



Rajal Debnath, Ph.D.
Scientist-B
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SUMMARY

- Microbiome bioinformatics scientist with 8+ years of strong interdisciplinary training (pre-doc, doctoral and post-doc) in conventional microbiology and mixed microbial community evaluation by analyzing DNA data from high throughput sequencing experiments and applying inferential statistics
- Developed collaborative projects in different aspect of basic and applied microbiology during Ph.D and as Research scientist (PI) generating > 90 lakhs grant support and translated most of the generated knowledge through communication in high-visibility journals (> 10 publications)
- Skilled communicator (both oral and written) of scientific thoughts, concepts and research findings in technical and non-technical forums

WORK EXPERIENCE

Central Silk Board, Ministry of textiles, Govt of India, Bangalore, India

www.csb.gov.in

Principal Investigator & Scientist

Nov 2015 – Present

- Microbiome establishment and transfer within the gut of non-mulberry wild silkmoths of North East India (Impact of domestication and selective rearing, multispecies dietary foliage chemistry and chemical pesticides in rearing fields)
- Microbiome of *Persea bombycina* and *Ricinus communis* (impact of management practices such as Coppicing, intercropping)
- Pangenome analysis of *Enterobacter asburiae* RJ12 for evolutionary transition of a plant symbiont to potential pathogen (Unreleased)
- Spatio-temporal distribution and functional ecology of bacterial community in Ramsar site wetland Deepor Beel

- **As PI, Grant support of INR 8.00 Lakh from DBT, India (2018-2019)**
– Foldscope (origami based) in detection of nosema spores from infected silkworms for onsite field application and managing pebrine disease in silkworm

- **As Coordinator & PI, approved for financial assistance of INR 66.44 Lakhs by DBT, India (2019-2022)**
– Gut metagenomes of polyphytophagous wild silkmoths as bio-resources for efficient biomass deconstructing enzymes. (Integrated omics approach - genomics, metagenomics, metabolomics)

- **As Co-PI, Research grant of INR 20 Lakh from Central Silk Board, Govt. of India (2016-2019)**
– Comparison of microbiomes from flacherie infected non-mulberry silkworms to understand host pathogen interaction (16S sequencing, machine learning, statistical modeling)

Council of Scientific and Industrial Research-NEIST, Jorhat Assam

www.rrljorhat.res.in

Senior Research Fellow & Ph.D fellow, Gauhati University

June 2013-October 2015

- Microbial ecology in Eastern Himalayan terrestrial ecosystem and endemic plant-microbe interaction.
- Heterologous expression, purification and characterization of cold active lipase (*Lip*) from psychrotolerant *Streptomyces moraviensis* from *Rhododendron arboreum*.

- Core microbiome profiling of endemic *Rhododendron arboreum* sp. delavayi plant from high altitude mountainous ecosystem (altitude depended selective colonization of Rhodococcus possibly conferring adaptation to UV irradiation; Bradyrhizobium and Rhodoplanes found to be the most significant members for plant adaptation in high altitude)
- Fluorescent Pseudomonas in counteracting root rot disease in *Vigna radiata* L. (green gram). Seed inoculation/ coating and green house experimentation with GGRJ12 strain suppressed disease by 28-93 % by up regulating stress responsive genes *acdS*, *KatA* and *gbsA*
- Genome assembly and annotation of Streptomyces sp. RSD-27 (PRJNA267035)

Senior Project fellow

April 2012 – March 2013

- Bioprospection of Actinobacteria (specifically Streptomyces) from cold regions of Arunachal Pradesh and *chi* gene diversity
- Culturable endophytic actinobacteria from indigenous medicinal plants and their distribution across different forested ecosystem in North East India

Junior Project Fellow

March 2010 – March 2012

- Screening, extraction, purification and characterization of bioactive molecules from agriculturally relevant Streptomyces strains and field application. (Indian council of Agricultural research funded network project on “Diversity and Application of microorganisms in agriculture and allied sector- AMAAS”)

SKILLS

Bioinformatics

R, python, Linux, Github, Bioconductor

Amplicon sequencing analysis (16S, ITS)

OTU clustering (QIIME, MOTHUR, UPARSE, Anvi'o), sub-OTU clustering (DADA2, oligotyping), alignment free sub-OTU clustering, Function prediction (PICRUST, FAPROTAX)

Shotgun metagenomics

Taxonomy and Function analysis, antibiotic resistance analysis, variant gene calling analysis, denovo genome assembly (validation and optimization), gene calling and annotation, genome based phylogeny construction and analysis, genome recovery from metagenome (MAG), Comparative genomics (pangenome, synteny analysis, pathway analysis, network analysis)

Statistics

Power calculations, ecological modeling, Diversity and ordination analysis, Differential abundance analysis, Biomarker identification, Association analysis (generalized linear modeling, network analysis, WGCNA), Classification and regression trees (CART), Random forest, Adaboost, data visualization techniques

Wet techniques

Nucleic acid preps (metagenome from soils, plants, insects), PCR and variants, soil enzyme assays (absorbance, fluorescence), clone library preparations for diversity analysis, protein and DNA electrophoretic techniques, western blots, qPCR assays, expression cloning and purification of proteins in heterologous hosts, trypsin digestion and MALDI-TOF analysis, exome library preps for Illumina sequencing runs

EDUCATION

2013-2017

Ph.D.

Biotechnology, CSIR-NEIST & Gauhati University, India
 Thesis title: *Bacterial community analysis and lipase screening from cold adapted region of Tawang, Arunachal Pradesh India*

2007-2009	M.Sc	Biotechnology, Bangalore University, India (with Honors)
2004-2007	B.Sc	Biotechnology, Bangalore University, India (with Honors)

ACADEMIC EXCELLENCE, AWARDS AND HONORS

June 2013-2016	CSIR-SRF, Fellowship Grant awarded by CSIR, Govt. of India
June 2011 & December 2011	CSIR-UGC (NET) Award for Lecturership, Govt. of India
February 2011	Graduate aptitude test in Engineering (GATE), MHRD, Govt. of India

PUBLICATIONS

Gohain, A., Sarma, R.K., **Debnath, R.** et al. (2019) Phylogenetic affiliation and antimicrobial effects of endophytic actinobacteria associated with medicinal plants: prevalence of polyketide synthase type II in antimicrobial strains. *Folia Microbiol.* PMID:30680589

Debnath, R., Yadav, A., Gupta, V. K., Singh, B. P. et al. (2016) Rhizospheric Bacterial Community of Endemic *Rhododendron arboreum* Sm. Ssp. *delavayi* along Eastern Himalayan Slope in Tawang. *Frontiers in Plant science.* PMID:27642287

Gohain, A., Gogoi, A., **Debnath, R.**, Yadav, A. et al. (2015) Antimicrobial biosynthetic potential and genetic diversity of endophytic actinomycetes associated with medicinal plants. *FEMS Microbiology Letters*, PMID: 26347302

Debnath, R., Saikia, R., Sarma, R. K., Yadav, A. et al. (2013) Psychrotolerant antifungal *Streptomyces* isolated from Tawang, India and the shift in chitinase gene family. *Extremophiles.* PMID:24085523

Sarma, R. K., Gogoi, A., Dehury, B., **Debnath, R.** et al. (2014) Community Profiling of Culturable Fluorescent Pseudomonads in the Rhizosphere of Green Gram (*Vigna radiata* L.) *PlosOne* PMID:25279790

Debnath, R., Sarma, R. K., Saikia, R., Yadav, A. et al. (2013) *Metagenomics: A Hunting Expedition in Microbial Diversity* In: *Molecular Biology of Bacteria*, Nova Science Publishers, Inc., New York (ISBN: 978-1-62618-189-2)

Talukdar, M., Duarah, A., Talukdar, S., Gohain, M. B., **Debnath, R.** et al. (2012) Bioprospecting *Micromonospora* from Kaziranga National Park of India and their anti-infective potential. (2012) *World Journal of Microbiology and Biotechnology* PMID:22806196

Sarma, R. K., **Debnath, R.**, Saikia, R., Handique, P. J. et al. (2012) Phylogenetic analysis of alkaline proteinase producing fluorescent pseudomonads associated with green gram (*Vigna radiata* L.) rhizosphere. *Folia Microbiologica* PMID:22374358

Tamuly, C., Hazarika, M., **Debnath, R.**, Saikia, R. et al. (2013) Effect of CTAB in biosynthesis of Au-nanoparticles using *Gymnocladus assamicus* and its biological evaluation. *Materials Letter* 113(15):103-106

Sarma, R., **Debnath, R.**, Yadav, A., Baruah, A. R. et al. (2014) Rhizosphere Engineering of Crop Plants by Bacterial ACC-deaminase. In: *Trends in Soil Microbial ecology*, Studium press LLC, Houston, U.S.A (ISBN: 1-626990-36-0)

Sosanka, S. P., Dutta, P., Bhuyan, P. M., **Debnath, R.** et al. (2017) *Aeromonas caviae* CSB04, a causal organism of bacterial flacherie in muga silkworm (*Antheraea assamensis* Helfer) *Current Science*, 112 (1): 32

INVITED PRESENTATION/ WORKSHOP

CSIR-NEIST National workshop on “Biological data analysis using R statistical language, 5-6 Jan. 2017

Nagaland Central University National workshop on “Microbiome studies: Design consideration and data analysis” on 14th Nov. 2018

ONGC Institute of Biotechnology and Geotectonic studies, Jorhat Assam on 05th June 2017, training of scientist on polyphasic microbial characterization and preservation

ADVANCED TRAININGS

“Transcriptomics – From Data analysis to inference” at CSIR-NEIST, 26-27 April 2018

“Cancer genomics”, Exome library prep for Illumina Hiseq sequencing and SNP data mining and variant analysis at ACTREC, Department of Atomic Energy from 12 - 17 July 2018

“Gene cloning protein biochemistry, Structural Biology & Bioinformatics” at ACTREC, Department of Atomic Energy, from 13 - 24 July 2015

“Bioinformatics for Gene Discovery” at Assam Agriculture University (AAU), Indian Council of Agricultural Research from 16 - 20 Feb 2015

"Data Deluge in Biology: Use of High-Performance Grid and Cloud computing" by Center for Development of Advanced Computing (C-DAC), Institute of Bioinformatics and Applied Biotechnology (IBAB) and Jorhat Medical College and Hospital, from 19-20 Dec 2013

PROFESSIONAL MEMBERSHIP/REVIEWER

Member of the American Society for Microbiology (ASM), 2017- present

Member of The Society for Applied Microbiology (Sfam), 2019-present

Reviewer of Research projects as part of Department of Science & Technology- Core research grant scheme, India, 2017-present

ABSTRACTS

Rajal Debnath, Dip K. Gogoi, K. Neog (2018). “Mapping the microbiome of Som (*Persea bombycina* K.) across region and season in Assam”, presented at the National Seminar on “Vanya Sericulture and Seribiodiversity for Economic Upliftment- SeribioEcon-2018” CMER&TI, 12th-13th March, pp-18

Rajal Debnath, Dip K. Gogoi, K. Neog (2017) “Insect gut microbiome-Implications in Vanya silkworm” presented at the National Seminar on “Economic insects of North East India: Thrust on Recent Advances in Vanya Silks” organized by CMER&TI and Directorate of Sericulture Bodoland Territorial Council (BTC), Kokrajhar Assam

Rajal Debnath, Archana Yadav, Ratul Saikia (2014). Delineating the major psychrophilic bacterial taxa from a cold adapted lake nearby Se La Pass in west Kameng district, Arunachal Pradesh. National Seminar on “Recent Advances in Biotechnological Research in North East India: Challenges and Prospects” organized by Department of Molecular Biology and Biotechnology (MBBT), Tezpur University, Nov 27-29, 2014

Rajal Debnath, Rupak K Sarma, Ratul Saikia*, Archana Yadav, Tarun C Bora (2012). Molecular phylogeny and detection of chitinase genes in *Streptomyces* isolated from tea rhizosphere. 18th International Conference (Post ISCBC) Perspective and Challenge in Chemical and biological Sciences: Innovation Cross Road. 28th -30th Jan., 2012, Institute of Advanced Study in Science & Technology (DST), Guwahati, Assam. OL-6, (No. 275), Pp-46.

R. Debnath, R. K. Sarma, T. C. Bora, R. Saikia* (2010). Genetic diversity of antagonistically potential *Streptomyces* spp. Isolated from Nambor Reserve Forest of Assam, India. First Indian Biodiversity Congress (IBC 2010) organized by CISSA and Kerala University, Thiruvananthapuram from 27th to 31st December 2010, Pp 50.