BIODATA

Name	**Dr. Abhay Raj**
Designation	Principal Scientist & Associate Professor in AcSIR
Institute	Environmental Microbiology Division, CSIR-Indian Institute of Toxicology Research Vishvigyan Bhavan 31, Mahatma Gandhi Marg, Post Box. No. 80, Lucknow-226001, UP, India. Email:araj@iitr.res.in, abhayrajmicro@gmail.com Phone: 0522-2476051 Ext.215 Mob: +91-9721949152
Date of birth	March 08, 1978
Sex	Male
Educational qualifications	B.Sc. (1999), M.Sc. (2001), Ph.D. (2009)

Detail of employment

- Junior Scientist-CSIR-IITR from 16.09.2008-15.09.2011
- Scientist-CSIR-IITR from 16.09.2011-15.09.2015
- Senior Scientist-CSIR-IITR from16.09.2015-15.09.2019
- Principal Scientist-CSIR-IITR from16.09.2019-till date

Research area:

Environmental Microbiology, Biotechnology & Toxicology

Current research interests:

- Bioremediation of industrial effluents for a sustainable environment
- Environmentally important microbial enzymes
- Lignin biodegradation and valorization
- Microplastic biodegradation
- Upcycling of solid waste
- Synthesis of biochar from waste sludge and its surface modification for agro-environ applications

Summary of research:

Dr. Abhay Raj is currently working as a Principal Scientist at CSIR-IITR, Lucknow, India. His research team is mainly focused on developing sustainable microbial processes for the effective treatment of industrial effluents, mainly from pulp & paper, distillery, tannery and textile industries. His team has mainly engaged in the screening and evaluation of bacterial strains for ligninolytic enzymes (LiP & Lac), basic mechanisms of treatment and changes in effluents toxicity after treatment. He is currently engaged in investigating and developing innovative methods for converting sewage and industrial sludge into biochar, with the intent of utilizing the resulting biochar for agricultural and environmental applications. He has published more than 60 research and review papers in SCI journals with a good impact factor (IF) on his research area. He has successfully completed seven major research projects funded by DSIR, DST-SERB, DBT, and CSIR, New Delhi, in which PI has characterized and identified a number of recalcitrant organic and inorganic pollutants and their metabolites by GC-MS/LC-MS, FT-IR analysis produced during the bacterial degradation and detoxification of distillery, tannery, textile, pulp & paper industry wastewaters. Besides it, Dr. Raj has also evaluated the toxicity of untreated and biologically treated industrial wastewater using terrestrial and aquatic test models for the safe disposal of wastewater into the environment and published the results in reputed International Journals. He has also published national and international book chapters and magazine articles. He has edited three international books on his research area. Presently, 3 Ph.D. students are working with Dr. Raj, and 6 students have completed their Ph.D. He is a life member of scientific organizations like American Society for Microbiology (ASM), the Association of Microbiologists of India (AMI), the Biotech Research Society of India (BRSI), and an active reviewer of various national & international reputed journals. Dr. Raj received a Raman Research fellowship from CSIR and worked 3 months with Professor Yong Sik Ok, a highly acclaimed and influential researcher (78,560 citations with an h-index of 145) at Korea University, Seoul, South Korea.

Awards

- Raman Research Fellowship (RRF) award-2022-2023 by the CSIR to work at Korea University, South Korea
- Young Environmentalist Award 2019 by the Agro-Environmental Development Society, Rampur, U.P.
- Best poster presentation Award-2019 in 2nd International Conference on recent advances in agricultural, Environmental & Applied Science for Global Development organized by Dr. YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh during 27-29 Sep. 2019.
- Best poster presentation Award-2018 in Bio-innovation for environmental and health sustainable developments (BEHSD-2018) organized by Biotech Research Society of India (BRSI) & CSIR-IITR Lucknow during 27-28 Nov. 2018.
- Research Grant for Yong Investigators-2014 by the Department of Biotechnology, Government of India.
- Second best poster presentation Award-2012 in the National Seminar on New Trends in Green Chemistry held at DAV College, CSJM University, Kanpur.

Membership of scientific society

- Association of Microbiologists of India (AMI), Life member
- American Society of Microbiology (ASM)
- Biotech Research Society of India (BRSI), Life member

Foreign visit:

- South Korea: Korea University Seoul under Raman Research Fellowship -2023 (3 months)
- South Korea: Korea University, Seoul, South Korea-2019 (5 days)
- China: Northwest A&F University, Yangling Shaanxi State, China-2018 (4 days)

Training organized under the Skill India development program

- Advance instrumentation for monitoring and analysis of environmental pollutants" from May 01-09, 2017 at CSIR-IITR.
- Basic and advanced tools in microbiology and molecular biology" from September 05-28, 2018 at CSIR-IITR.

Research projects

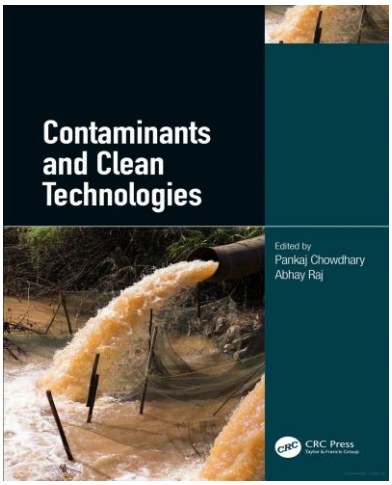
- Creation of DSIR-Common research and technology development hub (CRTDH) funded by the Department of Science and Industrial Research (DSIR), Govt. of India (2019-till date). **Co-investigator of activity**
- Development of application of laccase for diverse (Food Health & cosmetics) industries funded by CSIR as an FTT project (2019- 2021). **Principal Investigator**
- Studies on treatment efficacy improvement of existing tannery wastewater treatment system funded by the Science and Engineering Research Board (DST) Govt. of India (2018-2021). **Principal Investigator**
- Bioaugmentation of activated sludge for enhanced biodegradation of paper mill wastewater: An effort to restore river ecosystem funded by the Department of Biotechnology, Govt. of India (2017-2021). **Principal Investigator**
- Development of an improved biobleaching combination for application in the paper industry funded by the Department of Biotechnology, Govt. of India (2014-2017). **Principal Investigator**
- Development of a novel bioremediation technique by formulation of effective microbial consortia for detoxification of pulp and paper mill wastes funded by CSIR as a network project (2012-2017). **Principal Investigator**
- Characterization of air pollutants in cooking oil fumes and its impact on the respiratory health of Kitchen workers (2012-2017). **Co-investigator of activity**

Guidance of Ph.D. students

S. No.	Name	Thesis title	University	Enrolled Year
1	Anjali Singh	To study the antibiotic resistance in bacterial community growing in sewage treatment plant and its prevalence in riverine system.	BBD University, Lucknow	2021
2	Pooja Yadav	Bacterial degradation and toxicity evaluation of tannery effluent discharges after secondary treatment for environmental safety.	Amity University Lucknow	2020
3	Pradeep Kumar Singh	Studies on toxic effect of the tannery wastewater on histopathological and biochemical alterations in Swiss Mice	BBD University, Lucknow	2017
4	Annapurna Maurya	Studies on bacterial biofilm mediated bioremediation of tannery effluent for environmental safety.	AcSIR Ghaziabad	2017 (awarded 2023)
5	Rajesh Kumar	Studies on enhanced production of lignin peroxidase through molecular approach lignin degradation.	AcSIR Ghaziabad	2017 (awarded 2023)
6	Anil Kumar Singh	In silico approach to identify bacterial lignin peroxidase (LiP) for minimizing the toxic lignin level emerged from paper mills effluents.	AcSIR, Ghaziabad	2015 (awarded, 2022)
7	Sandeep Kumar	Genotoxic Effect of Tannery Wastewater and its Bioremediation.	BBD University, Lucknow	2015 (awarded 2023)
8	Sharad Kumar	Functional characterization of thermostable xylanase for toxicity reduction in pulp and paper industry wastes.	Amity University, Lucknow	2014 (awarded)
9	Izharul Haq	Bioremediation of pulp and paper mill effluent by ligninolytic bacteria.	Integral University, Lucknow	2014 (awarded)

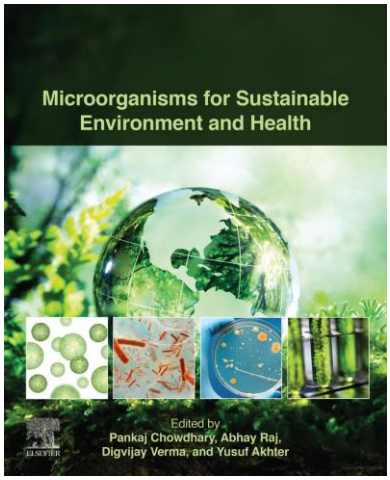
Books

1. **Contaminants and Clean Technologies**
   ISBN: 9780429275852
   Editors: Chowdhary P, Raj A
   Publisher: CRC Press
   Year: 2020

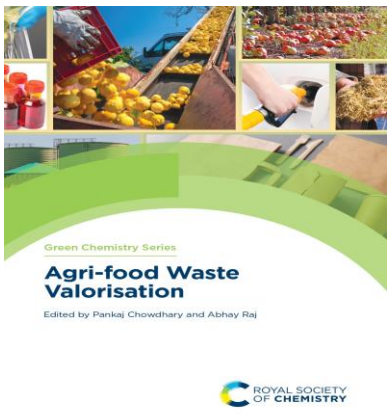


2. **Microorganisms for Sustainable Environment and Health**

   ISBN: 978-012-81-9004-3.
   Editors: Chowdhary P, Raj A, Verma D, Akhter Y
   Publisher: Elsevier Science
   Year: 2020



3. **Agri-food Waste Valorisation**
4. Editors: Chowdhary P, Raj A
5. Publisher: Royal Society of Chemistry (RSC)
6. Year: 2023 (in press)



Publications (63 nos.):

Citations: 3180; h-index:29; i-10 index:50 (as per 27/07/2023)

Google scholar link: https://scholar.google.co.in/citations?user=ll2C-pgAAAAJ&hl=en

Research papers published:

1. **Emerging technological solutions for the management of paper mill wastewater: Treatment, nutrient recovery and fourth industrial revolution (IR 4.0).**
   Kumar R, Maurya A & Raj, A.
   Journal of Water Process Engineering 2023, 53:103715 **(**Impact factor:7.0**)**
2. **Biofilm-based technology for industrial wastewater treatment: current technology, applications and future perspectives.**
   Maurya A, Kumar R & Raj A.
   World Journal of Microbiology and Biotechnology 2023, 39(5):112. (Impact factor:4.1)
3. **Characterization of tannery effluents by analyzing the recalcitrant organic pollutants and phytotoxicity assay.**
   Kumar S, Yadav A, Maurya A, Pratap SG, Singh PK & Raj, A.
   Journal of Applied Biology and Biotechnology 2022**,** 10(2): 91-99
4. **Isolation of functional ligninolytic *Bacillus aryabhattai* from paper mill sludge and its lignin degradation potential.**
   Singh A, Kumar R, Maurya A, Chowdhary P & Raj A
   Biotechnology Reports 2022, 35: e00755.
5. **Effective bioremediation of pulp and paper mill wastewater using *Bacillus cereus* as a possible kraft lignin-degrading bacterium.**
   Kumar R, Singh A, Maurya A, Yadav P, Yadav A, Chowdhary P & Raj A
   Bioresource Technology 2022, 352: 127076. (Impact factor:11.4)
6. **Biofilm formation and extracellular polymeric substance (EPS) production by *Bacillus haynesii* and influence of hexavalent chromium.**
   Maurya A, Kumar R, Yadav P, Singh A, Yadav A, Chowdhary P & Raj A
   Bioresource Technology 2022**,** 352: 127109. (Impact factor:11.4)
7. **Sustainable microalgal biomass production in food industry wastewater for low-cost biorefinery products: a review.**
   Ummalyma SB, Sirohi R, Udayan A, Yadav P, Raj A, Sim SJ & Pandey A.
   Phytochemistry Reviews 2022, 1-23. (Impact factor:7.7)
8. **In silico analytical toolset for predictive degradation and toxicity of hazardous pollutants in water sources.**
   Singh AK, Bilal M, Iqbal HM & Raj A
   Chemosphere 2022, 292:133250. (Impact factor:8.8)
9. **Synergistic role of bacterial consortium (RKS-AMP) for treatment of recalcitrant coloring pollutants of textile industry wastewater.**
   Kishor R, Raj A, Bharagava RN
   Journal of Water Process Engineering 2022, 47: 102700. (Impact factor:7.7)
10. **Detection and identification of hazardous organic pollutants from distillery wastewater by GC-MS analysis and its phytotoxicity and genotoxicity evaluation by using *Allium cepa* and *Cicer arietinum* L.**
    Chowdhary P, Singh A, Chandra R, Kumar PS, Raj A & Bharagava RN

Chemosphere 2022, 297: 134123. (Impact factor:8.8)

11. **Characterization of biofilm formation and reduction of hexavalent chromium by bacteria isolated from tannery sludge.**
    Maurya A, Kumar PS & Raj A
    Chemosphere 2022, 286:131795. (Impact factor:8.8)
12. **Preparation, characterization and agri applications of biochar produced by pyrolysis of sewage sludge at different temperatures.**
    Raj A, Yadav A, Arya S, Sirohi R, Kumar S, Rawat AP, Thakur RS, Patel DK, Lalbahadur &Pandey A (2021).
    Science of The Total Environment 2021, 795:148722. (Impact factor:9.8)
13. **Kinetic and thermodynamic investigations of sewage sludge biochar in removal of Remazol Brilliant Blue R dye from aqueous solution and evaluation of residual dyes cytotoxicity**.
    Raj A, Yadav A, Rawat AP, Singh AK, Kumar S, Pandey AK, Sirohi R & Pandey A.
    Environmental Technology and Innovation 2021, 23:101556. (Impact factor:7.1)
14. **A rapid and sensitive colorimetric method for the detection of cyanide ions in aqueous samples.**
    Rai PK, Mehrotra S, Raj A, Sharma SK (2021)
    Environmental Technology and Innovation, 24: 101973. (Impact factor:7.1)
15. **Investigation on biofilm formation activity of *Enterococcus faecium* under various physiological conditions and possible application in bioremediation of tannery effluent.**
    Maurya A, Kumar R, Singh A & Raj A
    Bioresource Technology 2021, 339:125586. (Impact factor:11.4)
16. **Decolourisation of textile dye by laccase: process evaluation and assessment of its degradation bioproducts.**
    Yadav A, Yadav P, Singh AK, Kumar V, Sonawane VC, Markandeya, Bharagava RN & Raj A . Bioresource Technology 2021, 340:125591. (Impact factor:11.4)
17. **Trends in predictive biodegradation for sustainable mitigation of environmental pollutants: Recent progress and future outlook.**
    Singh AK, Bilal M, Hafiz MNI & Raj A
    Science of The Total Environment 2021, 770:144561. (Impact factor:9.8)
18. **Lignin peroxidase in focus for catalytic elimination of contaminants-A critical review on recent progress and perspectives.**
    Singh AK, Bilal M, Hafiz MNI & Raj A
    International Journal of Biological Macromolecules 2021, 177:58-82. (Impact factor:8.025)
19. **Bioremediation of lignin derivatives and phenolics in wastewater with lignin modifying enzymes: Status, opportunities and challenges.**
    Singh AK, Bilal M, Hafiz MNI, Meyer AS and Raj A
    Science of The Total Environment 2021, 777:145988. (Impact factor:9.8)
20. **In silico exploration of lignin peroxidase for unraveling the degradation mechanism employing lignin model compounds.**
    Singh AK, Katari SK, Umamaheswari A & Raj A
    RSC Advances 2021, 11:14632–14653. (Impact factor: 4.036)
21. **Reduction of pollution load of tannery effluent by cell immobilization approach using *Ochrobactrum intermedium*.**
    Yadav P, Yadav A, Srivastava JK & Raj A.

Journal of Water Process Engineering 2021, 41:102059. (Impact factor: 7.7)

22. **Emerging and eco-friendly approaches for waste management: a book review.**
    Singh AK & Raj A
    Environmental Science Europe 2020, 32:107. (Impact factor: 5.481)
23. **Bacterial degradation of distillery wastewater pollutants and their metabolites characterization and its toxicity evaluation by using *Caenorhabditis elegans* as terrestrial test models.**
    Chowdhary P, Sammi SR, Pandey R, Kaithwas G, Raj A, Singh J & Bhargava RN
    Chemosphere 2020**,** 261:127689. (Impact factor: 8.8)
24. **Biotransformation and Cytotoxicity Evaluation of Kraft Lignin Degraded by Ligninolytic *Serratia liquefaciens*.**
    Singh AK, Yadav P, Bharagava RN, Saratale GD & Raj A
    Frontiers in Microbiology 2019, 10:2364. (Impact factor: 5.2)
25. **Phytotoxicity, cytotoxicity and genotoxicity evaluation of organic and inorganic pollutants rich tannery wastewater from a Common Effluent Treatment Plant (CETP) in Unnao district, India using *Vigna radiata* and *Allium cepa*.**
    Yadav A, Raj A, Purchase D, Ferreira LFR, Saratele, GD, Bharagava RN (2019)
    Chemosphere 2019, 224:324-332. (Impact factor: 8.8)
26. **Production and purification of xylanase from alkaliphilic *Bacillus licheniformis* and its pretreatment of eucalyptus kraft pulp.**
    Raj A, Kumar S, Singh SK & Prakash J
    Biocatalysis and Agricultural Biotechnology 2018**,** 15:199–209. (Impact factor: 0.636)
27. **Stress response of *Triticum aestivum* L. and *Brassica juncea* L. against heavy metals growing at distillery and tannery wastewater contaminated site**.
    Chowdhary P, Yadav A, Singh R, Chandra R, Singh DP, Raj A & Bharagava RN (2018)
    Chemosphere 2018**,** 206: 122-131. (Impact factor: 8.8)
28. **Biodegradation of Azure-B dye by Serratia liquefaciens and its validation by phytotoxicity, genotoxicity and cytotoxicity studies.**
    Haq I, Raj A & Markandeya
    Chemosphere 2018, 196: 58-68. (Impact factor: 8.8)
29. **Book Review: Environmental pollutants and their bioremediation approaches.**
    Chowdhary P, Hare V & Raj A
    Frontiers in Bioengineering and Biotechnology 2018. 6:193. (Impact factor: 5.890)
30. **Environmental pollution and health hazards from distillery wastewater and treatment approaches to combat the environmental threats: a review.**
    Chowdhary P, Raj A & Bharagava RN.
    Chemosphere 2018, 194: 229-246. (Impact factor: 8.8)
31. **Purification, characterization and thermostability improvement of xylanase from *Bacillus amyloliquefaciens* and its application in pre-bleaching of kraft pulp.**
    Kumar S, Haq I, Prakash J, Singh SK, Mishra S & Raj A
    3 Biotech 2017, 7: 20-31. (Impact factor: 2.893)
32. **Genotoxicity assessment of pulp and paper mill effluent before and after bacterial degradation using *Allium cepa* test**.
    Haq I, Kumar S, Raj A & Lohani M, Satyanarayana GNV
    Chemosphere 2017**,** 169: 642-650. (Impact factor: 8.8)

33. **Characterization and identification of bacterial pathogens from treated tannery wastewater.**
    Chowdhary P, More N, Raj A and Bharagava RN
    Microbiology Research International 2017**,** 5(3): 30-36. (Impact factor: 0.601)
34. **Improved enzyme properties upon glutaraldehyde cross-linking of alginate entrapped xylanase from *Bacillus licheniformis*.**
    Kumar S, Raj A, Haq I & Prakash J
    International Journal of Biological Macromolecules 2017, 98:24–33. (Impact factor: 8.025)
35. **Genotoxicity evaluation of tannery effluent treated with newly isolated hexavalent chromium reducing *Bacillus cereus*,**
    Kumari V, Yadav A, Haq I, Kumar S, Bharagava RN, Singh SK & Raj A
    Journal of Environmental Management 2016**,** 183: 204-211. (Impact factor: 8.91)
36. **Evaluation of RAPD Technique to induced DNA damage by heavy metal to detect the genotoxic effect on mung bean (*Vigna Radiata* (L.) Wilczek) seedlings.**
    Kumar S, Raj A, Prakash J, Kumar M & Shukla NK
    International Journal of Applied Research and Technology 2016**,** 1(1): 1-12.
37. **Immobilization and Biochemical Properties of Purified Xylanase from *Bacillus amyloliquefaciens* SK-3 and Its Application in Kraft Pulp Biobleaching**.
    Kumar S, Haq I, Yadav A, Prakash J & Raj A.
    Journal of Clinical Microbiology and Biochemical Technology 2016**,** 2(1): 26-34.
38. **Evaluation of the phytotoxic and genotoxic potential of pulp and paper mill effluent using *Vigna radiata* and *Allium cepa*.**
    Haq I, Kumari V, Kumar S, Raj A, Lohani M & Bhargava RN
    Advances in Biology 2016**,** Article ID 8065736, 10 pages.
39. **Evaluation of bioremediation potentiality of ligninolytic *Serratia liquefaciens* for detoxification of pulp and paper mill effluent.**
    Haq I, Kumar S, Kumari V, Singh SK & Raj A
    Journal of Hazardous Materials 2016**,** 305:190–199. (Impact factor: 14.224)
40. **Assessing hazardous risks of indoor airborne polycyclic aromatic hydrocarbons in the kitchen and its association with lung functions and urinary PAH metabolites in kitchen workers**. Singh A, Nair KC, Kamal R, Bihari V, Gupta MK, Mudiam MKR, Satyanarayana GNV, Raj A, Haq I, Shukla NK, Khan AH & Srivastava AK
    Clinica Chimica Acta 2016**,** 452: 204–213. (Impact factor: 6.315)
41. **Antimicrobial potential of few marine derived fungi against dermatophytes, moulds and fouling bacteria.**
    Bhosale SH., Chaudhari BP & Raj A
    World Journal of Pharmaceutical Sciences 2016**,** 4(4): 20-25. (Impact factor: 0.09)
42. **Microbial indicators, pathogens and methods for their monitoring in water environment: a review.**
    Saxena G, Bharagava RN, Kaithwas G & Raj A
    Journal of Water and Health 2014**,** 13(2): 319-339. (Impact factor: 2.264)
43. **Effect of tannery effluent toxicity on seed germination alpha-amylase activity and early seedling growth of mung bean *(Vigna radiata*) seeds.**
    Kumari V, Kumar S, Haq I, Yadav A, Singh VK, Ali Z and Raj A
    International Journal of Latest Research in Science and Technology 2014**,** 3 (4):165-170.

44. **Detection of tannery effluents induced DNA damage in mung bean by use of random amplified polymorphic DNA markers.**
    Raj A**,** Kumar S, Haq I & Kumar M
    ISRN Biotechnology 2014**,** Vol. Article ID 727623: 8 pages.
45. **Impact of tannery effluent in simulated condition on some physico-chemical characteristics of river water and its seasonal variation.**
    Singh VK, Ali Z & Raj A
    Journal of Applicable Chemistry 2014**,** 3 (2):776-782.
46. **Study of impact of tannery effluent on river water quality using *Vigna radiata* L. bioassay.**
    Singh VK, Ali Z and Raj A
    Research Journal of Chemistry and Environment 2014, 18(1):62-65.
47. **Modulatory effect of tannery effluents on physico-chemical quality of Ganga River water**. Singh VK, Ali Z & Raj A
    Chemical Science Transactions 2014**,** 3(1):73-78.
48. **Bioremediation and toxicity reduction in pulp and paper mill effluent by newly isolated ligninolytic *Paenibacillus* sp.**
    Raj A, Kumar S, Haq I & Singh SK
    Ecological Engineering 2014**,** 71:355-362. (Impact factor: 4.379)
49. **Detection of tannery effluents induced DNA damage in mung bean by use of random amplified polymorphic DNA markers.**
    Raj A**,** Kumar S, Haq I & Kumar M
    ISRN Biotechnology 2014**,** Article ID 727623: 8 pages.
50. **Characterization of a new *Providencia* sp. strain X1 producing multiple xylanases on Wheat Bran.**
    Raj A, Kumar S, Singh SK & Kumar M
    The Scientific World Journal 2013, Article ID 386769: 10 pages. (Impact factor: 0.398)
51. **A highly thermostable xylanase from *Stenotrophomonas maltophilia*: purification and partial characterization.**
    Raj A, Kumar S & Singh SK
    Enzyme Research 2013, Article ID 429305: 8 pages.
52. **Impact of tannery effluent in simulated condition on some physico-chemical parameters of river water.**
    Singh VK, Ali Z & Raj A
    ISST Journal of Applied Chemistry 2013**,** 4(2):39-41
53. **Studies of water quality: physico-chemical characteristics of Ganga River in Kanpur.**
    Singh VK, Ali Z, Raj A & Singh SK
    ISST Journal of Applied Chemistry 2012**,** 3(1):17-22.
54. **Antibiotic resistance, plasmid and RAPD profiles of multidrug-resistant coliform bacteria isolated from sewage samples of Ghaziabad City, India**.
    Raj A
    Universal Journal of Environmental Research and Technology 2012**,**12 (4): 1-7.
55. **Reduction of pollutants in pulp paper mill effluent treated by PCP-degrading bacterial strains.**
    Chandra R**,** Raj A**,** Yadav S & Patel DK
    Environmental Monitoring and Assessment 2009, 155: (1-4):1-11. (Impact factor: 3.307)

56. **Characterization and optimisation of three potential aerobic bacterial strains for Kraft lignin degradation from pulp paper waste**.
    Chandra R**,** Raj A**,** Purohit HJ & Kapley A.
    Chemosphere 2007**,** 67: 839-846. (Impact factor: 8.8)
57. **Identification of low molecular weight aromatic compounds by gas chromatography-mass spectrometry (GC-MS) from kraft lignin degradation by three *Bacillus* sp.**
    Raj A**,** Mudiam MKR & Chandra R
    International Biodeterioration and Biodegradation 2007, 59: 292-296. (Impact factor: 4.907)
58. **Decolourisation and treatment of pulp and paper mill effluent by lignin degrading *Bacillus* sp.**
    Raj A, Mudiam MKR & Chandra R
    Journal of Chemical Technology and Biotechnology 2007, 82: 399-406. (Impact factor: 3.709)
59. **Biodegradation of kraft lignin by newly isolated bacterial strain, *Aneurinibacillus aneurinilyticus* from sludge of a pulp paper mill**.
    Raj A**,** Chandra R, Mudiam MKR, Purohit HJ & Kapley A
    World Journal of Microbiology and Biotechnology 2007, 23: 793-799. (Impact factor: 4.1)
60. **Biodegradation of kraft-lignin by *Bacillus* sp. isolated from sludge of pulp and paper mill.**
    Raj A, Mudiam MKR, Chandra R, Purohit HJ & Kapley A
    Biodegradation 2007**,** 18(6): 783-792. (Impact factor: 3.731)
61. **Seasonal bacteriological analysis of Gola River water contaminated with pulp paper mill waste in Uttranchal, India.**
    Chandra R, Singh S & Raj A
    Environmental Monitoring &Assessment 2006. 188: 393-406. (Impact factor: 3.307)
62. **Physico-chemical characterization of pulp and paper mill effluent and toxicity assessment by a tubificid worm, *Tubifex tubifex*.**
    Raj A**,** Chandra R & Patel DK (2005)
    Toxicology International 2005**,** 12: 109-188. (Impact factor: 0.107)
63. **Comparative analysis of physico-chemical and bacteriological parameters of Kraft and pulp paper mill effluents.**
    Raj A & Chandra R (2004)
    Indian Journal of Environmental Protection 2004**,** 24: 481-489. (Impact factor: 0.137)

Book Chapters (09 nos.)

1. **Microbes and Environment: Recent Advancement in Environmental Biotechnology.**
   Chowdhary P, Mani S, Shukla P & Raj A
   Microbial Biotechnology: Role in Ecological Sustainability and Research
   Wiley Publishing, Germany, 2023, ISBN: 978111983445-8
2. **Bacterial degradation of emerging pollutants from paper industry wastewater**
   Kumar R& Raj A
   Current Developments in Biotechnology and Bioengineering
   Elsevier Science, 2022. ISBN:9780323919029.
3. **Toxicity evaluation of paper mill pollutants using In Silico toxicology approach for environmental safety.**

Singh AK & Raj A
Contaminants and Clean Technologies.
CRC Press, Taylor & Francis Group 2020. ISBN 9780367225995.

4. ***In silico* bioremediation strategies for removal of environmental pollutants released from paper mills using bacterial ligninolytic enzymes.**
   Singh AK & Raj A
   Microorganisms for sustainable in environment and health. Elsevier Singapore 2020. ISBN: 0128190019, 9780128190012.
5. **Recent advances in application of biofilm in bioremediation of industrial wastewater and organic pollutants.**
   Maurya A & Raj A
   Microorganisms for sustainable in environment and health. Elsevier Singapore 2020. ISBN: 0128190019, 9780128190012.
6. **Tannery wastewater: a major source of residual organic pollutants and pathogenic microbes and their treatment strategies**
   Yadav A, Yadav P, Raj A, Ferreira LFR, Saratale GD & Bharagava RN
   Microbes in Agriculture and Environmental Development
   CRC Press, 2020. ISBN: 9781003057819
7. **Pulp and paper mill wastewater: ecotoxicological effects and bioremediation approaches for environmental safety.**
   Haq I & Raj A
   Bioremediation of industrial waste for environmental safety. Volume II: Biological agents and methods for industrial waste management.
   Springer Nature Singapore 2019. ISBN: 978-981-13-1890-0
8. **Endocrine-disrupting Pollutants in industrial wastewater and their degradation & detoxification approaches.**
   Haq I and Raj A
   Emerging and Eco-friendly Approaches for Waste Management"
   Springer Nature Singapore, 2018. ISBN 978-981-13-4209-7
9. **Organic pollutants and pathogenic bacteria in tannery wastewater and their removal strategies.**
   Yadav A, Mishra S, Kaithwas G, Raj A & Bharagava RN
   Microbes and Environmental Management
   Studium Press (India) Pvt. Ltd. 2017, New Delhi. ISBN-10:9380012837

Conference presentation (36 nos.)

1. Singh A Zehra A, Anbumani S & Raj A. Assessment of pulp and paper mill effluent characteristics and its ecotoxicity to plant and fish. International conference on Biotechnology for resource efficiency, energy, environment, chemical and health (BRE3CH-2021) organized by Biotech Research Society of India at CSIR-Indian Institute of Petroleum, Dehradun, Uttarakhand during 1-4 Dec, 2021.
2. Kumar R & Raj A**.** Characterization and optimization of lignin peroxidase production by bacteria with possible industrial application. International Conference on Biotechnology for resource efficiency, energy, environment, chemical and health (BRE3CH-2021) organized by

Biotech Research Society of India at CSIR-Indian Institute of Petroleum Dehradun, Uttarakhand during 1-4 Dec, 2021.

3. Maurya A & Raj A. Characterization of extracellular polymeric substances associated with chromium reducing *Bacillus haynesii* and chromium bio-reduction process. International conference on Biotechnology for resource efficiency, energy, environment, chemical and health (BRE3CH-2021) organized by Biotech Research Society of India at CSIR-Indian Institute of Petroleum, Dehradun, Uttarakhand during 1-4 Dec, 2021.
4. Yadav P and Raj A**.** Bio-mitigation of pollutants from tannery effluent persist after secondary treatment. International conference on Biotechnology for resource efficiency, energy, environment, chemical and health (BRE3CH-2021) organized by Biotech Research Society of India at CSIR-Indian Institute of Petroleum, Dehradun, Uttarakhand during 1-4 Dec, 2021.
5. Raj A. Exploring sustainable approach towards biomitigation of paper industry effluent. International Conference on Biotechnology for resource efficiency, energy, environment, chemical and health (BRE3CH-2021) organized by Biotech Research Society of India at CSIR-Indian Institute of Petroleum, Dehradun, Uttarakhand during 1-4 Dec, 2021.
6. Maurya A, Kumar R, Singh A and Raj A**.** Investigation on biofilm formation activity of *Enterococcus faecium* under various physiological conditions. International Conference on Biotechnology for Sustainable Agriculture, Environment and Health will be organized by Biotech Research Society of India at Malaviya National Institute of Technology, Jaipur, Rajasthan, during 4- 8 April 2021
7. Yadav A and Raj A**.** Biodegradation of reactive blue 4 dye by fungal laccase: statistical optimization and characterization biodegraded products. International Conference on Biotechnology for Sustainable Agriculture, Environment and Health will be organized by Biotech Research Society of India at Malaviya National Institute of Technology, Jaipur, Rajasthan, during 4- 8 April 2021
8. Raj A, Yadav P and Yadav A. Decolorization and treatment of textile dye wastewater through adsorption on sewage sludge derived biochar. International Conference on Biotechnology for Sustainable Agriculture, Environment and Health will be organized by Biotech Research Society of India at Malaviya National Institute of Technology, Jaipur, Rajasthan, during 4- 8 April 2021.
9. Yadav P & Raj A**.** Reduction of pollution load of tannery effluent by cell immobilization approach using *Ochrobactrum intermedium*. International Conference on Biotechnology for Sustainable Agriculture, Environment and Health will be organized by Biotech Research Society of India at Malaviya National Institute of Technology, Jaipur, Rajasthan, during 4-8 April 2021.
10. Maurya A & Raj A. Bioremediation of chromium solutions and chromium-containing tannery effluent by a consortium of biofilm-forming bacteria. 2nd International conference on recent advances in agricultural, Environmental & Applied science for global development (RAAEASGD-2019) at Dr. YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, during 27-29 Sep. 2019.
11. Raj A. Ligninolytic Microbes: An eco-friendly tool for bioremediation of paper and paper mill effluent. Invited talk in 2nd International conference on recent advances in agricultural, Environmental & Applied science for global development (RAAEASGD-2019) at Dr. YS

Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, during 27-29 Sep. 2019.

12. Yadav A, Bharagava RN & Raj A**.** Detection and characterization of multi-drug and multi-metal resistant *Klebsiella pneumoniafrom* treated tannery wastewater. 2nd International conference on recent advances in agricultural, Environmental & Applied science for global development (RAAEASGD-2019) at Dr. YS Parmar University of Horticulture and Forestry, Solan, Himanchal Pradesh during 27-29 Sep. 2019.

13. Kumar R & Raj A. Screening of ligninolytic bacteria with lignin peroxidase activity for degradation of lignin and azo dye. 2nd International conference on recent advances in agricultural, Environmental & Applied science for global development (RAAEASGD-2019) at Dr. YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh during 27-29 Sep. 2019.

14. Singh A and Raj A. Isolation and characterization of lignin utilizing bacteria from activated sludge of paper mill and its ligninolytic activity assay. 2nd International conference on recent advances in agricultural, Environmental & Applied science for global development (RAAEASGD-2019) at Dr. YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh, during 27-29 Sep. 2019.

15. Maurya A, Yadav P & Raj A**.** Detection and quantification of biofilm-forming bacterial from sludge of CETP treating tannery wastewater. Poster presentation in Bio-innovation for environmental and health sustainable developments (BEHSD-2018) organized by Biotech Research Society of India at CSIR-Indian Institute of Toxicology Research, Lucknow during 27-28 Nov. 2018.

16. Singh AK and Raj A. In *silico* bioremediation approach using lignin peroxidase to minimizing environmental pollutants released from paper mill. Poster presentation in Bio-innovation for environmental and health sustainable developments (BEHSD-2018) organized by Biotech Research Society of India at CSIR-Indian Institute of Toxicology Research, Lucknow during 27-28 Nov. 2018.

17. Raj A & Kumar R (2018) Bacterial degradation of kraft lignin and its application in effluents decolorisation. Oral presentation in Bio-innovation for environmental and health sustainable developments (BEHSD-2018) organized by Biotech Research Society of India at CSIR-Indian Institute of Toxicology Research, Lucknow during 27-28 Nov. 2018.

18. Raj A. Biological approach for the bioremediation of pulp and paper industry wastewater using bacterial system. Oral presentation in International Conference on Biotechnological Research & Innovation for sustainable development (BioSD) of XV Annual Convention of the Biotech Research Society of India (BRSI) at CSIR-Indian Institute of Chemical Technology, Hyderabad, 22-25 Nov 2018.

19. Raj A. Strategies towards bioremediation of paper industry wastewater treatment. Oral presentation in 2018 Yangling International Agri-Science Forum on Ecological Agriculture: Green Quality & Efficiency at Northwest A&F University, Yangling Shaanxi State, China during 5-8 Nov. 2018.

20. Singh AK & Raj A**.** In *silico* identification of isolated potential of lignin-degrading bacterial species by 16S rRNA sequencing towards clean up toxic chlorolignin from the environment.

Poster presentation in International Toxicology Conclave (ITC)-2018 at CSIR-Indian Institute of Toxicology Research, Luckow during 2-3 Nov. 2018.

21. Yadav P and Raj A**.** Development of potential bacterial consortium for treatment of tannery wastewater. Poster presentation in International Toxicology Conclave (ITC)-2018 at CSIR-Indian Institute of Toxicology Research, Luckow during 2-3 Nov. 2018.

22. Haq I & Raj A**.** Biodegradation of Endocrine Disrupting Pollutants in Industrial Wastewater and Their Detoxification Approaches. Oral presentation in 4th India International Science Festival (IISF)-2018, organized by the Ministry of Science & Technology, Ministry of earth science and Vijana Bharti at Indira Gandhi Pratisthan, Lucknow, during 5-8 Oct 2018.

23. Singh AK & Raj A**.** In silico comparative analysis of ligninolytic enzymes for enzyme-ligand interaction of phenolic derivatives pollutants from paper mills. Poster presentation at the international conference on bioinformatics at Jawaharlal Nehru University, New Delhi during 26-28 Sep. 2018.

24. Raj A. Biodegradation of tannery effluent using immobilized cell of *Bacillus cereus* oral presentation in 58th Annual Conference of Association of Microbiologists of India (AMI2017) on International Symposium on "Microbes for Sustainable Development: Scope & Applications" (MSDSA-2017) at Babasaheb Bhimrao Ambedkar University, Lucknow during 16-19 Nov, 2017.

25. Haq I and Raj A & Chandra R. Biodegradation of Azure B dye by Serratia liquefaciens and its detoxification evaluation by phytotoxicity, genotoxicity and cytotoxicity studies. 58th Annual Conference of Association of Microbiologists of India on International Symposium on "Microbes for Sustainable Development: Scope & Applications" (MSDSA-2017) at Babasaheb Bhimrao Ambedkar University, Lucknow during 16-19 Nov, 2017.

26. Singh AK & Raj A. Modern Trends in Next Generation Sequencing for 16srRNA based Bacterial identification. 58th Annual Conference of Association of Microbiologists of India on International Symposium on "Microbes for Sustainable Development: Scope & Applications" (MSDSA-2017) at Babasaheb Bhimrao Ambedkar University, Lucknow during 16-19 Nov, 2017.

27. Raj A, Singh AK & Haq I. Detection and bioremediation of genotoxicity in effluent from paper industry. International Conference on Emerging Trends in Biotechnology for Waste Conversion (ICETBWC – 2017). CSIR-Natinal Environental Engineering Research Institute, Nagpur, during 8-10 Oct -2017.

28. Singh AK & Raj A. Exploration of Bacterial Derived Dyp type Peroxidase from structure to function. International Toxicology Conclave (ITC) at CSIR-Indian Institute of Toxicology Research, Luckow 2017 during 5-6 Nov 2017.

29. Haq I, Raj A & Lohani M. Biodegradation of pulp and paper mill effluent by lignin peroxidase producing *Serratia liquefaciens*. 2nd International Conference on new challenges in Biotechnology and molecular biology in the Context of 21st Century (NCBMBCC) organized by Indian Society of Genetics, Biotechnology Research and Development at St John's College Agra (UP), India during 27-29 Feb, 2016.

30. Prakash J, Kumar S, Awasthi G & Raj A. Evaluation of RAPD technique to induced DNA damage by heavy metals to detect the genotoxicity effect in mung beans seedling (*Vigna*

radiate L). 5th International Conference on Plant and Environmental Pollution (ICPEP-5) organized by the International Society of Environmental botanist at CSIR-National Botanical Research Institute, Lucknow (U.P.) during 24-27 Feb, 2015,

31. Haq I & Raj R**.** Isolation and characterization of laccase producing *Paenibacillus* sp. for bioremediation of pulp and paper mill effluent. 54th Annual Conference of AMI (Association of Microbiologists of India) during 17-20 Nov, 2013 at M.D. University, Rohtak Haryana.

32. Kumar S & Raj A. Detection of tannery effluents induced DNA damage in mung bean by use of random amplified polymorphic DNA markers. Microbes Promoting Crop Health held at CSIR-Central Institute of Medicinal and Aromatic Plant, Lucknow (U.P.) during 26-27 Oct, 2013.

33. Kumar S & Raj A**.** Isolation and characterization of a new *Providencia* sp. strain X1 producing multiple xylanases on wheat bran. 33rd Annual Conference of STOX held at College of Veterinary Science and Technology, DUVASU, Mathura (U.P.) during 23-25 Oct, 2013.

34. Kumar S, Kumar M & Raj A. Evaluation of genetic analysis of Escherichia coli isolated from two different environmental sources: sewage water versus soiled bedding materials of laboratory rodents. 32nd Annual Session of the Academy of Environmental Biology (AEB) and national seminar on emerging pollutants and pathogens: challenges and risk reduction (EPPCRR) held at CSIR-Indian Institute of Toxicology Research, Lucknow, during 20-22 Sep, 2012.

35. Raj A**,** Verma A & Chandra R. Thermophilic aerobic bacterium producing cellulose-free and thermoalkaloactive xylanase isolated from sawmill soil. National Seminar on New Trends in Green Chemistry held at CSJM University, Kanpur (U.P.) during, 14-15 Dec, 2010.

36. Chandra R, Raj A**,** Purohit HJ & Kapley A. Biodegradation of kraft lignin by three pure and mixed aerobic bacterial cultures isolated from pulp and paper sludge presented in "International Conference on Toxicology Environmental and Occupational Health"; held at CSIR-Indian Institute of Toxicology Research, Lucknow, during 14-17 Nov, 2005.

37. Raj A and Chandra R. Effect of 1st phase application of anaerobically treated distillery sludge on soil micro-flora and plant growth of *Phaseolus mungo* L. presented in "National symposium on Biodiversity, Biotechnology and Environmental Toxicology in the New Millennium" and 24th annual session of the Academy of Environmental Biology held at Mumbai University during 22-24 Nov, 2004.

Invited speaker

India:

38. International Conference on Biotechnology for Sustainable Agriculture, Environment and Health organized by BRSI-2021 at Malaviya National Institute of Technology, Jaipur, Rajasthan, during 4-8 April 2021.

39. International Conference on Biotechnology for resource efficiency, energy, environment, chemical and health (BRE3CH-2021) organized by BRSI-2021 at CSIR-IIP Dehradun, Uttarakhand during 1-4 DEC, 2021.

40. 2nd International conference on recent advances in agricultural, Environmental & Applied Science for global development (RAAEASGD-2019) organized by Agro-Environmental Development Society and in association with Dr. YS Parmar University of Horticulture and Forestry, Solan, Himachal Pradesh during 27-29 Sep. 2019.

41. National seminar on Biotechnology intervention in agriculture, health and industry at Gorakhpur University, Gorakhpur on 23-24th Feb, 2019.

42. International Conference on Bio-innovation for environmental and health sustainable developments (BEHSD-2018) organized by Biotech Research Society of India (BRSI) & CSIR-IITR Lucknow during 27-28 Nov. 2018

43. International Conference on Biotechnological Research & Innovation for sustainable development (BioSD) of XV Annual convention of the Biotech Research Society, India (BRSI) at CSIR-IICT, Hyderabad during 22-25 Nov 2018.

Abroad

44. IBI Biochar World Congress-2019. Korea University, Seoul, Korea, during Nov. 10-14, 2019

45. 2018-Yangling International Agri-Science Forum on Ecological Agriculture: Green Quality & Efficiency at Northwest A&F University, Yangling Shaanxi State, China during 5-8 Nov. 2018.

Guidance of M.Sc./MTech students (35 nos.)

S No	Name of the Person	Qualification	Place/ University	Duration
1	Namita Singh	M.Sc. (Microbiology)	SRM University Lucknow	Feb-May, 2022
2	Himani Jugvani	M.Sc. (Microbiology)	MDU Rohtak	July-Dec, 2021
3	Akansha Soni	M.Sc. (Environmental science)	BHU, Varanasi	Feb-June, 2021
4	Vivek Kumar	M.Sc. (Microbiology)	Dr. Shakuntla Mishra N&R University	Feb-June, 2019
5	Purnima Singh	M.Sc. (Microbiology)	Lucknow University	Jan-May, 2018
6	Sanjay hema Gauri Chitre	M.Sc. (Environ. Sc.)	Banasthali Vidyapith	Dec 2017-May, 2018
7	Aniruddha Kumar	M.Sc. (Microbiology)	Bundelkhand University	Feb-July,2017
8	Deepak Singh	M.Sc. (Microbiology)	Bundelkhand University	Feb-July, 2017
9	Subham Mishra	M.Sc. (Microbiology)	Bundelkhand University	Feb-July, 2017
10	Priya Chuahan	M.Sc. (Microbiology)	IFTM university	Jan-July, 2017
11	Priyanka Yadav	M.Sc. (Microbiology)	Bundelkhand University	Jan-June, 2016
12	Neha Pateria	M.Sc. (Microbiology)	Bundelkhand University	Jan-June, 2016
13	Romil Sharma	M.Sc. (Microbiology)	Gurukul Kangri University Haridwar	Jan-June, 2015
14	Anil Pandey	M.Sc. (Microbiology)	Bundelkhand University, Jhansi	Jan-June, 2015
15	Prashank Dixit	M.Sc. (Biotechnology)	CSJM University Kanpur	July-Oct, 2014

16	Suneel Kumar	M.Sc. (Biotechnology)	Dr. RML Avadh University, Faizabad	Feb-Jun, 2014
17	Abinash Dixit	M. Sc. (Biotechnology)	Bundelkhand University, Jhansi	Jan-Jun, 2013
18	Kalpna Verma	M. Sc. (Biotechnology)	Bundelkhand University, Jhansi	Jan-Jun, 2013
19	Abhay Singh	M. Sc. (Biotechnology)	Amity University, Lucknow	Jan-May, 2013
20	Ashutosh Yadav	M. Sc. (Microbiology)	Bundelkhand University, Jhansi	Feb-Jun, 2013
21	Ajay Kumar	M. Sc. (Microbiology)	CSJM University Kanpur	July-Sep, 2012
22	Gaurav Sharma	M. Sc. (Microbiology)	CSJM University Kanpur	July-Sep, 2012
23	Dipika Rai	M.Tech (Environ. Eng.)	Institute of Engineering & Technology, Lucknow	Jan-June, 2012
24	Akhilesh Ojha	M.Tech (Environ. Eng.)	Institute of Engineering & Technology, Lucknow	Jan-June, 2012
25	Praveen Kumar	M. Sc. (Microbiology)	Lucknow University	Jan-May, 2012
26	Ved Prakash Giri	M.Sc (Microbiology)	CSJM University Kanpur	Aug-Oct, 2011
27	Vivek K. Pandey	M.Sc (Microbiology)	CSJM University Kanpur	Aug-Oct, 2011
28	Rajesh Kumar	M.Sc.(Biotechnology)	CSJM University Kanpur	July-Sep, 2011
29	N. Neha Swamy	M.Sc (Microbiology)	Pt. Ravishanker Shukla University, Raipur	Jan-May,2011
30	Subhash Chandra	M.Sc (Env. Microbiology)	BBAU, Lucknow	Jan-May,2011
31	Ashish Verma	M.Sc (Microbiology)	CSJM, University, Kanpur	Aug-Nov, 2011
32	Rashmi Verma	M.Sc. (Biotechnology)	Banasthali University, Rajasthan	Jan-Jun, 2010
33	Gorakh Nath Singh	M.Sc. (Biochemistry)	AAI-DU, Allahabad	Jun-Sep, 2009
34	Mohit Naresh	M.Sc. (Medical Microbiology)	CCS University, Meerut	April-Oct,2009
35	Kamlesh Yadav	M.Sc. (Biotechnology)	Jiwa Ji University, Gwalior	Jan-March,2009

Abhay Raj