

Rakshak Kumar, PhD

Scientist & Asst. Professor (AcSIR)
Department of Biotechnology,
CSIR-Institute of Himalayan Bioresource Technology,
Palampur-176061 (HP)

Phone: +91 1894 233339, ext. 441
rakshakacharya@gmail.com
rakshak@ihbt.res.in

PROFESSIONAL CAREER

2017 to date: Scientist, High Altitude Microbiology Lab, CSIR-IHBT, Palampur

2014 to 2017: DST INSPIRE Faculty, Department of Biotechnology, CSIR-IHBT, Palampur

2013 to 2014: DS Kothari Postdoctoral Fellow, Sikkim University, Gangtok

2012 to 2013: DBT Research Associate, Institute of Microbial Technology, Chandigarh

ACADEMICS

2012 Ph.D Awarded on August 17th, 2012, under the supervision of Dr. SR Joshi, Associate Professor, Microbiology Laboratory, Department of Biotechnology and Bioinformatics, North Eastern Hill University, Shillong, Meghalaya.

Title of Thesis: **Characterization of metal tolerant bacteria from soils of Domiasiat area of Meghalaya**

2005 Master of Science (Biotechnology), University of Madras, Chennai, Tamil Nadu.

2002 Bachelor of Science [Biotechnology (Hons.), Botany and Chemistry], North Eastern Hill University, St. Anthony's College, Shillong, Meghalaya.

1999 AISSCE (Class XII), CBSE Board, DAV Public School, B S City, Jharkhand.

1997 AISSE (Class X), CBSE Board, DAV Public School, B S City, Jharkhand.

AWARDS AND HONOURS

- **INSPIRE Faculty Award** from Department of Science & Technology, Government of India in July 2014
- **Dr. D S Kothari Postdoctoral Fellowship Award** from University Grants Commission, Government of India in August 2013
- **DBT-Research Associateship in Biotechnology & Life Sciences** from Department of Biotechnology, Ministry of Science and Technology, Government of India in May 2012
- **JRF** and **SRF** from BRNS, DAE
- **Second Rank** in BSc, Biotechnology (Hons.) Examination, 2002 of North-Eastern Hill University, Shillong, Meghalaya

RESEARCH AREAS OF INTEREST

- ◆ High Altitude Microbiology
- ◆ Bacterial Systematic and Genomics
- ◆ Food Microbiology and Probiotic

PROJECTS

Undergoing Projects

- 1. Study of bacteria from the ice core of East Rathong glacier of Sikkim with reference to climate change**, Sanctioned by DST, Govt. of India under INSPIRE Faculty programme. Oct 2014 to Oct 2019. Rs 35,00000/-
- 2. Bringing Back the Real Green: Eradicating Invasive Species and Restoring Ecosystem through Community Participation**, Sanctioned by "National Mission On Himalayan Studies" implemented by the Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt. of India. June 2018-June 2021. Rs 46,08000/-

Granted Projects:

- 1. Development of bacterial formulations for organic waste degradation in cold regions of Sikkim and Himachal Pradesh**, Recommended by WMT program of TDT Division, DST, Govt. of India.
- 2. Indigenous enzymes for vegetable and rice bran oil degumming**, Recommended by CSIR Agri-Nutri-Biotech theme, CSIR, Govt. of India.

Completed Projects

1. Study of bacterial diversity from East Rathong glacier of Sikkim for bioprospection

Sikkim University

Gangtok, Sikkim

UGC-DS Kothari Postdoctoral Fellowship

Sep. 2013-Sep. 2014

The field expedition of East Rathong Glacier, West Sikkim was successfully completed from 28 April, 2014 to 6th May, 2014. Culture associated bacteria from the glacier samples were isolated at 10°C and the plate assays for their enzyme characterization was performed. The work on East Rathong glacier during this fellowship led me conceptualise the proposal for DST-INSPIRE Faculty programme and although I concluded the Kothari fellowship in a year but the microbial study from this glacier was taken forward with INSPIRE Faculty project. Furthermore, during this period I was actively involved in conducting theory as well as practical classes for MSc Microbiology program in the university and also helped MSc Dissertation project on water quality analysis and microbial load of a sacred lake viz. Khichiporli from West Sikkim.

2. Thermophilic bacteria from the hot springs of North East India and its industrial applications

CSIR-Institute of Microbial Technology

Chandigarh

DBT Research Associateship

July. 2012- Sep. 2013

Heat tolerant bacteria surviving above 50°C were studied from 5 different hot springs of northeast India from the state of Meghalaya and Sikkim. A total of 137 thermo tolerant bacteria were isolated from different points of five selected ponds. Based on amplified ribosomal DNA restriction analysis (ARDRA) the isolates (n=137) could be categorised into 41 phylotypes. Representative 46 bacteria analysed from the identified phylotypes were affiliated to 6 different phyla viz. *Firmicutes*, *Deinococcus-Thermus*, *Alphaproteobacteria*, *Betaproteobacteria*, *Gammaproteobacteria* and *Bacteroidetes* with the generation of 16S rRNA gene sequences. Low diversity indices were observed among the 5 sampling sites owing to similar physiological conditions of

the ponds. Out of the identified isolates 76% showed positive amylase activity; 54% showed protease activity; 52% showed lipase activity in Tween-40 and 24% in Tween-80; the least positive enzyme activity was for cellulase with only 6.5% positives. When tested for restriction endonuclease activities it was observed that 30% of the isolates digested λ -DNA while 22% digested pBR322. Fatty acid profile studies indicated that short-chain fatty acids, unsaturated fatty acids, branched fatty acids, cyclic and cis fatty acids are predominant in the thermophilic bacteria. There were occurrences of 4 sequences which showed sequence similarity of less than 98.7% with the nearest phylogenetic neighbours. These bacteria are previously uncharacterized bacteria which were expected from these sampling sites being geographically distinct and previously unexplored. One of the four isolate, AK 31^T has been affiliated to a novel species of *Caldimonas* genus. Phylogenetic analyses indicated that the strain AK31^T clustered with *C. manganoxidans* JCM 10698^T and *C. taiwanensis* On1^T with a phylogenetic distance of 3.25% (96.75% similarity). Based on data from the current polyphasic study, strain AK31^T is proposed as a novel species of the genus *Caldimonas*, for which the name *Caldimonas meghalayensis* sp. nov. is proposed.

PUBLICATIONS

◆ Peer Reviewed Research Papers:	20
◆ Review Article:	01
◆ Book Chapters:	04
◆ Popular Article:	01
◆ Abstracts in conferences:	12

FULL LIST OF PUBLICATIONS

(a) Research papers published in peer-reviewed and indexed journals

1. **Kumar R***, Acharya V, Mukhia S, Singh D, Kumar S. 2018. Complete genome sequence of *Pseudomonas frederiksbergensis* ERDD5: 01 revealed genetic bases for survivability at high altitude ecosystem and bioprospection potential. Genomics. Accepted: In Press. (*Corresponding Author) [IF: 2.910]
2. **Kumar R***, Acharya V, Singh D, Kumar S. 2018. Strategies for high-altitude adaptation revealed from high quality draft genome of non-violacein producing *Janthinobacterium lividum* ERGS5:01. Standards in Genomic Sciences. 13(1), 1. (*Corresponding Author) [IF: 1.6]
3. Maurya AK, Devi R, Kumar A, Koundal R, Thakur S, Sharma A, Kumar D, **Kumar R**, Padwad YS, Chand G and Singh B. 2018. Chemical Composition, Cytotoxic and Antibacterial Activities of Essential Oils of Cultivated Clones of *Juniperus communis* and Wild *Juniperus* Species. Chemistry & Biodiversity. [IF: 1.6]
4. Himanshu, Swarnkar MK, Singh D, **Kumar R***. 2016. First complete genome sequence of a species in the genus *Microterricola*, an extremophilic cold active enzyme producing bacterial strain ERGS5:02 isolated from Sikkim Himalaya. **Journal of Biotechnology**. 222, 17-18. (*Corresponding Author) [IF: 2.533]
5. **Kumar R***, Singh D, Swarnkar MK, Singh AK, Kumar S. 2016. Complete genome sequence of *Arthrobacter alpinus* ERGS4:06, a yellow pigmented bacterium tolerant

- to cold and radiations isolated from Sikkim Himalaya. **Journal of Biotechnology.** 220, 86-87. (*Corresponding Author) [IF: 2.533]
6. **Kumar R***, Singh D, Swarnkar MK, Singh AK, Kumar S. 2015. Genome assembly of *Chryseobacterium polytrichastri* ERMR1:04, a psychrotolerant bacterium with cold active proteases, isolated from East Rathong Glacier in India. **Genome Announcement.** 3(6):e01305-15. (*Corresponding Author)
 7. **Kumar R***, Singh D, Swarnkar MK, Singh AK, Kumar S. 2015. Complete genome sequence of *Arthrobacter* sp. ERGS1: 01, a putative novel bacterium with prospective cold active industrial enzymes, isolated from East Rathong glacier in India. **Journal of Biotechnology.** 214, 139–140. (*Corresponding Author) [IF: 2.533]
 8. **Kumar R**, Kumar R, Nupur, Srinivas TNR, Kumar PA. 2013. *Caldimonas meghalayensis* sp. nov., a novel thermophilic betaproteobacterium isolated from a hot spring of Meghalaya in northeast India. **Antonie van Leeuwenhoek.** 104(6), 1217-1225. [IF: 1.588]
 9. **Kumar R**, Nongkhlaw M, Acharya C, Joshi SR. 2013. Soil bacterial metagenomic analysis from uranium ore deposit of Domiasiat in North-east India. **Current Science.** 105(4), 495-498. [IF: 0.883]
 10. **Kumar R**, Nongkhlaw M., Acharya C, Joshi SR. 2013. Growth media composition and heavy metal tolerance behaviour of bacteria characterized from the sub-surface soil of uranium rich ore bearing site of Domiasiat in Meghalaya. **Indian Journal of Biotechnology.** 12, 115-119. [IF: 0.368]
 11. Nongkhlaw M.*, **Kumar R ***, Acharya C, Joshi SR. 2012. Occurrence of horizontal gene transfer of P_{IB}-type ATPases among bacteria isolated from uranium rich deposit of Domiasiat in North East India. **Plos One.** 7(10) e48199. (*Equal Contribution) [IF : 2.766]
 12. **Kumar R**, Nongkhlaw M, Acharya C, Joshi SR. 2013. (U)-tolerant bacterial diversity from U ore deposits of Domiasiat in North-East India and their prospective utilisation in bioremediation. **Microbes and Environment.** 28(1), 33-41. [IF: 2.476]
 13. **Kumar R**, Acharya C, Joshi SR. 2011. Isolation and analyses of uranium tolerant *Serratia marcescens* strains and their utilization for aerobic uranium U(VI) bioadsorption. **The Journal of Microbiology.** 49(4), 568-574. [IF: 2.319]
 14. **Kumar R**, Joshi SR, Acharya C. 2008. Metal tolerant *Bacillus* and *Pseudomonas* from Uranium rich soils of Meghalaya, pp 345-350. **Research Journal of Biotechnology, Special Issue.** [IF: 0.233]
 15. Sohliya I, Joshi SR, Bhagobaty RK, **Kumar R.** 2009. Tungrymbai- A traditional fermented soybean food of the ethnic tribes of Meghalaya. **Indian Journal of Traditional Knowledge.** 8(4), 559-561. [IF: 1.061]
 16. **Kumar R**, Acharya C, Joshi SR. 2012. Diversity of uranium tolerating bacteria at Domiasiat, West Khasi Hills, Meghalaya. **Assam University Journal of Science & Technology: Biological and Environmental Sciences.** 9(1), 186-190. [ISSN 0975-2773]
 17. Rapsang GF, **Kumar R**, Joshi SR. 2011. Identification of *Lactobacillus pobuzihii* from *Tungtap*-a traditionally fermented fish food, and analysis of its bacteriocinogenic potential. **African Journal of Biotechnology.** 10(57), 12237-12243. [ISSN: 1684-5315]
 18. Bhagobaty RK, Joshi SR, **Kumar R.** 2010. *Penicillium verruculosum* RS7PF: A root fungal endophyte associated with an ethno-medicinal plant of the indigenous tribes

of Eastern India. **African Journal of Microbiology Research**. 4(9), 766-770. [ISSN: 1996-0808]

19. Joshi SR, **Kumar R**, Saikia P, Bhagobaty RK, Thokchom S. 2009. Impact of roadside pollution on microbial activities in sub-tropical forest soil of North East India. **Research Journal of Environmental Sciences**. 4(3), 280-287. [ISSN: 1819-3412]
20. Joshi SR, Bhagobaty RK, **Kumar R**. 2008. Microbial Community on Leaf Surfaces of Broad-Leaved alder (*Alnus nepalensis* D.Don) and Needle-leaved khasi pine (*Pinus kesiya* Royle Ex Gordon) as Influenced by Atmospheric Dry Deposition of Roadside Pollution in Eastern Himalayas. **Research Journal of Environmental Sciences**. 2(4), 234-242. [ISSN: 1819-3412]

(b) Review article

21. **Kumar R**, Nongkhlaw M, Acharya C, Joshi SR. 2013. Bacterial community structure from the perspective of the uranium ore deposit of Domiasiat in India. **Proceedings of the National Academy of Sciences, India Section B: Biological Sciences**. 83(4), 485-497. [IF:0.396]

(c) Book chapters in book published

22. **Kumar R**, Joshi SR. 2008. Microbial ecology of the soil: Studying the diversity of microorganisms in the most complex of environments- A review, pp 267-277. *In* P Parihar and L Parihar (eds.), **Advances in Applied Microbiology**, Agrobios. [ISBN number: 8177543563]
23. **Kumar R**, Joshi SR. 2009. Probiotics: Biotechnology in prolongation of life, pp 187-212. *In* C.S.K. Mishra and Pascale Champagne (eds.). **Biotechnology Applications**, I.K. International Pvt. Ltd., New Delhi. [ISBN number: 978-93-80026-29-9]
24. **Kumar R**, Joshi SR. 2009. Probiotics: Indigenous fermented foods as a source of potential medicinal microbes, pp 211-222. *In* D Marngar and S Jyrwa (eds). **Biodiversity-Herbal Medicine**. [ISBN number: 978-81-83701-54-9]
25. Joshi SR, Kalita D, **Kumar R**, Nongkhlaw M, Swer PB. 2014. Metal-Microbe Interaction and Bioremediation, pp 235-251. *In* D. K. Gupta and C. Walther (eds.). **Radionuclide Contamination and Remediation through Plants**. Springer International Publishing. [ISBN number: 978-3-319-07664-5]

(d) Popular Article

26. Rai AK, **Kumar R**. 2015. Potential of microbial bio-resources of Sikkim Himalayan region. *ENVIS Bulletin on Himalayan Ecology*, 23, 99-105. [ISSN: 0971-7447]

(e) Abstracts published in Seminar/ Conferences

1. **Kumar R**, Joshi SR, Bhattacharjee A. "Characterization of lactic acid bacteria (LAB) isolated from indigenous fermented fish food using SDS-PAGE whole cell protein profile" in **Proceedings of the Section of Biological Sciences, 77th Annual Session and Symposium, National Academy of Sciences, India**, December 6-8, 2007 at CFTRI, Mysore, pp.8.
2. **Kumar R**, Joshi SR, Acharya C, Apte SK. "Metal tolerant bacterium from uranium rich site of Meghalaya" in **Proceedings of the National Seminar on toxicity of chemicals & their hazards with special reference to heavy metals**. October 23 -24, 2008 at St. Edmund's College, Shillong, Meghalaya, pp.171.
3. **Kumar R**, Joshi SR, Acharya C, Apte SK. "Metal-resistant Bacterial strains isolated from Uranium rich environment of Domiasiat in Meghalaya" in **Proceedings of the Environmental Sciences Section, 96th session of the Indian Science Congress**, January 3-7, 2009 at North Eastern Hill University, Shillong, Meghalaya, pp 1-2.

4. Joshi SR, Sarma B, **Kumar R**. "Diversity of metal tolerant bacteria from pre-mined uranium rich areas" in **Proceedings of the Seminar on Biodiversity of North-East India-Issues and Concerns**, May 22, 2010 at North Eastern Hill University, Shillong, Meghalaya, pp 7.
5. **Kumar R**, Sarma B, Acharya C Joshi SR. "Characterization of Culturable Aerobic Uranium Tolerant Bacteria from Sub-surface Soils around the Dumping Sites of Uranium Exploratory Drilling and Test Recovery Plant of Domiasiat in India" in **Proceedings of the International Symposium on Recent Advances in Cross-disciplinary Microbiology: Avenues & Challenges**, December 14-17, 2010 at 51st Annual Conference of Association of Microbiologists of India (AMI), December at Birla Institute of Technology, Mesra, Ranchi, pp 131.
6. Sarma B, **Kumar R**, Joshi SR, Acharya C. "Dual tolerant gram- negative bacilli from uranium-rich site of meghalaya: a biodiversity adaptation approach" in **Proceedings of the International Seminar on "Managing Biodiversity for Sustainable Livelihoods in the Changing Environment in Marginal Mountain Regions"** December 21-23, 2010 at North Eastern Hill University, Shillong, Meghalaya.
7. **R Kumar**, Macmillan Nongkhlaw, Acharya Celin, Joshi SR. "Metal tolerance potential in different growth media by the identified uranium (U)- tolerant bacteria from the sub-surface soil of U rich ore bearing site of Domiasiat in Meghalaya" in **Proceedings of the National Conference on "Biology and Bioinformatics of Economically Important Plants and Microbes"** February 17-19, 2012 at University of North Bengal, Siliguri, West Bengal.
8. Nongkhlaw M, **Kumar R**, Joshi SR. "Metal transporting genes among bacteria from uranium rich area: Bioprospecting organisms for metal bioremediation" in **Proceedings of the National Conference on "Biology and Bioinformatics of Economically Important Plants and Microbes"** February 17-19, 2012 at University of North Bengal, Siliguri, West Bengal.
9. **Kumar R**, Tamang JP. "Relevance of bacterial study from glaciers in terms of climate change" in **Proceedings of the National Conference on "Microbial World 2014: National Seminar on Applied Microbiology"** March 14, 2014 at University of North Bengal, Siliguri, West Bengal.
10. **Kumar R**, Ravinder K., Nupur, Srinivas TNR, Kumar PA. "Study of the diversity of thermo tolerant bacteria of the hot springs of Sikkim and Meghalaya in north-east India" in **Proceedings of the National Symposium "Himalayan Biodiversity: Prospects and Challenges"** March 20-21, 2014 at North Eastern Hill University, Shillong.
11. **Kumar R**, Joshi SR, Kumar PA, Tamang JP "Microbial diversity from extreme environments and their preservation" in National Seminar on **"Preservation of Biodiversity and Cultural Diversity"** November 1, 2014 at School of Life Sciences, Sikkim University (central university), Gangtok.
12. **Kumar R**, Kumar S "Adaptational insights from the physiology and genomics of bacteria thriving in the alpine region of Sikkim Himalaya" in National Conference on **"Recent Advances in Applied Biological Sciences"** May 4-5, 2018 at North Eastern Hill University, Shillong.

PERSONAL DETAILS

Father's name : Madhur Kumar Chhetri
Born : August 10, 1982-Shillong, Meghalaya
Marital status : Single
Permanent Address : C/o Dandapani Sharma
House No. 7 & 8, Nabagraha Road,
Silpkhuri, Dist: Kamrup Metropolitan,
Guwahati-781003, Assam, India

NAMES AND ADDRESSES OF REFEREES

1. Dr. Sanjay Kumar
Director
CSIR-Institute of Himalayan Bioresource
Technology, Palampur-176061 (HP)
E-mail: sanjaykumar@ihbt.res.in
2. Dr. Dharam Singh,
Senior Scientist
Department of Biotechnology,
CSIR-Institute of Himalayan Bioresource
Technology, Palampur-176061 (HP)
E-mail: dharamsingh@ihbt.res.in
3. Dr. Celin Acharya
Scientific Officer
Molecular Biology Division, Bhabha Atomic
Research Centre Trombay, Mumbai-400085
E-mail: celin@barc.gov.in
4. Dr. SR Joshi
Associate Professor
Department of Biotechnology & Bioinformatics,
North-Eastern Hill University, Shillong-793022,
Meghalaya. E-mail: srjoshi2006@yahoo.co.in

DECLARATION

I declare that the information furnished above is true and correct to the best of my knowledge and belief, and that no related information is concealed.

Date: 06-08-2018

Place: Palampur

(RAKSHAK KUMAR)