



समानो मंत्रः समितिः समानी

University of North Bengal

Rajarammohunpur, Siliguri-734013 India

Department of Botany



Dr. Arnab Sen

MSc, PhD, FIAAT, FLS, FNABS

PROFESSOR

- Fellow of the National Academy of Biological Sciences (FNABS)
- Fellow of the Linnean Society, London, UK (FLS)
- Fellow of Indian Association of Angiosperm Taxonomy (FIAAT)

Members of Learned Societies:

- Society for General Microbiology, UK (2014-2016, 2019)
- American Society for Microbiology (ASM), USA (2007-2008)
- International Society for Computational Biology (ISCB), USA
- Int. Association of Computer Science and Information Technology (Singapore)
- Association of Microbiologists of India (AMI)
- Society for Plant Biochemistry and Biotechnology
- Indian Association for Angiosperm taxonomy (IAAT)
- National Academy of Biological Sciences
- Asian Phytopathological Society

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Coordinator, **Bioinformatics Facility Centre**, University of North Bengal

In-charge, **Biswa Bangla Genome Centre**

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Subject Specialization (Areas of Research Interest): Nano-technology, Cytogenetics, Meta-genomics, Bio-informatics, Drug designing and Network pharmacology

No. of Ph.D. students: (a) Supervised: **21** (b) On-going: **08**

No. of M.Phil. students: (a) Supervised: N/A (b) On-going: N/A

No. of Publications: Total: **195** (a) Journals: **187** (b) Books: **02** (c) Chapters: **6**

Impact Factor: 255.79 (2023, as per Thomson Reuters)

Citation Index: For latest citation index [CLICK HERE](#)

Country Visited (for Academic purposes): Bangladesh, USA, Canada, Portugal, France, Algeria, Singapore, UK, Tunisia etc.

University Education:

- PhD from North Eastern Hill University in “**Electron Microscopy and Molecular Biology of *Frankia***” in the year 1997.
- MSc in Botany with specialization in Cytogenetics from Center for Life Sciences Department of Botany, North Bengal University securing **First class second position** in the University in the year 1990.
- Graduation: BSc (Honors) in 1988.

Awards & Recognition:

- **DBT CREST** Award 2011-2012
- **DBT Overseas** Award 2006-2007
- **DST Fast Track Young Scientist** Award, 2001
- Principal Investigator, **Frankia Genome Project** (US Deptt. of Energy sponsored)
- **University Silver Medal** for securing 1st class second position in MSc.
- **Honorary Chief Advisor**, Sikkim State Biotech Hub 2012
- Member of the Advisory Board: Bioinformatics Centre, Sikkim Central University, Sikkim.
- **Visiting Faculty**: Rajiv Gandhi University, 2004
- **Visiting Faculty**: Vidyasagar University
- **Visiting Faculty**: Sikkim Central University 2012-2017
- **Visiting Faculty**: Post Graduate Diploma in Tea Management, NBU

Special Honors & Achievements:

- Establishment of **Biswa-Bangla Genome Center** at North Bengal University
- Establishment of **Bioinformatics Facility** at North Bengal University
- Delivered **Constance Ledward Rollins Distinguished Lecture** at Department of Microbiology, University of New Hampshire, USA in the year 2007.
- **Member of the PhD defense board**, University of New Hampshire, USA
- **Coordinator and Member Secretary**: DBT-Bioinformatics Facility
- **Academic Coordinator**: Certificate course in plant tissue culture 2006
- **Associate co-Coordinator**: Medicinal plants workshop programs 2006
- Reviewer of scientific papers of various National and International Journals.

Editorship of Journals:

- **Editor: Indian Journal of Microbiology** (a Springer publication) (2006-2011)
- **Editor: NBU Journal of Plant Sciences** (2010-2012; 2017-2019)
- **Guest Editor: Indian Journal of Biotechnology** (a CSIR publication)

Fellowships/Scholarships availed

- **DBT Overseas associateship to Univ. of New Hampshire, USA, 2005-06 (one year)**
- **CREST Fellowship** to University of Lyon, France (6 months)
- **Fellowship** for a period of 3.5 years, sponsored by IFCPAR (**Indo-French Center for the Promotion of Advanced Research**) at NEHU, Shillong
- **Fellow of the Linnean Society**, London, UK (FLS)
- Research associate-ship in a **Indo-US Project on Wheat Biotechnology**.
- Fellow of Indian **Association of Angiosperm Taxonomy (FIAAT)**
- Research associateship in a Transgenic Brassica Project at IARI, New Delhi
- Research associateship in a Wheat Biotechnology Network Project at Meerut University, Meerut

Membership of Learned Societies

- Society for General Microbiology, UK (2014-2016, 2019)
- American Society for Microbiology (ASM), USA (2007-2008)
- International Society for Computational Biology (ISCB), USA
- *Life Member*: International Association of Computer Science and Information Technology (Singapore)
- *Life Member*: Association of Microbiologists of India (AMI)
- *Life Member*: National Academy of Biological Sciences (Chennai, India)
- *Life Member*: Society for Plant Biochemistry and Biotechnology
- *Life Member*: Indian Association for Angiosperm taxonomy (IAAT)

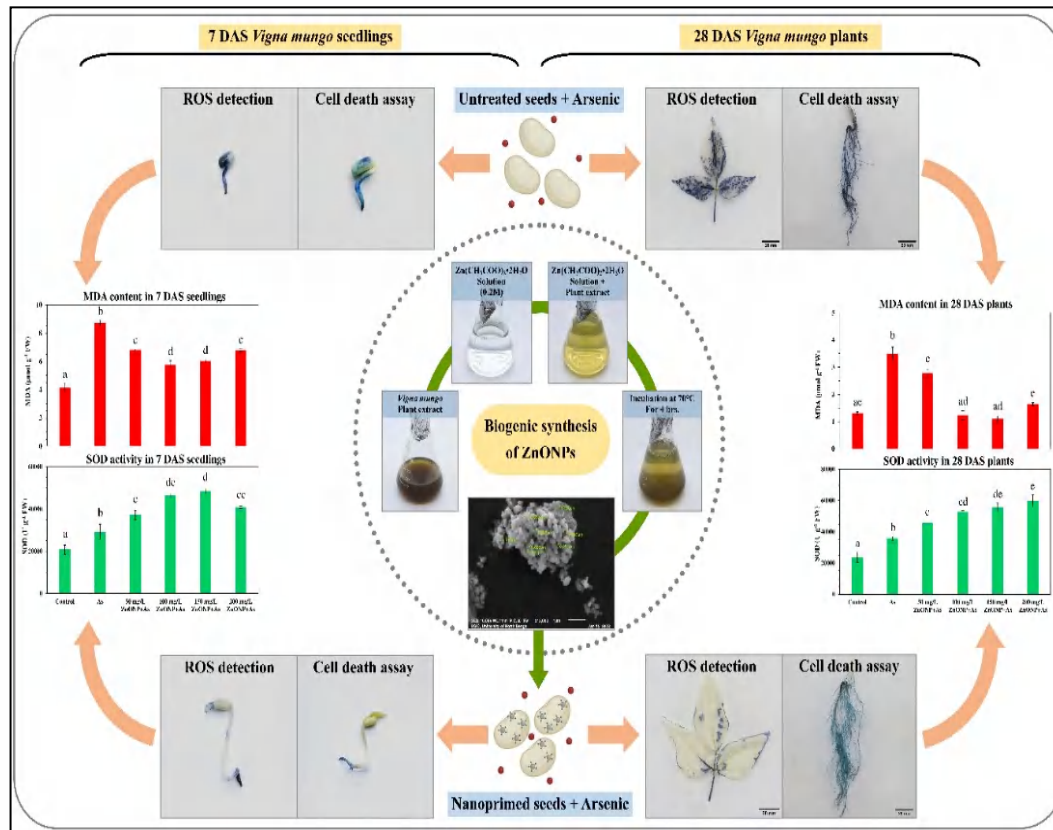
Member of the Statutory Bodies

- Member of the Court, University of North Bengal
- Member of PhD Defense Board, University of New Hampshire (2007, 2012), USA
- External Member of the Executive Committee of Bioinformatics Centre, Vidyasagar University
- Member of Board of Research Studies (BRS), Department of Zoology and, Department of Botany, CBPBU
- BRS member, Department of Botany, Microbiology, Raiganj University
- BRS member, Department of Biotechnology, North-Eastern Hill University, Shillong
- BRS member, Assam University, Silchar
- Member of the Syllabus Committee, Botany, Diamond Harbour Women's University
- Member of PhD Defense Board, Gauhati University
- Member of the Teacher Recruitment Board, Bodoland University
- Member of the Executive Committee, Bioinformatics Centre, Sikkim Central University
- Member of the Executive Committee, Bioinformatics Centre, TM Bhagalpur University
- Member of PhD Defense Board, Dibrugarh University
- Member of PhD Defense Board, Banaras Hindu University
- Member of PhD Defense Board, BN Mandal University, Madhepura
- Member of PhD Defense Board, Magadha University, Bodhgaya
- Member of PhD Defense Board, Rajsahi University, Bangladesh
- Member of PhD Defense Board, Visva Bharati University, Shantiniketan
- Member of PhD Defense Board, Calcutta University, Kolkata
- Member of PhD Defense Board, Osmania University, Hyderabad
- Member of PhD Defense Board, USTM, Meghalaya

AREAS OF RESEARCH INTEREST

Nanobiotechnology:

Our group is continuously working in phytochemistry and phytomedicines. These types of studies may prove to be helpful in the medicinal field. Phytomedicines derived from herbs and shrubs that possess therapeutic and curative properties have been utilized globally since time immemorial. The North-Eastern region of India is a “biodiversity



hub” (Kar et al., 2016). The entire region is rich in flora and fauna and contains various edible underutilized juicy fruit-bearing plants like *Elaeagnus pyriformis*, *Myrica nagi*, *Rubus plicatus*, etc. Nutritionally, **underutilized fruits** contain an enormous amount of macro elements such as nitrogen, phosphorus, potassium, calcium, magnesium, and sodium and contain micro-elements which include Iron, Zinc, Copper, and Manganese which promise to be of immense therapeutic significance.

Native people in Northeast India

use various types of fruits for various purposes, often grown wild and sold in local markets (Kar et al., 2019). *Baccaurea ramiflora*, a popular fruit in East and Northeast India, is known for its ethnomedicinal and high nutritive values. The seeds of *B. ramiflora* are effective against indigestion, constipation, and snake bites, making it an important part of the Rath Yatra in Odisha, India.

Plant and fruit phytochemicals are essential for the **green synthesis of silver nanoparticles**, which are increasingly used as anti-microbial agents. AgNPs, synthesized from secondary metabolites, have antioxidant efficacy and antimicrobial activity against pathogenic microorganisms. Their in-silico molecular docking analysis suggests the potential for cancer combat by manipulating apoptosis (Banerjee et al., 2022). Underutilized fruit *Phyllanthus acidus* is used for ethnomedicinal purposes. Our recent study compared the efficacy of raw fruit juice and nanoparticles on gentamicin-induced nephrotoxicity in a mouse model. Results showed that high doses of *P. acidus* nanoparticles significantly improved creatinine and urea levels, enhanced antioxidant enzymes, and restored glomerulus structure. The study suggests that PANH is more ameliorative than high doses of *P. acidus* fruit juice in treating kidney injury.

Our study investigated the potential of beta-sitosterol conjugated silver nanoparticles (BSAgNPs) to ameliorate carbon tetracycline-induced liver injury in Swiss albino mice. The results showed that BSAgNPs significantly increased liver

tissue SOD activity, and catalase activity, and reduced nuclear factor erythroid-2-related factor 2 (Nrf2) levels. The antifibrotic effect of BSAgNPs may promote the lowering of chronic inflammation, oxidative stress, and collagen deposition, suggesting that **nanoparticle-mediated drug delivery** of beta-sitosterol may have therapeutic promise against liver complications ([Kar et al., 2022a](#)) .

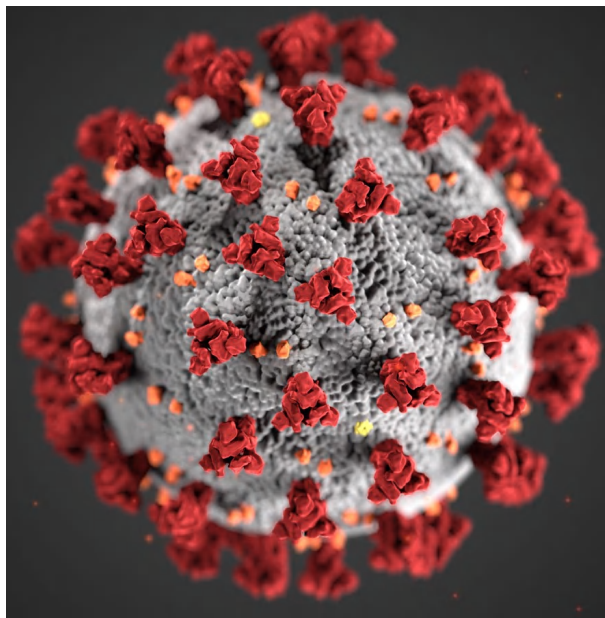
India experiences abundant rainfall during monsoon, but groundwater supplies irrigation water, causing As contamination in agricultural fields. Nanoparticle-mediated plant toxicity amelioration offers promising results in recent advancements. Arsenic (As), a toxic metalloid, is a widespread issue in the Earth's crust and is primarily caused by anthropogenic factors such as excessive use of groundwater, pesticides, mining activities, and sewage sludge. India, Bangladesh, and China are more prone to arsenic contamination due to the high As content in their bedrock. Black gram, a vital pulse crop, is a major producer of black gram, which is high in protein, carbohydrates, and fiber content. We have used Zinc Oxide Nanoparticles (ZnONPs) to address heavy

metal and metalloid toxicity in plants, with being a popular solution. **ZnONPs have been used as nano fertilizers** to combat zinc deficiency in agricultural soils, reducing As-accumulation and enhancing growth and photosynthesis in rice seedlings. However, the feasibility of applying ZnONPs to alleviate As-induced stress in black gram has not been documented. The study found that ZnONPs priming altered metabolic pathways decreased ROS generation, and increased osmoregulatory, acting as an alternative source of Zn²⁺, an important micronutrient. These findings have significant potential for improving the overall health of black gram grown in arsenic-contaminated agricultural fields ([Banerjee et al., 2023](#)) .

Heavy metals in agricultural soils are a concern for human health and global food security. Nanoparticles have the potential to reduce plant absorption and bioavailability, but environmental toxicity and ecosystem impact remain. Future research should focus on biodegradable and biocompatible NPs, safety, dependability, effectiveness, and long-term impacts.

Research on Covid-19 and Post-Covid:

This group started working on SARS-CoV-2 since the emergence of the novel virus. The first study was conducted *in silico* using natural compounds of *Clerodendrum spp.* to find its potency against the disease ([Kar et al., 2020](#)). In the study they found potential drug candidates such as taraxerol that exhibited significant results against S (spike) protein, M^{pro} (main protease) and RdRp (RNA-dependent RNA polymerase) of the virus. It was found in another study carried out by this group that common cold drugs Dextromethorphan along with Prednisolone and Dexamethasone have potential against Covid-19 ([Sarkar and Sen, 2020](#)). Well known medicinal plants *Justicia adhatoda*, *Ocimum sanctum* and *Swertia chirata* were extensively studied by this group; *in silico* studies of compounds anisotine and amarogentin extracted from these plants showed promising results against spike protein (crucial for host recognition and attachment) and M^{pro} or main protease enzyme (crucial for replication of viral genome) of SARS-CoV-2 ([Kar et al., 2020](#)).

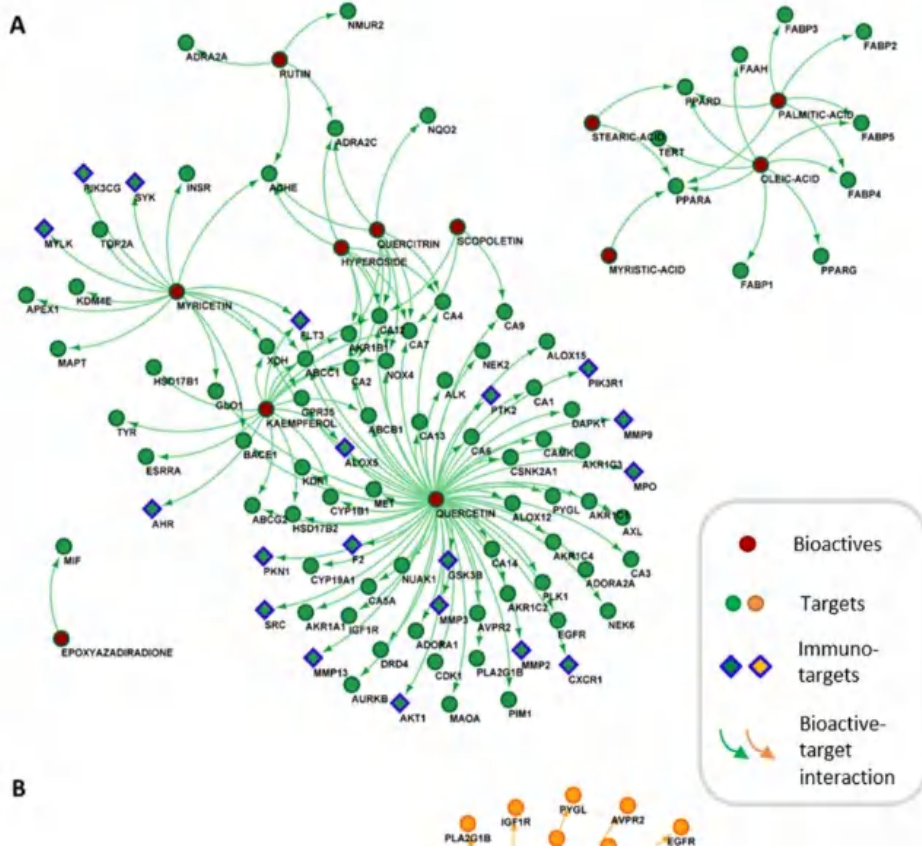


Other bio-sources were also studied such as cyanobacteria; cyanobacterial proteins cyanovirin-N, scytovirin and phycocyanin showed promising results in preventing the spike protein, the papain-like protease (PL^{Pro}) and the main protease (M^{Pro}) of SARS-CoV-2 that helps in the attachment and replication of the virus ([Naidoo et al., 2021](#)). Work has also been done on different mutants of the SARS-CoV-2 virus that emerged over the past few years. *In silico* study based on molecular docking and molecular dynamics simulation was carried out to detect inhibitory potential of 605 phytochemicals against spike protein of SARS-CoV-2 wild type as well as mutant variants B.1.1.7 (Alpha), B.1.351 (Beta), P.1 (Gamma), B.1.617.2 (Delta), and B.1.1.529 (Omicron) ([Kar et al., 2022](#)).

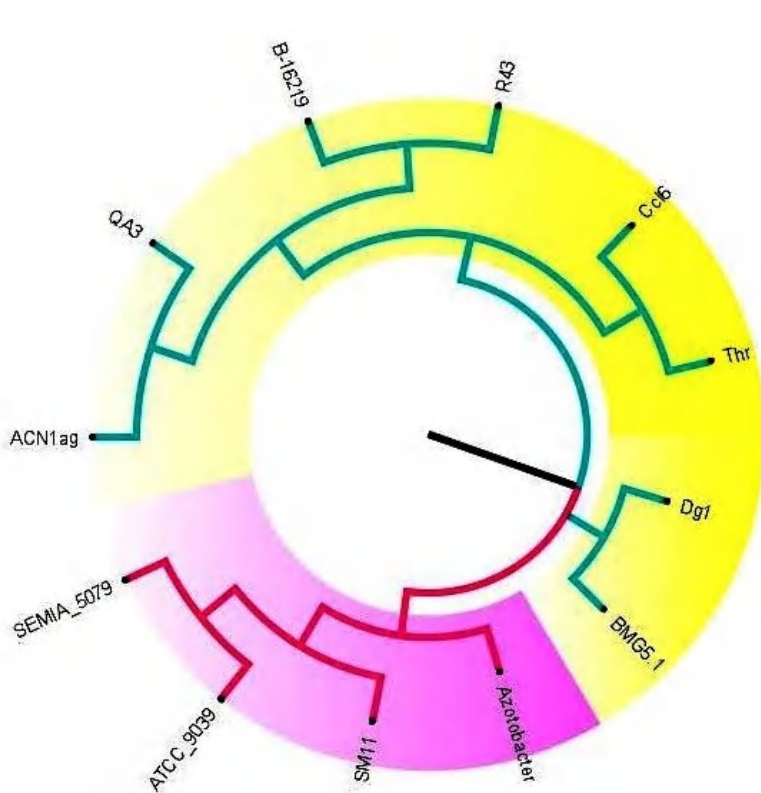
Some symptoms were found to be persistent in the survivors of Covid-19 disease, known as Post-Covid symptoms or Long-haul Covid-19. This group has studied effectiveness of Cannabidiol (CBD) and Cannabivarin (CVN) obtained from *Cannabis sativa* plant, using molecular docking and simulation, that revealed these compounds' ability to down-regulate post-Covid related central nervous system (CNS) proteins ([Sarkar et al., 2021](#)). This can be beneficial in post-covid symptoms treatment strategy. Another *in silico* study carried out by this group suggests that the natural phytochemicals derived from *Citrus macroptera* could be employed in Post-covid inflammation complexities ([Lala et al., 2022](#)). Moreover, the emergence of Mucormycosis as a syndemic or synergistic epidemic in the post-covid phase, caused many casualties. The group explored the possible role of traditional antifungal plants, Neem (*Azadiracta indica*) and Turmeric (*Curcuma longa*), in management of Covid-Associated Mucormycosis ([Datta et al., 2022](#)). The results suggested a triple-front attack on the fungal pathogens through necrosis inhibition, iron chelation and immunoboosting.

Biological network Analysis:

We work on determination of the constituent compounds present in medicinally important plants. These phytochemicals are bioactive agents that hold much potential. On consumption or application of plant extracts, these compounds enter our body and work through interaction with different enzymes and proteins. To understand these interactions we took the aid of Network pharmacology. It is an emerging subject of systematic drug research in the era of artificial intelligence and big data. Human body is controlled by a network of Proteins and metabolic pathways. Plants, through their phytochemicals, have the ability to control multiple points of these networks and thus, provide a better management of diseases. The less adverse effects, affordability, and easy accessibility highlight their potential in traditional remedies. Thus, identifying the target proteins of medicinal plants has become an important aspect in treatment of numerous diseases. In our lab we have worked on the plants Neem and Turmeric, both of which have



well known antifungal potential. The plants were repurposed against Covid associated Mucormycosis (CAM) or black fungus (Datta et al., 2022). We took a step-by-step approach for identifying the target proteins and ligands associated with Mucormycosis treatment. Functional network analysis and Molecular docking approaches were applied to validate our findings. Quercetin derived from both Neem and Turmeric was found to be one of the main phytochemicals working against Mucormycosis. Along with that, Caffeic acid, Curcumin, Kaempferol, Tetrahydrocurcumin and Myricetin also play a pivotal role in fighting against Black-Fungus. A thorough analysis of our result suggested a triple-front attack on the fungal pathogens and the approaches are necrosis inhibition, iron chelation and immuno-boosting. Moreover, we have worked on the potential of an anthocyanin rich tea variety, Purple tea, through network pharmacology and have been able to explore its medicinal properties against lifestyle diseases. We determined its constituent phytochemicals through GCMS. Our study showed the mechanism of action of Purple tea against diabetes, coronary heart disease, obesity, cancer, etc. Presently we are working on the in silico exploration of the potential of the



plant *Phyllanthus acidus* against Monkey pox virus since the leaves of this plant have a history of being used in treatment of chicken pox and small pox in northeast India. We are also working on the efficacy of *Tupistra nutans* against diabetes through in silico and in vivo studies. The plant is consumed as vegetable and is also traditionally used in treatment of diabetes in Sikkim and in the hilly region of West Bengal. Another traditionally significant plant, *Tacca integrifolia* is also being explored for scientific validation of its potential in regulation of menstrual disorders in females through in silico and invitro cell culture studies.

Microbial Genomics:

This lab has pioneered *in-silico* studies on diazotrophic and clinical Actinobacteria since the year 2000. The actinobacteria *Frankia* and its host plant interactions were studied extensively and have collaborations with labs of the University of New Hampshire, USA, University of Lyon, France, University of Tunisia. Niche adaptation, biosynthetic energy cost, and resource partitioning in *Frankia* genomes were studied and the works were published in reputed journals of international acclaim ([Sarkar et al, 2017](#), [Sen et al, 2019](#)). The insights into the actinobacteria genomes by the *In-silico* approach have overhauled taxonomy and are recognized by Bergey's Manual ([Sen et al, 2014](#)). This group orchestrated several whole-genome sequencing of Actinobacteria -*Frankia*, *Streptomyces*, N₂-fixing *Rhizobium*, etc. and these are available in NCBI database ([Rai et al, 2017](#); [Gtari et al, 2017](#)). The lab has to its credit a couple of databases, on Mycobacterium secretome-MycoSec to facilitate Global Health. Another aspect is the study of host-microbial interaction through reverse ecology analysis, proteome and meta barcoding studies ([Sen et al, 2022](#), [Gueddou et al, 2017](#)). Recently, this group is dealing with the bacterial reverse transcriptase, the nitrogen fixing operon of *Frankia*, Surfactome of bacteria and so on. Prof. Sen has recently coined a term 'Surfactome' representing all the proteins present in the bacterial surface and has studied the *Frankia* surfactome to a deeper extent. This group is aiming to study about the surfactome and RTs of several other microbial group. Along with that, they have also ventured in the development of the epitope-based vaccine against the Monkey Pox Virus.

Ethno pharmacology and Nano biology:

The lab is actively involved in the elucidation of various phyto-compound from indigenous medicinal plants, under-utilized fruits, etc. of the northeast region. Biogenic synthesis of nanoparticles using the extract and their antioxidant, antimicrobial, and anti-cancer properties are studied to tap their efficacy as potential drugs for the future. Bioactive metabolites are also studied both in *in vitro* (molecular docking) and *in vivo* (murine models). Another arena of research is the empowerment of the indigenous communities by promoting their traditional foods and beverages.

Micro-propagation and molecular marker studies:

Micropropagation is the rapid vegetative propagation of plants under in vitro conditions Micropropagation of economically important crops such as tea, turmeric, etc. and barcoding of clones of tea using molecular markers is also another area of interest for this group.

Ethnic fermented beverages consumed by different tribes in North Bengal:

Consumption of alcoholic or fermented beverages had a cultural connotation, since Indus Valley Civilization. The process of preparing ethnic brews has been developed by several tribal communities in India. Fermentation not only increases the shelf life of food and beverages but also influences the texture of the food, nutrition uptake, and aroma. Every tribal community has its native brew. The substrate selection and starter culture preparation differs for every community depending on the tropo geographical region of their habitat. North Bengal is home to different tribal communities such as Toto, Rabha, Orao/Santal, Bodo, Lepcha, Rabha and others. The 'Toto' tribe from West Bengal, India is the primitive mongoloid Indo-Bhutanese isolated endemic group and their livelihood is mainly based on forest



produce 'Eu'(/ju:/), is the most popular millet-based ethnic brew of this tribe and this drink is available only in this small enclave called Toto para. The microbial diversity present in the brew was mainly constituted of probiotic and fermenting bacteria. The nutrient profiling of Eu estimated the amount of protein, carbohydrate, free amino acid, and free fatty acid. The nutritional substance present in the brew probably supports the growth of the probiotic microflora. Reverse ecology-based network analysis revealed considerable complementary interaction between humans and the good bacteria present in the Eu.

Scientific analysis revealed that Eu is a non-toxic, low-alcohol content brew that has plenty of beneficial probiotic bacteria with prebiotic substances. Eu is a probiotic health drink rather than a recreational drink. 'Haria' or Rice beer is an ethnic, alcoholic, refreshing staple food prepared from low-grade rice by the indigenous experts of rural areas in central and eastern India. Similar to Haria, another rice-based beer consumed by the Rabha tribe in India is known as 'Choko'/'chokot'. It is also nearly impossible to know when the tribe first started preparing this native brew. 'Choko'/'chokot' is a rice-based fermented brew where the starter culture ('Bakhor or phap') is made up of eleven different plants. The metagenomic analysis of the starter culture of chokot showed that several dominant bacterial genera out of this Bacillus, Arthrobacter, Lactobacillus, Ilyobacter, and Lactococcus are prevalent. Commercialization of this type of fermented ethnic non-industrial brew can be an alternative source of income for different tribal communities of North Bengal, India.

Tea Garden Weed Research:

Tea is regarded as one of the most consumed beverages throughout the world but its productivity is at risk because of various pests and infections. *Oligonychus coffeae* or Red spider mites are the most prevalent pest causing huge losses to the tea industry. The control measures using chemical pesticides have a negative impact on the quality of tea and make it unfit for human consumption. In this context, floral diversity can be explored to effectively control pests. Pests



have been managed using pesticides for as long as there has been agriculture. Pesticides have been used in ancient China, Egypt, Greece, and India from far before 2000 BC.

Pest control methods used by the Sumerians around 4,500 years ago included sulphur dusting. Surapala, a scientist in ancient India, investigated and recommended many plants and other goods with biocidal properties to treat plant illnesses. The well-known "panchamula" (five plant roots), which was widely used at the time, has antiviral, antibacterial, antifungal, and antifeeding properties. The use of synthetic chemical pesticides is either outlawed or regulated owing to the residual issue and consumer health concerns. Pesticide resistance affects at least 500 different insect and mite species. Using botanicals to manage pests is successful and safe pest management.

There are various types of pest that attack on the tea plant like tea mosquito bug, red slug, red spider mite, thrips, jassids etc. Out of them tea red spider mite and tea mosquito bug are more dominant pest in these region and causes huge



crop lose on tea industry in every year. The objective of our work is to acquire information on the pest control status of Dooars and Terai concerning botanical formulations used against Tea pests and select new plant species effective for pest control.

In last few years, the world experienced an unprecedented pandemic called COVID-19. The pandemic took 6,709,387 lives and 663,248,631 positive cases (as of 8:18pm CET, 19 January 2023 according to WHO) were reported world wide.

It has been experienced that the people who had chronic respiratory problems were particularly vulnerable to COVID-19 pandemic. It was actually a syndemic where comorbid people suffered more.

One of the main causes of respiratory problems is viral infection and in such cases no effective medicines are available so far. Herbal drugs on the other hand showed promise in giving relief to respiratory ailments. As a result more and more researches are tilting towards phytocompounds as a remedy to such problems.

It is, in this context, we at North Bengal University decided to create a database which will provide valuable and effective information on the plants and their constituent compounds which are essentially effective against respiratory disorders. In the present version of the database, we have provided 329 medicinal plants traditionally known to cure respiratory disorders in Darjeeling region along with the parts used.

Also we have taken a step to evaluate the efficiency of the phytocompounds through *in silico* methods.



- All plants
- Plants without report against COVID-19
- Plants reported against COVID-19
- Plants without reported Phytocompounds
- Plants with reported phytocompounds

PHYTORESP-a Database

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Technology generation:

- Novel techniques for isolation of *Frankia* in pure culture and generation of single spore cultures of *Frankia*.

Research projects (recently carried out/ongoing):

- Establishment of **Biswa-Bangla Genome Centre**
- Indo-Tunis Project on “Phytoremediation of Heavy Metal-Contaminated Soils in Tunisia and India using Frankia-Alnus symbiosis”. 2017-2019 (Two Years)
- A Bioinformatics perspective to impede the tubercle bacillus (TB) devastation in West Bengal (Three Years)
- Frankia Genome Project (Sequencing and analysis of FIVE Frankia genomes, Sponsored by US Department of Energy, Govt. of United States of America) (Principal Investigator)
- Development of novel methodology for understanding the mechanism of nitrogen fixation through codon usage analysis related genes and protein structure modeling of relevant gene product (protein) and its implication DBT, Govt. of India sponsored (Co-PI)
- Establishment of Bioinformatics Facility. Sponsored by DBT, New Delhi. (Principal coordinator)
- Production of Transgenic tea for fungal resistance. Sponsored by DST, New Delhi (completed) (Principal Investigator)
- Detection of Best alder-Frankia symbiosis using molecular markers. Sponsored by UGC, New Delhi (Principal Investigator)
- Rehabilitation of the Tissue Culture Laboratory. Sponsored by Department of Horticulture, Government of West Bengal, India. (Principal Investigator)
- Survey, conservation, development of propagation techniques and popularization of cultivation of medicinal plants in Terai, Dooars, Hills of North Bengal and Sikkim. NMPB, Government of India sponsored. (Co-Principal Investigator)

PhD Supervised/Supervising

- Molecular characterization of Frankia and alder-Frankia symbiosis in Eastern India- Balwinder Singh Bajwa (Awarded)
- Study of genetic diversity and standardization of genetic transformation in *Camellia sinensis* (L.) O. Kuntze- Manprit Gill (Awarded)
- Studies of codon usage, proteome analysis and evolution of nitrogen fixing genes in some microorganisms- A bioinformatic approach- Saubashya Sur (Awarded)
- Genomics of some pathogenic food bacteria and molecular modeling of their important toxins and their interactions- Uttam Kumar Mondal (Awarded)
- Genetic diversity of Frankia associated with *Hippophae* L. in Lachen valley of North Sikkim. Bharat Basistha (Awarded)
- Diversity of Frankia associated with *Alnus nepalensis* and *Casuarina equisetifolia* in West Bengal. Debadin Bose. (Awarded)
- In silico characterization of some nitrogenase proteins found in symbiotic diazotrophs and cyanobacteria -Subarna Thakur (Awarded)
- Study of genetic diversity and micropropagation of bamboos growing in North Bengal- Arvind Kumar Goyal (Awarded)
- Diversity study of *Rhizobium* from North Bengal and Sikkim through Biochemical and Molecular characterization and exploration of their role as biofertilizer- Ritu Rai (Awarded)
- Diversity and micropropagation of *Canna* from West Bengal and Orissa- Tanmayee Mishra (Awarded)
- Micropropagation, diversity study and detection of antioxidants in some medicinal Zingibers- Malay Bhattacharya (Awarded)
- Medicinal and molecular documentation of some members of Mimosaceae and their micro-symbionts- Manas Ranjan Saha (Awarded)

- Riddles of human intestinal microflora- a bioinformatics perspective.- Ayan Roy (Awarded)
- Characterization and diversity of selected Actinorhizal haemoglobin genes and proteins with reference to *Alnus-Frankia* symbiosis- Sanghati Bhattacharya (Awarded)
- Relationship of Multiple Tannase Sequences and Structures through Bio-informatics- Amrita Banerjee (Awarded)
- Studies of molecular diversity and chemical properties of selected medicinal members under the genus *Clerodendrum* L.- Pallab Kar (Awarded)
- Comparative and Evolutionary Genomics of Selected Actinobacteria with Special Reference to Pathogenicity- Shilpee Pal (Awarded)
- Bioinformatic characterization of selected Actinobacteria with a focus on biotopic diversity- Indrani Sarkar (Awarded).
- Molecular detection and diversity analysis of *Bipolaris sorokiniana* in sorghum and induction of systemic resistance by bioinoculants- Priyanka Bhattacharya (Awarded)
- Medicinal and molecular profiling of selected tea varieties of Darjeeling and Dooars- Reha Labar (Awarded).
- Medicinal and molecular profiling of selected members of *Araliaceae*- Arnab Chakraborty (Registered).
- Biochemical, molecular and genomic studies of selected *Streptomyces* isolates from tea garden soils of North Bengal- Saroja Chhetri (Registered).
- Medicinal and molecular profiling of selected Rutaceous members with a focus on *Citrus* L.- Mousikha Lala (Registered).
- Ethnomedicinal and molecular profiling of the fermented beverages used by different tribes in North Bengal, India – Soumita Bhattacharjee
- STUDIES ON THE SELECTED TEA GARDEN WEEDS FOR THE PROMOTION OF TEA PLANT HEALTH –Sandipan Ghosh
- Selected underutilized fruits of north east India for overall health improvement of humankind-SWARNENDRA BANERJEE

Selected Post-Graduate Dissertations:

- Isolation and characterization of the *Streptomyces* sp from the rhizospheric soil of *Areca catechu* of plants of jaigaon, west Bengal -*Abisekh Karki* (2023)
- Ayurveda plants against respiratory disease and their anti-inflammatory efficacy- Ananya Banik (2023)
- Phytoresp: a curated database of plants against respiratory disease- *Anushka Das* (2023)
- In vitro antioxidant and antimicrobial activities of *Elaeagnus pycnantha* (silverbeery) fruit extract and its effective role against testicular damage, oxidative stress linked to male infertility.- *Usashi Shome* (2023)
- Improvement of *Pisum sativum* (l) yield under arsenic stress potential role of the zinc oxide nanoparticles in abiotic stress management- *Rajarshi Sarkar* (2023)
- In vitro and in silico evaluation of medicinal plants used in starter culture (ranu dabai) of fermented rice beer by the inhabitants of tea garden of terai region of west Bengal- *Prasant Gupta* (2022)
- Selected native plants of sub-Himalayan West Bengal effective against neurological disorders as revealed by network pharmacology- *Thering Dhendup Lepcha* (2022)
- Isolation, identification, and characterization of the root nodule associating endophytic diazotrophs from the leguminous plants growing near the tea garden area of the University of North Bengal- *Anipa Saha* (2022)
- Effect of Arsenic contaminated soil in vigna moong plants and its amelioration with Zinc oxide nanoparticle priming - *Jarzis Islam* (2022)
- Mitigation of Arsenic toxicity in early growth phase of vigna moong with the help of zinc oxide nanoparticles priming- *Sourik Mondal* (2022)

- In silico screening of chemical compounds of Citrus in different disease-related targets- *Anup Barman* (2021)
- Fruit juice of some Actinorhizal plants (*Myrica nagi*, *M. esculanta*, *Eleagnus pyriformis*) may help in reducing nephrotoxicity in kidney- *Babita Sah* (2021)
- Anti-inflammatory, anti-cancerous, anti-oxidant, anti-fungal, anti-microbial, and CNS stimulant activity evaluation through molecular docking studies of phytochemicals found in 5-AV2 and 1-ASSAM cultivars of *Camellia sinensis* - *Reshmi Sarki* (2021)
- In silico investigations of chemical constituents of *Clerodendrum* species in the anti-cancer, anti-inflammatory, anti-diabetic, hepatoprotective, anti-oxidant, and anti-bacterial drug targets- *Sangita Bose* (2021)
- Synthesis of silver nanoparticles using *Ficus rumphii* leaf extract and their antioxidant activity- *Sagarika Ray* (2021)
- Comparative study on antioxidant property of distilled alcohol made from *Rhododendron arboreum* sm. and *Zingiber officinale* consumed by ethnic groups of Darjeeling Hills- *Anjana Sharma* (2020)
- Biogenic synthesis of silver nanoparticles using *Clerodendrum inerme* leaf extract and antioxidant activity- *Moumita Barman* (2020)
- Optimization and characterization of silver nanoparticle synthesized using green approach – A review - *Pinki Sutradhar* (2020)
- Characterization and application of green synthesis of metallic silver nanoparticles (AgNps) – A review- *Debarati Saha* (2020)
- Bioinformatics perspective of *Atopobium* sp.- *Dipayan Pal* (2019)
- Production and biochemical characterization of *Averrhoa carambola* (Kamranga) wine- an underutilized fruit and beverage- *Mampi Mondal* (2019)
- Antioxidant and medicinal profiling of three members of Chlorophyceae- *Deep Deb* (2019)
- Isolation and characterization of *Streptomyces* strains - *Namita Das* (2019)
- Antioxidant Profiling of *Schefflera arboricola* - *Uttam Roy* (2018)
- Antioxidant Profiling of *Trevesia palmate*- *Rahul Kumar Prasad* (2018)
- Isolation and characterization of Actinobacterial strains from Tea Garden of NBU Campus - *Sandipan Ghosh* (2018)
- Comparative antioxidant activity of four different cultivars of *Ziziphus* sp.- *Sourav Paul* (2018)
- Small RNAs of some selected species of Actinobacteria in light of Pseudoknot, free energy, and target protein classes: a bioinformatics approach- *Md Sohaib* (2017)
- Codon usage pattern of carbohydrate-active enzymes (CAZy) in Actinobacteria: an in silico approach- *Priyashree Bhadra* (2017)
- Investigation of codon usage pattern on CAZyme of Actinobacteria- *Frankia*, *Leifsonia*, and *Streptomyces* genome - *Riya Das* (2017)
- Small RNAs of some selected species of Actinobacteria in light of Pseudoknot, free energy, and target protein classes: a bioinformatics approach- *Satyaki Biswas* (2017)
- Molecular diversity of 18 tea [*Camellia sinensis* (L.) Kuntze] varieties in North Bengal with RAPD and ISSR markers - *Suman Seth* (2016)
- In silico drug targeting against tubercle *Bacillus* from India- *Dwipanwita Adhikari* (2016)
- Antioxidant profiling of *Marsilea minuta* Linn.- *Alokejyoti Biswas* (2016)
- High profile medicinal properties screening of selected home and country-made wines - *Mousikha Lala* (2015)
- In-silico study on heat shock proteins of selected Actinobacteria - *Md. Azmalul Alam* (2015)

- Altitudinal diversity study of *Alnus nepalensis* D.DON with RAPD markers - Mamta Kumari Chhetri (2015)

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GenBank submission (Genome Projects):

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GenBank submission (Partial sequences):

Bamboo	: 26
Canna	: 08
Turmeric	: 02
Frankia	: 22
Tea (Camellia)	: 40
Clerodendrum	: 29
Streptocaulon sylvestre	: 03
Food sample (Eu)	: 01
Yeast sample	: 03

Database created:

- Bamboo-infoline: a database for North Bengal Bamboos (www.bamboodb.ind.in)
- MycoSec: a database for Mycobacterium Secretome analysis (www.bicnbu.in/mycosec)

Books:

- Biology of Useful Plants and Microbes by Arnab Sen (ed), Narosa Publication House, New Delhi.
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