapur, Nagaland	One day Training programme	Organised by CSIR-NEIST on 7 August 2021	CSIR AROMA Mission
2.	Cultivation and Processing of Aromatic Plants	51 farmers Medziphema Campus, Nagaland University, Nagaland	One day Training programme	Organised by CSIR-NEIST on 7 August 2021	CSIR-AROMA Mission
3.	Cultivation and Processing of Aromatic Plants	67 Farmers Krishi Vigyan Kendra,Changlang, Arunachal	One day Training programme	Organised by CSIR-NEIST on 7 September 2021	CSIR-AROMA Mission
4.	Cultivation and Processing of	69 Farmers Balijan village	One day Training programme	Organised by CSIR-NEIST 1 October	CSIR-AROMA

	Aromatic Plants	Bokakhat, Golaghat, Assam		2021	Mission
5.	Cultivation and Processing of Aromatic Plants	81 Farmers Nongpoh, Meghalaya	One day Training programme	Organised by CSIR-NEIST 02 October 2021	CSIR-AROMA Mission
6.	Cultivation and Processing of Aromatic Plants	54 Farmers Pedung village, Bomdila West Kameng district, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST 07 October 2021.	CSIR-AROMA Mission
7.	Cultivation and Processing of Aromatic Plants	62 Farmers Seppa Village, East Kameng district, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST 08 October 2021	CSIR-AROMA Mission
8.	Cultivation and Processing of Aromatic Plants	62 Farmers Thadnongiaw village, Ri-bhoi district, Meghalaya	One day Training programme	Organised by CSIR-NEIST 28 October 2021	CSIR-AROMA Mission
9.	Cultivation and Processing of Aromatic Plants	54 Farmers Umkaduh village, Ri-bhoi district, Meghalaya	One day Training programme	Organised by CSIR-NEIST 29 October 2021	CSIR-AROMA Mission
10.	Cultivation and Processing of Aromatic Plants	52 Farmers Bhairymbang, Ri-bhoi district, Meghalaya	One day Training programme	Organised by CSIR-NEIST 30 October 2021	CSIR-AROMA Mission
11.	Cultivation and Processing of Aromatic Plants	65 Farmers Khekhapara village, Goalpara district, Assam	One day Training programme	Organised by CSIR-NEIST 15 November 2021	CSIR-AROMA Mission
12.	Cultivation and Processing of Aromatic Plants	56 Farmers Khoraghat village, Kokrajhar, Assam	One day Training programme	Organised by CSIR-NEIST 16 November 2021	CSIR-AROMA Mission
13.	Cultivation and Processing of Aromatic Plants	52 Farmers Nongthymmai village, East Khasi Hills, Meghalaya	One day Training programme	Organised by CSIR-NEIST on 17 November 2021	CSIR-AROMA Mission
14.	Cultivation and Processing of Aromatic Plants	63 Farmers Myrdon, Ri-bhoi district, Meghalaya	One day Training programme	Organised by CSIR-NEIST on 18 November 2021	CSIR-AROMA Mission
15.	Cultivation and Processing of Aromatic Plants	84 Farmers Leimukhri village, Dhemaji district, Assam	One day Training programme	Organised by CSIR-NEIST on 19 November 2021	CSIR-AROMA Mission
16.	Cultivation and Processing of Aromatic Plants	103 Farmers Bokajan village, Karbi Anglong, Assam	One day Training programme	Organised by CSIR-NEIST on 13 January 2022	CSIR-AROMA Mission

17.	Cultivation and Processing of Aromatic Plants	87 Farmers Bokakhat, Golaghat, Assam	One day Training programme	Organised by CSIR-NEIST on 28 January 2022	CSIR-AROMA Mission
18.	Cultivation and Processing of Aromatic Plants	66 Army Eco Warriors 134 INF BN (TA) ECO, Tezpur, Assam	One day Training programme	Organised by CSIR-NEIST on 02 February 2022	CSIR-AROMA Mission
19.	Cultivation and Processing of Aromatic Plants	70 Farmers Boko, Kamrup, Assam	One day Training programme	Organised by CSIR-NEIST on 03 February 2022	CSIR-AROMA Mission
20.	Cultivation and Processing of Aromatic Plants	94 Farmers Roha, Nagaon, Assam	One day Training programme	Organised by CSIR-NEIST on 04 February 2022	CSIR-AROMA Mission
21.	Cultivation and Processing of Aromatic Plants	64 Farmers Modai Village, Changlang district, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST on 06 February 2022	CSIR-AROMA Mission
22.	Cultivation and Processing of Aromatic Plants	60 Farmers Leimekuri, Dhemaji, Assam	One day Training programme	Organised by CSIR-NEIST on 05 March 2022	CSIR-AROMA Mission
Activities under Cultivation of floriculture crops					
1.	**Cultivation of floriculture crops**	44 Participants District Floriculture Association, Dimapur, Nagaland	One day Training programme	Organised by CSIR-NEIST on 06 August 2021	CSIR-Floriculture Mission
2.	**Cultivation of floriculture crops**	30 Participants *Bade Village Chumukedima,* Nagaland	One day Training programme	Organised by CSIR-NEIST on 07 August 2021	CSIR-Floriculture Mission
3.	**Cultivation of floriculture crops**	43 Participants Namsai, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST on 19 September 2021	CSIR-Floriculture Mission
4.	**Cultivation of floriculture crops**	44 Participants Dhola, Tinsukia, Assam	One day Training programme	Organised by CSIR-NEIST on 19 September 2021	CSIR-Floriculture Mission
5.	**Cultivation of floriculture crops**	65 Participants Tezu, Lohit, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST on 20 September 2021	CSIR-Floriculture Mission
6.	**Cultivation of floriculture crops**	73 Participants Roing, Lower Dibang Valley, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST on 21 September 2021	CSIR-Floriculture Mission
7.	**Cultivation of floriculture crops**	40 Participants Dambuk, Lower Dibang Valley, Arunachal Pradesh	One day Training programme	Organised by CSIR-NEIST on 21 September CSIR-NEIST on 2021	CSIR-Floriculture Mission

8.	**Cultivation of floriculture crops**	50 Participants Dhola, Tinsukia, Assam	One day Training programme	Organised by CSIR-NEIST on 07 October 2021	CSIR-Floriculture Mission
9.	**Cultivation of floriculture crops**	35 Participants Hajo, Kamrup, Assam,	One day Training programme	Organised by CSIR-NEIST on 26 October 2021	CSIR-Floriculture Mission
10.	**Cultivation of floriculture crops**	41 Participants Hilikhabari, Jorhat, Assam	One day Training programme	Organised by CSIR-NEIST on 04 November 2021	CSIR-Floriculture Mission
11.	**Cultivation of floriculture crops**	35 Participants Hilikhabari, Jorhat, Assam	One day Training programme	Organised by CSIR-NEIST on 06 January 2022	CSIR-Floriculture Mission
12.	**Cultivation of floriculture crops**	80 Participants Udalguri, Assam	One day Training programme	Organised by CSIR-NEIST on 02 February 2022	CSIR-Floriculture Mission
13.	**Cultivation of floriculture crops**	80 Participants CSIR-NEIST, Jorhat	One day Training programme	Organised by CSIR-NEIST on 14 March 2022	CSIR-Floriculture Mission
14.	**Cultivation of floriculture crops**	36 Participants *Hozukhe village,* Dimapur, Nagaland	One day Training programme	Organised by CSIR-NEIST on 17 March 2021	CSIR-Floriculture Mission
15.	**Cultivation of floriculture crops**	36 Participants *Vihoshe village, Chumukedima,* Nagaland	One day Training programme	Organised by CSIR-NEIST on 17 March 2021	CSIR-Floriculture Mission
16.	**Cultivation of floriculture crops**	36 Participants *Thipuju village, Phek,* Nagaland	One day Training programme	Organised by CSIR-NEIST on 18 March 2021	CSIR-Floriculture Mission
Other Training Programmes					
1	Drug Discovery Hackathon Training and Mentorship Program	20 participants from Institutes all across India	Training and mentorship was provided to students in the areas of Artificial Intelligence and Machine Learning and their applications in Drug Discovery	CSIR AICTE MHRD 30 September 2021 - 29 March 2022	AICTE
2	Skill development program under PMKVY	37 participants	Training on using basic machine learning algorithms	ACDS Division, CSIR-NEIST, January - March 2021	PMKVY
3	Biosafety Guidelines	**35** (Scientist/Technical Officer/PhD Scholar/ Project Fellow of CSIR-NEIST, Jorhat)	**Online** Biosafety Training **"*Laboratory Biosafety and Biosecurity*" (Resource Person:** Dr. Bibhuti B. Kakoti, Associate Professor, Dibrugarh	Institutional Bio-Safety Committee (IBSC), CSIR-NEIST, Jorhat 18 June 2021	-

			University, Assam, India)		
4	Summer and Winter Training	38 Nos. of students from various Govt/Pvt Institutions.	Hands-on training on R&D activities	CSIR-NEIST, Jorhat	-----
5	Apprentice	**3** Nos of Students of ITI, Govt. of Assam	One Year Practical Training on Different Trades	Organised by CSIR-NEIST, Jorhat	-----

Projects Undertaken (Externally Funded)

Sl No	PI & Title	Project Code with Funding Agency	Contract Value (Rs in Lakhs)
1	Dr Ratul Saikia, Consultancy project for Establishment of OP-12 Biofertilizer Plant in Mizoram.	CNP0479 Agriculture Department, Govt. of Mizoram	3.54
2	Dr J Leon Raj Structural health monitoring of plinth beam of control room building at 132/33 kV Silapathar (New) substation under (NERPSIP), Assam.	CNP0480 Power Grid Corporation	3.50
3	Dr Dipul Kalita Study on composition of different bamboo species according to their age for bioethanol production.	CNP0481 Assam Bio Refinery Private Limited, Numaligarh	4.99
4	Dr Ratul Saikia Biofertilizer for Yield Enhancement in Normal to Water Stress Conditions for Entrepreneurship Development	GPP0377 DBT, Min of Science & Technology	110.92
5	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
6	Dr Siddhartha P Saikia Establishment of BioNEST bioincubator facility at CSIR-NEIST, Jorhat.	GPP0379 BIRAC, DBT, New Delhi	255.70
7	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
8	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	277.99
9	Ms Neha Thakare Development of structurally modified biopolymer-based electrostatic nanofibers for biomedical applications.	GPP0382 DST, Min of Science & Technology	18.21

10	Dr Binoy Kr Saikia Development of Graphene Super-capacitors using Northeastern coal for power applications.	GPP0383 Ministry of Elecronics & Information Technology,	179.67
11	Dr Dipankar Neog Technopreneur Promotion Programe(TePP) Outreach Centre(TUC) Promoting Innovations in Individuals, Start-ups and MSMEs(PRISM).	GPP0384 Min of Sc & Tech, Dept. of Sc & Ind. Res, Govt of India, New Delhi.	9.00
12	Dr Archana Moni Das Bio-evaluation and identification of lead Molecules for Lung and Colon cancer from Selected Medicinal Plants.	GPP0385 ICMR	10.20
13	Dr Ratul Saikia Establishment of OP-12 Biofertilizer Plant in Mizoram.	GPP0386 Agriculture Department, Govt. of Mizoram	16.22
14	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
15	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
16	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
17	Mr Jiban Jyoti Mahanta Drug Discovery Mentorship and Training Program.	GPP0390 All India Council for Technical Education, New Delhi	68.20
18	Dr Jatin Kalita, Capacity building and Continuing Medical Education (CME) in AYUSH.	GPP0391 Rashtriya Ayurveda Vidyapeeth, New Delhi	9.00
19	Dr Archanamoni Das Profiling of immunomodulatory and anti-inflammatory activities and estimation of micronutrients of traditional medicines from the Eastern and Western Himalaya with special reference to Assam, Arunachal Pradesh, and Manipur.	GPP0392 DBT, Min of Science & Technology	55.64

20	Dr Pankaj Bharali Microlabs based Genomic Surveillance of the SARS-CoV-2.	GPP0393 CSIR-Institute of Genomics & Integrative Biology (IGIB)	73.09
21	Dr Jatin Kalita Exploration of potential bioactives from edible insects of North East Region of India with special reference to anti-diabetic, anti-inflammatory and antioxidant effects.	GPP0394 DBT, Min of Science & Technology	30.83
22	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

Projects Ongoing (Externally Funded)

Sl No	PI & Title	Project Code with Funding Agency	Contract Value (Rs in Lakhs)
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 Analysis and Design of Police Station using 3D Sandwich panels at Vishakhapatnam, Andhra Pradesh.	CNP0474 Beardsell Limited	7.55
3	Er Vaskar Rajkhowa Upgradation of Water Filtration Plant of CMER&TI Residential Campus, Cinnamara, Jorhat.	CNP0476 Central Silk Board, Lahdoigarh Jorhat Assam	14.73
4	Dr J Leon Raj Structural health monitoring of foundations of towers and chimneys, Silapathar, Assam.	CNP0478 M/s Teamsindia Towerlines Pvt Ltd, Silapathar, Dhemaji	6.49
5	Dr Ratul Saikia Consultancy fee for Establishment of OP-12	CNP0479 Agriculture Department,	3.54

	Biofertilizer Plant in Mizoram.	Govt. of Mizoram	
6	Dr J Leon Raj Structural health monitoring of plinth beam of control room building at 132/33 kV Silapathar (New) substation under (NERPSIP), Assam.	CNP0480 Power Grid Corporation	3.50
7	Dr Dipul Kalita Study on composition of different bamboo species according to their age for bioethanol production.	CNP0481 Assam Bio Refinery Private Limited, Numaligarh	4.99
8	Dr Anil Kumar Singh Maintenance, Monitoring of Plantations, Carbon Sequestration Calculation and Scientific Data Recording of the Eco-restored Abandon Well Sites from 2019-2022.	CNP0483 Oil India Ltd	114.09
9	Dr Saurabh Baruah Setting up of the Multiparametric Geophysical Observatory for monitoring of Earthquake precursor in Mikir Hills Plateau,Assam.	GPP0294 Min. of Earth Sciences, CGO Complex, Lodi Road, New Delhi- 110 003.	425.24
10	Dr Binoy Kumar Saikia National Carbonaceous Aerosols Programme (NCAP) Working Group-III project.	GPP0325 Min of Environment, Forest & Climate Change	106.08
11	Dr Manoj Kumar Phukan Seismic Microzonation of Greater Dimapur	GPP0326 Directorate of Geology & Mining, Govt. of Nagaland, Dimapur	19.50
12	Dr Prasenjit Manna A novel therapeutic against metabolic syndrome via activation of coagulation unrelated Vitamin K dependent proteins.	GPP0331 SERB(DST), Min of Science & Technology	31.64
13	Dr Biswajit Saha Red-Ox active Ferrocene Functionalized N-Heterocyclic Carbene-Molybdenum Complex for Catalytic Nitrogen Triple Bond Reduction.	GPP0333 SERB(DST), Min of Science & Technology	35.55
14	Dr P Yuvraj Diastereoselective synthesis of Lamellarin alkaloid natural product fused spirooxindoles and its analogues. A series of evaluation of its biological activities against Mycobacterium tuberculosis.	GPP0334 SERB(DST), Min of Science & Technology	32.76
15	Dr H P Dekabaruah Regional Mapping of Carbon Stock, Sequestration and Sink Potential of Reserve Forest Ecosystem of Assam for improvement	GPP0336 G B Pant Institute of Himalayan Environment and Sustainable	99.17

	of Ecosystem Health and Services.	Development, Almora, Uttarakhand	
16	Dr Lakshi Saikia Application of Biosynthesized Metal nanoparticles for Quality Enhancement of Muga Silk Fiber.	GPP0338 DBT, Min of Science & Technology	34.80
17	Dr Mohan Lal Establishment of Gene Bank and Distinctness Uniformity and stability(DUS), characterisation of Lemon Grass(Cymbopogan flexuosus L.) germplasm.	GPP0339 Protection of Plant Varieties & Farmers Rights Authority, Ministry of Agri & Farmers Welfare	18.00
18	Dr Chandan Tamuly Chemical investigation and therapeutic evaluation for linking marker compound(s) with anti-diabetic potential of young shoots of Wendlandia glabrata D.C and fruits of Phoebe Cooperiana, used by indigenous ST people of Arunachal Pradesh.	GPP0340 DBT, Min of Science & Technology	42.06
19	Dr Jatin Kalita Establishment of Rural Women Technology Park in CSIR-NEIST, Jorhat, Assam.	GPP0341 DST, Min of Science & Technology	61.41
20	Dr Chandan Tamuly Chemical profiling, quantification of bio-active constituents of ethno-medicinal plant of Arunachal Pradesh.	GPP0342 National Medicinal Plants Board(NMPB), Ministry of AYUSH, New Delhi	20.96
21	Dr Mohan Lal Varietal development for high fruit yield and high solasodine content of Solanum Khasianum, A high value medicinal plant of NE India.	GPP0343 National Medicinal Plants Board(NMPB), Ministry of AYUSH, New Delhi	49.87
22	Er Jayanta Jyoti Bora Setting up of rural appropriate technology demonstration centre at Arunachal Pradesh.	GPP0344 Arunachal Pradesh State Council for Science and Technology	35.10
23	Dr Chandan Tamuly Empowerment of ST people of Arunachal Pradesh through income generation exploring under-utilized food item Tashe.	GPP0345 DST, Min of Science & Technology	30.63
24	Dr M J Bordoloi Bio-prospecting of some indegenous medicinal plants of NE region of India with special reference to Anti-inflammatory	GPP0346 DBT, Min of Science & Technology	25.63

	properties.		
25	Dr Mantu Bhuyan STINER-Common Facility Centre at CSIR-NEIST, Jorhat, Assam.	GPP0347 Min of Development of NE Region (MDoNER)	4000.00
26	Dr Binoy Kr Saikia Development of hybrid battery power module with indigenously developed supercapacitor and Li-ion cell.	GPP0348 Ministry of Elecronics & Information Technology,	264.75
27	Dr Dipanwita Banik Investigation of oleo chemicals of under-utilized wild nutmegs native to NE India and value addition thereof.	GPP0349 DBT, Min of Science & Technology	35.61
28	Dr Gakul Baishya Development of novel leads for anti-obesity from North East traditional system through chemistry biology interphase.	GPP0350 DBT, Min of Science & Technology	41.16
29	Dr Ram Awatar Maurya Continous Flow Photochemistry: Visible Light Induced C-H Functionalization and C-C/C-X Bond Formation to Access Valuable Heterocycles and Natural Products.	GPP0351 SERB(DST), Min of Science & Technology	27.79
30	Dr Debasis Mohanty Active Geodynamics, Evolution, Structure and Deformation analysis of Indo-Burman Wedge.	GPP0352 SERB(DST), Min of Science & Technology	13.40
31	Dr Siddhartha P Saikia Phytopharmaceutical Development of Ficus semicordata Buch.-Ham. ex Sm. as per regulatory guideline of DCGI (Under the Phytopharmaceutical Mission for North East Region).	GPP0353 DBT, Min of Science & Technology	32.80
32	Dr Sangeeta Sharma Estimation of Ground motion parameters and development of a new attenuation relation from the earthquakes originated in and around North East India.	GPP0354 Min. of Earth Sciences, CGO Complex, Lodi Road, New Delhi- 110 003.	37.57
33	Dr Mohan Lal Development of disease resistant superior variety of bhut Jolokia (Capsicum chinense Jacq.) through backcross breeding.	GPP0355 G B Pant National Institute of Himalayan Environment and Sustainable Development	13.58

34	Dr Pallab Pahari Oxidative addition and electrophile driven cyclization approach towards azaspirocycles: synthesis and anticancer activity.	GPP0356 SERB(DST), Min of Science & Technology	39.79
35	Dr Pravin G Ingole Development of nanoparticles incorporated thin film nanocomposite polymer membranes for effective mixture gas separation.	GPP0357 DST, Min of Science & Technology	30.15
36	Dr Ratul Saikia Molecular investigation into lignocellulolytic system of few Wild silkmoth in North-East India.	GPP0359 DBT, Min of Science & Technology	28.07
37	Dr Supriya Saha Designing Advanced Functional Materials for Better Performing Photovoltaic Devices Through In-Silico Study.	GPP0360 DST, Min of Science & Technology	13.50
38	Dr Supriya Saha Advanced Hybrid Nanomaterials and their Photocatalytic Efficiency towards Solar Fuel Generation through CO2 Reduction:A Quantum Chemical exploration.	GPP0361 SERB(DST), Min of Science & Technology	22.88
39	Dr Jyoti Kumar Doley Study on High Speed Formability of Welded Blanks of Aluminium Joined by Different Welding Methods.	GPP0362 SERB(DST), Min of Science & Technology	52.60
40	Dr Jyoti Kumar Doley Design characterization and fabrication of a free flow water wheel with high efficiency for electricity generation in remote hilly area.	GPP0363 SERB(DST), Min of Science & Technology	29.96
41	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
42	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
43	Dr Rinku Baishya Design and evaluation of peptide assisted delivery strategy targeting integrin for potential alleviation of atherosclerosis.	GPP0366 SERB(DST), Min of Science & Technology	17.39
44	Dr Sanjib Gogoi Enantioselective Synthesis of Spirocycles Using Metal-Catalyzed Oxidative C-H	GPP0367 SERB(DST), Min of Science & Technology	34.74

	Activation Reactions.		
45	Dr Santanu Baruah Effect of Change in Coulomb Stress on Gutenberg-Richter law for the seismicity of North East India Region.	GPP0368 SERB(DST), Min of Science & Technology	6.60
46	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
47	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
48	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
49	Dr Rajib Lochan Goswamee Pilot Scale Demonstration and Popularisation of Some Sustainable Technology for the supply of Safe Water in Fluoride and Arsenic Affected Areas.	GPP0372 DST, Min of Science & Technology	107.05
50	Dr G Narahari Sastry Polymers, Their Composites and Polymeric Membranes for Sustainable Development of Petroleum Industries.	GPP0373 Ministry of Chemicals and fertilizers	499.00
51	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
52	Dr Lakshi Saikia Assessment of Air, Water and Soil Quality in Baghjan Oil Blowout Site and its Vicinity, Tinsukia, Assam.	GPP0375 Central Pollution Control Board(CPCB), New Delhi	81.40
53	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
54	Dr Ratul Saikia Biofertilizer for Yield Enhancement in Normal	GPP0377 DBT, Min of Science &	110.92

	to Water Stress Conditions for Entrepreneurship Development.	Technology	
55	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
56	Dr Siddhartha P Saikia Establishment of BioNEST bioincubator facility at CSIR-NEIST,Jorhat.	GPP0379 BIRAC, DBT, New Delhi	255.70
57	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
58	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	277.99
59	Ms Neha Thakare Development of structurally modified biopolymer-based electrostatic nanofibers for biomedical applications.	GPP0382 DST, Min of Science & Technology	18.21
60	Dr Binoy Kr Saikia Development of Graphene Super-capacitors using Northeastern coal for power applications.	GPP0383 Ministry of Elecronics & Information Technology,	179.67
61	Dr Dipankar Neog Technopreneur Promotion Programe(TePP) Outreach Centre(TUC) Promoting Innovations in Individuals, Start-ups and MSMEs(PRISM).	GPP0384 Min of Sc & Tech, Dept. of Sc & Ind. Res, Govt of India, New Delhi.	9.00
62	Dr Archana Moni Das Bio-evaluation and identification of lead Molecules for Lung and Colon cancer from Selected Medicinal Plants.	GPP0385 ICMR	10.20
63	Dr Ratul Saikia Establishment of OP-12 Biofertilizer Plant in Mizoram.	GPP0386 Agriculture Department, Govt. of Mizoram	16.22
64	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
65	Dr Jatin Kalita Establishment of Bioresource Centre for making S&T Intervention in Banana Value Chain for Socio Economic Development in	GPP0388 DBT, Min of Science & Technology	69.21

	Udalguri District, Assam.		
66	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
67	Mr Jiban Jyoti Mahanta Drug Discovery Mentorship and Training Program.	GPP0390 All India Council for Technical Education, New Delhi	68.20
68	Dr Jatin Kalita Capacity building and Continuing Medical Education (CME) in AYUSH.	GPP0391 Rashtriya Ayurveda Vidyapeeth, New Delhi	9.00
69	Dr Archanamoni Das Profiling of immunomodulatory and anti-inflammatory activities and estimation of micronutrients of traditional medicines from the Eastern and Western Himalaya with special reference to Assam, Arunachal Pradesh, and Manipur.	GPP0392 DBT, Min of Science & Technology	55.64
70	Dr Pankaj Bharali Microlabs based Genomic Surveillance of the SARS-CoV-2.	GPP0393, CSIR-Institute of Genomics & Integrative Biology (IGIB)	73.09
71	Dr Jatin Kalita Exploration of potential bioactives from edible insects of North East Region of India with special reference to anti-diabetic, anti-inflammatory and antioxidant effects.	GPP0394 DBT, Min of Science & Technology	30.83
72	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

PROJECTS COMPLETED (EXTERNALLY FUNDED)

Sl No	PI & Title	Project Code with Funding Agency	Contract Value (Rs in Lakhs)
1	Dr J Leon Raj Analysis and Design of Police Station using 3D Sandwich panels at Vishakhapatnam, Andhra Pradesh.	CNP0474 Beardsell Limited	7.55
2	Er Vaskar Rajkhowa Upgradation of Water Filtration Plant of CMER&TI Residential Campus, Cinnamara, Jorhat.	CNP0476 Central Silk Board, Lahdoigarh Jorhat Assam	14.73
3	Dr J Leon Raj Structural health monitoring of foundations of towers and chimneys, Silapathar, Assam.	CNP0478 M/S Teamsindia Towerlines Pvt Ltd, Silapathar, Dhemaji	6.49
4	Dr Saurabh Baruah Setting up of the Multiparametric Geophysical Observatory for monitoring of Earthquake precursor in Mikir Hills Plateau,Assam.	GPP0294 Min. of Earth Sciences, CGO Complex, Lodi Road, New Delhi- 110 003.	425.24
5	Dr Manoj Kumar Phukan Seismic Microzonation of Greater Dimapur.	GPP0326 Directorate of Geology & Mining, Govt. of Nagaland, Dimapur.	19.50
6	Dr Prasenjit Manna A novel therapeutic against metabolic syndrome via activation of coagulation unrelated Vitamin K dependent proteins.	GPP0331 SERB(DST), Min of Science & Technology	31.64
7	Dr Biswajit Saha Red-Ox active Ferrocene Functionalized N-Heterocyclic Carbene-Molybdenum Complex for Catalytic Nitrogen Triple Bond Reduction.	GPP0333 SERB(DST), Min of Science & Technology	35.55

8	Dr P Yuvraj Diastereoselective synthesis of Lamellarin alkaloid natural product fused spirooxindoles and its analogues. A series of evaluation of its biological activities against Mycobacterium tuberculosis.	GPP0334 SERB(DST), Min of Science & Technology	32.76
9	Dr H P Dekabaruah Regional Mapping of Carbon Stock, Sequestration and Sink Potential of Reserve Forest Ecosystem of Assam for improvement of Ecosystem Health and Services.	GPP0336 G B Pant Institute of Himalayan Environment and Sustainable Development, Almora, Uttarakhand	99.17
10	Dr Lakshi Saikia Application of Biosynthesized Metal nanoparticles for Quality Enhancement of Muga Silk Fiber.	GPP0338 DBT, Min of Science & Technology	34.80
11	Dr Mohan Lal Establishment of Gene Bank and Distinctness Uniformity and stability(DUS), characterisation of Lemon Grass(Cymbopogan flexuosus L.) germplasm.	GPP0339 Protection of Plant Varieties & Farmers Rights Authority, Ministry of Agri & Farmers Welfare	18.00
12	Dr Chandan Tamuly Chemical investigation and therapeutic evaluation for linking marker compound(s) with anti-diabetic potential of young shoots of Wendlandia glabrata D.C and fruits of Phoebe Cooperiana, used by indigenous ST people of Arunachal Pradesh.	GPP0340 DBT, Min of Science & Technology	42.06
13	Dr Jatin Kalita Establishment of Rural Women Technology Park in CSIR-NEIST, Jorhat, Assam.	GPP0341 DST, Min of Science & Technology	61.41
14	Dr Chandan Tamuly Empowerment of ST people of Arunachal Pradesh through income generation exploring under-utilized food item Tashe.	GPP0345 DST, Min of Science & Technology	30.63
15	Dr M J Bordoloi Bio-prospecting of some indegenous medicinal plants of NE region of India with special reference to Anti-inflammatory properties.	GPP0346 DBT, Min of Science & Technology	25.63
16	Dr Mantu Bhuyan STINER-Common Facility Centre at CSIR-NEIST, Jorhat, Assam	GPP0347 Min of Development of NE Region (MDoNER)	4000.00

17	Dr Dipanwita Banik Investigation of oleo chemicals of under-utilized wild nutmegs native to NE India and value addition thereof.	GPP0349 DBT, Min of Science & Technology	35.61
18	Dr Gakul Baishya Development of novel leads for anti-obesity from North East traditional system through chemistry biology interphase.	GPP0350 DBT, Min of Science & Technology	41.16
19	Dr Ram Awatar Maurya Continous Flow Photochemistry: Visible Light Induced C-H Functionalization and C-C/C-X Bond Formation to Access Valuable Heterocycles and Natural Products.	GPP0351 SERB(DST), Min of Science & Technology	27.79
20	Dr Siddhartha P Saikia, Phytopharmaceutical Development of Ficus semicordata Buch.-Ham. ex Sm. as per regulatory guideline of DCGI (Under the Phytopharmaceutical Mission for North East Region).	GPP0353 DBT, Min of Science & Technology	32.80
21	Dr Lakshi Saikia Assessment of Air, Water and Soil Quality in Baghjan Oil Blowout Site and its Vicinity, Tinsukia, Assam.	GPP0375 Central Pollution Control Board(CPCB), New Delhi	81.40
22	Mr Jiban Jyoti Mahanta Drug Discovery Mentorship and Training Program	GPP0390 All India Council for Technical Education, New Delhi	68.20
23	Dr Jatin Kalita Capacity building and Continuing Medical Education (CME) in AYUSH.	GPP0391 Rashtriya Ayurveda Vidyapeeth, New Delhi	9.00

TECHNOLOGIES RELEASED TO THE INDUSTRY

S.No	Know-How	Party	Date of signing

1	M/s Vista Naturals Guwahati, Assam	For technology transfer of Patchouli variety, Jor Lab P-1	24/08/2021
2	M/s Sansys Enterprise, Dibrugarh, Assam	For technology transfer of OP-12 biofertilzer'	20/09/2021
3	M/s Finite Technologies, Ambala Cantt, Haryana	For technology transfer "'Design Know-How for Fabrication of Essential Oil Distillation Unit'"	07/10/2021
4	M/s Axom Agro Chemicals, Moranhat, Dibrugarh, Assam	For technology transfer of OP-12 biofertilzer'	30/03/2022

CSIR-NEIST transferred improved variety of Patchouli (Jor Lab P-1)

Dr G Narahari Sastry, Director, CSIR-NEIST handing over agro-technology package of improved variety of Patchouli (Jor Lab P-1) to M/s Sansys Enterprise, Dibrugarh, Assam in presence of technology team members and business development team on 24 August 2021.

CSIR-NEIST transferred OP-12 Bio-fertilizer Technology

Dr G Narahari Sastry, Director, CSIR-NEIST handing over technology package of OP-12 Biofertilizer technology to M/s Vista Naturals Guwahati, Assam in presence of technology team members and business development team on 20 September 2021.

CSIR-NEIST transferred Design Know-How for Fabrication of Essential Oil Distillation Unit

Dr G Narahari Sastry, Director, CSIR-NEIST handing over technology package of “Design Know-How for Fabrication of Essential Oil Distillation Unit ” to M/s Finite Technologies, Ambala Cantt, Haryana in presence of technology team members and business development team on 07 October 2021.

CSIR-NEIST transferred OP-12 Bio-fertilizer Technology

Dr G Narahari Sastry, Director, CSIR-NEIST handing over technology package of OP-12 Biofertilizer technology to M/s Axom Agro Chemicals, Moranhat, Dibrugarh, Assam in presence of technology team members and business development team on 30 March 2022.

MoU AGREEMENTS SIGNED

S.No	Party	Purpose
1	Saciwater, Andhra pradesh	Research Collaboration pertinent to project titled the *"Pilot Scale Demonstration and Popularisation of some Sustainable Technology for the Supply of Safe Water in Fluoride and Arsenic Affected Areas".*
2	Dibang Farmers Producers Cooperative Society, Arunachal Pradesh	For the implementation of *the "CSIR-Aroma Mission"* in 500 hectares of land in the state of Arunachal Pradesh
3	Assam Petrochemical Limited, Namrup, Assam	For working together in the field of catalysis, waste management, human resource development and any other areas of mutual interest.
4	Jorhat Institute of Science and Technology, Jorhat Assam	Academic and Research Collaboration
5	The Royal Global University, Guwahati, Assam	Academic and Research Collaboration
6	Arunachal Pradesh State Council for Science & Technology, Itanagar	For the project titled "Varietal improvement and value addition of large cardamom (*Ammomum sabulatum* L.) and Turmeric (*Curcuma* sp.) of Arunachal Pradesh through Integrated Approach"

CSIR-NEIST sign MoU with Dibang Farmers Producers Cooperative Society, Arunachal Pradesh

Dr G Narahari Sastry, Director, CSIR-NEIST, Jorhat signed an MoU with Dibang Farmers Producers Cooperative Society Ltd., Anini, Dibang Valley District, Arunachal Pradesh on 17 August 2021 for implementation of the CSIR AROMA MISSION in the state of Arunachal Pradesh.

CSIR-NEIST sign MoU with Assam Petrochemical Limited, Namrup, Assam

Dr G. Narahari Sastry, Director, CSIR-NEIST and Shri Atul Chandra Barman, Managing Director, Assam Petrochemicals Limited, Namrup signed and exchanged an MoU on 20 September 2021 at APL, Namrup to work together in the field of Catalysis, waste management, human resource development and any other areas of mutual interest.

CSIR-NEIST sign MoU with Jorhat Institute of Science and Technology (JIST), Jorhat Assam

Dr G. Narahari Sastry, Director, CSIR-NEIST and Dr. Atanu Kumar Dutta, Principal, Jorhat Institute of Science and Technology, Jorhat signed an MoU on 17 October 2021 signed and exchanged an MoU in presence of officials from both the institutes for research academic collaboration.

CSIR-NEIST sign MoU with Royal Global University, Guwahati Assam

Dr G. Narahari Sastry, Director, CSIR-NEIST and Ms. Angira Mimani, Registrar, The Royla Global University, Guwahati signed an MoU on 18 October 2021 signed and exchanged an MoU in presence of officials from both the institutes for research academic collaboration.

PATENTS

GRANTED INDIA

1.	TITLE	NANO ALUMINA COATED BIO-GRAPHITE AND ITS PREPARATION THEREOF
	PATENT NO	367615
	INVENTORS	JITU SAIKIA, SUSMITA SARMAH, PALAKSHI BORDOLOI, TOBIUL HUSSAIN AHMED, JAYANTA JYOTI BORA, ARADHANA GOSWAMI, RAJIB LOCHAN GOSWAMEE
	DATE OF GRANT	25/May/2021
2.	TITLE	A METHOD FOR THE ISOLATION OF VANILLIN FROM RICE STRAW
	PATENT NO	376752
	INVENTORS	ARCHANA MONI DAS, ABDUL AZIZ ALI, DILIP KONWAR, TARUN CHANDRA BORA, MANASH PROTIM HAZARIKA
	DATE OF GRANT	09/SEP/2021

FILLED IN INDIA

1.	TITLE	DISPERSIBLE DEODORANT AND FRESHENER TABLET COMPOSITION
	APPLICATION NO	202111052414
	INVENTORS	PALLAV SAIKIA, DIPUL KALITA
	FILLING DATE	15/NOV/2021
2.	TITLE	SYNERGISTIC COMPOSITION OF QUINAZOLINONE COMPOUNDS WITH RIFAMPICIN TO POTENTIATE EFFICACY AGAINST M. TUBERCULOSIS
	APPLICATION NO	202111054718
	INVENTORS	ANIL KUMAR SINGH, TEJOSMITA SEN, PRANJAL GOGOI, KASHMIRI NEOG
	FILLING DATE	26/Nov/2021
3.	TITLE	A PROCESS FOR PRODUCTION OF ACTIVATED CARBON FROM SUBBITUMINOUS TERTIARY HIGH SULFUR INDIAN COALS BY ULTRASONIC-ASSISTED

CHEMICAL ACTIVATION

APPLICATION NO	**202011046539**
INVENTORS	**BINOY KUMAR SAIKIA, TONKESWAR DAS, PRASENJIT SAIKIA, DIPANKAR NEOG, MOUSUMI BORA, SANTHI MARIA BENOY**
FILLING DATE	**20/OCT/2021**

PAPERS PUBLISHED

National And International

Journal:

1. *Radio Waveguide−Double Ratchet Rotors Work in Unison on a Surface to Convert Heat into* Power by Anup Singhania, Indrani Ghosh, Pathik Sahoo, Daisuke Fujita, Subrata Ghosh, Anirban Bandyopadhyay, *Nano Letters*, 20(9), P 6891–6898 (12.279)
2. IndiGenomes: a comprehensive resource of genetic variants from over 1000 Indian genomes by Chiranjita Goswami, Biraj Jyoti Borah, Manash Jyoti Kalita, Himadri Saikia, Kohei Tada, Shingo Tanaka, Pankaj Bharali, *Journal Of Colloid And Interface Science*, P 446-456 (7.489)
3. *Efficient hydroxylation of benzene to phenol by H_2O_2 using Ni-doped $CuWO_4$ on carbon nitride as a catalyst under solar irradiation and its structure-activity correlation* by Purashri Basyach, Ankur Kanti Guha, Sukanya Borthakur, Lisamoni Kalita, Pubali Chetia, Karanika Sonowal, Lakshi Saikia, *Journal of Materials Chemistry A: Materials for Energy and Sustainability*, P 12774-12789 (11.301)
4. *Boosting the electrocatalytic activity of Pd/C by Cu alloying: Insight on Pd/Cu composition and reaction pathway* by Chiranjita Goswami, Biraj Jyoti Borah, Manash Jyoti Kalita, Himadri Saikia, Kohei Tada, Shingo Tanaka, Pankaj Bharali, *Journal of colloid and interface science*, P 446-456 (7.489)
5. *Selective permeation of L-tyrosine through functionalized single-walled carbon nanotube thin film nanocomposite membrane* by Monti Gogoi, Rajiv Goswami, PG Ingole, Swapnali Hazarika, *Separation and Purification Technology* (7.312)
6. *Chitosan: A promising therapeutic agent and effective drug delivery system in managing diabetes mellitus* by Sanjib Sarkara, Dibyendu Das, Prachurjya Duttaa, Jatin Kalita, Sawlang Borsingh Wanna, Prasenjit Manna, *Carbohydrate Polymers* (7.182)
7. *Development of thin film nanocomposite membrane incorporated with mesoporous synthetic hectorite and MSH@UiO-66-NH_2 nanoparticles for efficient targeted feeds separation, and antibacterial performance* by M Borpatra Gohain, RR Pawar, S Karki, A Hazarika, S Hazarika, P G Ingole, *Journal of Membrane Science*, 609, P 118212 (7.015)
8. *A (1) H NMR spectroscopic method for the quantification of propenylbenzenes in the essential oils: Evaluation of key odorants, antioxidants and post-harvest drying techniques for Piper betle L* by Phirose; Kemprai, Bhaskar Protim Mahanta, Pranjit Kumar Bora, Siddhartha Proteem Saikia, Deep Jyoti Das, Jyoti Lakshmi Hati Boruah, Saikat Haldar, *Food chemistry*, P 127278 (6.306)
9. Synthesis of quaternary carbon-centered indolo [1,2-a]quinazolinones and indazolo[1,2-a]indazolones via C-H functionalization by Kongkona Gogoi, Bidisha R. Bora, Geetika Borah, Bipul Sarma, Sanjib Gogoi, Chemical Communications, P 1388-1391 (5.996)
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