

Curriculum vitae of Professor L C Rai

Date of Birth	July 15, 1950
Marital Status	Married
Present Position	BHU Distinguished Professor (Lifelong) NASI Senior Scientist Formerly DAE Raja Ramanna Fellow & J C Bose National Fellow CAS in Botany, Institute of Science Banaras Hindu University, Varanasi- 221 005, India
Email.	lcrbhu15@gmail.com; lcrai@bhu.ac.in Cell:+919415-225821; Fax:+91-542-2368174
Education	B.Sc. 1971, Botany, Zoology, Chemistry Banaras Hindu University M.Sc. 1973, Botany, Banaras Hindu University Ph.D. 1976, Botany, Banaras Hindu University
Thesis Topic	Phycology of Polluted Waters
Post Doctoral Research	October 1988 to January 1989 Department of Biological Sciences The City University of New York, USA With Professors T.E. Jensen and J.W. Rachlin January 1989 to August 1989 R. M. Parsons Laboratory, Department of Civil Engineering Massachusetts Institute of Technology, USA With Professor François M. M. Morel, Director June 1996 to October, 1996 Institute of Biotechnology-3, Jülich, Germany With Professor Dr. C. J. Soeder, Director October 1997, Department of Biology & Microbiology University of Wisconsin Oshkosh, USA With Professor Dorothy L. Parker June 1998 to October, 1998 Institut für Chemie und Göesphere -6, Jülich, Germany With Professor Dr. C. J. Soeder & Dr. F.H. Mohn May, 1999 to July, 1999 Institut für Chemie und Göesphere -6, Jülich, Germany

Research Experience	With Professor Dr. C. J. Soeder & Dr. F.H. Mohn
Teaching Experience	46 Years 43 Years August 1977 to October 1979, Lecturer in Botany, North- Eastern Hill University, Shillong October 1979 to February 1987, Lecturer in Botany Banaras Hindu University, Varanasi February 1987 to January 1995, Reader in Botany Banaras Hindu University, Varanasi February 1995- June 2016, Professor of Botany Banaras Hindu University, Varanasi December 2016, BHU Distinguished Professor (Lifelong)
Awards and Honors	Merit Scholarship 1965-1967 INDO –US Fulbright Fellowship 1988- 1989 Career Award, University Grants Commission 1988-91 Guest Research Fellowship, Julich, Germany 1996, 98, 99 Pitamber Pant National Environment Fellowship Award, 1996 Visiting Professor University of Wisconsin, USA 1997 Visiting Professor Saitama University, Japan 2008, 2009 E.P.Odum Gold Medal International Society for Ecological Communications, 2009. Prof. C. N. R. Rao Education Foundation Award for Excellence in Science Research, 2009 J. C. Bose National Fellowship DST, New Delhi, 2010 Prof. R. N. Tandon Memorial Lecture Award, NASI Allahabad 2010 Prof. S. B. Saksena Memorial Medal, INSA, New Delhi, 2011. Prof. M. R. Goyal Award for Excellence in Cyanobacterial Research, 2013 INSA-DFG Bilateral Exchange visit to Rostock, Germany 2014 DAE Raja Ramanna Fellowship 2015 BHU Distinguished Professor (Life Long) December 14, 2016 Editor Proceedings National Academy of Sciences, India 2017 Prof. Shree Ranjan Memorial Lecture Award NASI Allahabad 2018 Elected Vice President NASI Allahabad, 2019
Fellowship of the Societies	Fellow, National Academy of Sciences, Allahabad, India Fellow, Indian National Science Academy, New Delhi India Fellow, National Academy of Agricultural Sciences, New Delhi Fellow, National Institute of Ecology, New Delhi, India Fellow, Institute of Environmental Engineers, New Delhi, India Fellow, Indian Botanical Society
Ph. D. Awarded	Thirty-four (34), 2 Ph. D.'s, & 2PDF currently working

Editor	Journal of Scientific Research, 1999-2010
Associate Editor	Journal of Integrated OMICS, since 2012
Editor	Journal of Current Microbiology since 2017
	Proceedings of National Academy of Sciences, Allahabad since 2018
Joint Coordinator	Industrial Microbiology 2000-2006
Coordinator	Industrial Microbiology 2007-2011
	Centre of Advanced Study in Botany 2011-2015
	Secretary NASI Local Chapter, 2000-2007
	Convener, INSA Local Chapter, 2012-2015
Membership in Societies	UGC expert for COSIST and SAP Program
	UGC expert for 10th Plan Visiting Committee
	Member, Ecosystem Research Project Advisory Committee, M.O.En, New Delhi, 2003-2007.
	Member, Environmental Research Committee, M.O.En, New Delhi, 2003-2007
	Member, PAC Plant Sciences, DST, New Delhi, 2004-2015
	Member, Technical Committee, National Institute of Biologicals, Noida 2005-2008
	Member, Biology Textbook Development Committee, NCERT, New Delhi, 2006
	Expert member Life Sciences, DST-FIST New Delhi since 2013
	Expert member DST- Ramanujan Fellowship since 2014
	Council member Asia Oceania Agricultural Proteomics Organization (AOAPO), Japan since 2014
	Member Steering Committee DST-SAIF since 2017
	Member Apex Council Prime Minister's Research Fellowship 2018
	Member Court & EC, Tripura University, Agartala
	Member Apex Council DST PURSE Since 2020
Conference Attended	Several Conferences in India,
	First International Conference on Metal Pollution in Lakes, Ontario, Canada, August 1988
	European Phycological Congress, Köln, Germany, 1996
Publications	Full Papers: 203
Book Authored/	1 — with Professor H. D. Kumar, F N A
Edited	1 — with Professors J. P. Gaur & C. J. Soeder
	2 — with Professor J. P. Gaur
International	Prof. C. J. Soeder, IBT-3, Julich, Germany, 1996-1999
Collaboration with	Prof. D.L. Parker, University of Wisconsin Oshkosh, USA, 1997-2000.
	Prof H. Nakamoto, Saitama University, Japan, 2007-2009.
	Prof. Martin Hageman University of Rostock, Germany 2014

Research Projects Ongoing

1. NASI Senior Scientist Platinum Jubilee Project **2020-2025**
2. Functional characterization of desiccation and/ or salinity stress induced hypothetical proteins from N₂-fixing cyanobacteria **NBAIM- ICAR 2017-2021.**
3. Molecular characterization of stress responsive hypothetical proteins Alr8073, Alr5059, Alr3014 and Alr3199 of diazotrophic cyanobacterium *Anabaena* sp. PCC 7120 **DST- 2018-2021**

LIST OF PUBLICATIONS OF PROFESSOR L. C. RAI

Books

Rai, L.C. and Gaur J.P. (eds.) (2006) Invasive Alien Species and Biodiversity in India: Proceedings of the Workshop held in Botany Department B.H.U p. 206

Rai, L.C. and Gaur J.P. (eds.) (2001) Algal Adaptation to Environmental Stresses: Physiological, Biochemical and Molecular Mechanisms. Springer-Verlag, Heidelberg, Germany, p.421.

Rai, L. C. Gaur, J. P. and Soeder, C. J. (eds.) (1994) Algae and Water Pollution. E. Schweitzerbart'sche, Verlagsbuchhandlung, Stuttgart, Germany, p. 304.

Kumar, H. D. and Rai, L. C. (1986) Microbes and Microbial Processes. Affiliated East West Press, New Delhi, pp. 213

Full Papers: 203

203: Rai, R., Singh, S., Rai, K.K., Raj, A., Srivastava, S., and Rai, L.C. (2021). Regulation of antioxidant defense and glyoxalase systems in cyanobacteria. *Plant Physiology and Biochemistry*. 168: 353-372

202. Pandey S., Awasthee N., Shekher, A., Rai, L.C., Gupta, S.C., and Dubey S. K. (2021). Biogenic synthesis and characterization of selenium nanoparticles and their applications with special reference to antibacterial, antioxidant, anticancer and photocatalytic activity. *Bioprocess & Biosystems Bioengineering*. <https://doi.org/10.1007/s00449-021-02637-0>

201. Rai R., Rai, K.K. Singh S., Raj A. and Rai, L C (2020). Stress responsive protein and signal transduction in cyanobacteria. *In* Rastogi R. et al. (Eds). *Ecophysiology and Biochemistry of Cyanobacteria*. Rastogi R.P. et.al. (Eds) Springer Nature (In press).

200. Yadav, S., Centola, M., Yildiz, Ö., Pogoryelov D., Rai L.C., & Schleiff, E. (2020). The two-domain cyclophilin family protein anaCyp40 of *Anabaena* sp. regulates photosystem assembly and phycobilisome association. *Nature Communication* (Revised MS submitted)

199. Yadav, S., Centola, M., Yildiz, Ö., Pogoryelov D., Rai L.C., & Schleiff, E. (2020). Purification and X-ray crystallographic analysis of the Peptidyl-prolyl cis-trans isomerase Alr5059 from *Anabaena* sp. PCC 7120. Crystallography Reports 65(7), 1226-1230.
198. Rai, R., Singh, S., Chatterjee, A., Rai, K. K., Rai, S., and Rai, L. C. (2020) All4894 encoding a novel fasciclin (FAS-1 domain) protein of *Anabaena* sp. PCC7120 revealed the presence of a thermostable β -glucosidase. Algal Research 51:102036
197. Chatterjee, A., Singh, S. Rai, R., Rai, S. and Rai, L.C. (2020) Functional characterization of Alr0765 a hypothetical protein from *Anabaena* sp. PCC 7120 involved in cellular energy status sensing, iron acquisition and abiotic stress management in *E.coli* using molecular, biochemical and computational approaches. Current Genomics 20: 1-16
196. Kumar A., and Rai L. C. (2020) Soil organic carbon and availability of soil phosphorus regulate abundance of culturable phosphate solubilizing bacteria in paddy fields of the Indo-Gangetic Plain. Pedosphere: 30: 405–413
- 195 Kumari, N., Rai, L.C., 2020. Cyanobacterial Diversity: Molecular Insights Under Multifarious Environmental Conditions. In: Singh, P.K. et al. (Eds.), Advances in Cyanobacterial Biology, Academic Press Elsevier, USA, pp. 17-33.
194. Rai, S. Rai, R., Singh P K and Rai, L. C. (2019). Alr2321, a multiple stress inducible glyoxalase I of *Anabaena* sp. PCC7120 detoxifies methylglyoxal and reactive species oxygen. Aquatic Toxicology 214. 105238
193. Rai R. and L.C. Rai (2019). Proteomics reveals acclimation strategies towards abiotic stress management in *Anabaena* spp. Mini Review. AOAPO News Letter, Japan
192. Rai, S., Yadav, S., Rai, R., Chatterjee, A., Singh, S. and Rai, L C. (2019). Biochemical and Molecular characterization of All0580 a novel type II glyoxalase of *Anabaena* sp. PCC 7120 that confers abiotic stress tolerance in *E. coli* Internatl. J. Macromol.124: 981-993
191. Sen, S., Rai, R. Chatterjee A., Rai, S., Yadav S., Agrawal C. and Rai, L C (2019) Molecular Characterization of two novel proteins All1122 and Alr0750 of *Anabaena* PCC 7120 conferring tolerance to multiple abiotic stresses in *Escherichia coli*. GENE :685:230-241
190. Chatterjee, A., Shankar, A. Singh, S. Keshari V. Rai, R., Patel, A. and .Rai, L C.(2018). Beneficial microorganisms and abiotic stress tolerance. Hasanuzzaman et al. (eds).471-499 Francis and Taylor

189. Rai, R., Singh, S. Rai, S., Shankar, A., Chatterjee, A. and .Rai, L. C. (2018). Abiotic stress mediated oxidative damage in plants: An overview Hasnuzzaman, M.et. al. (eds). 225-250. CRC Press
188. Chaterjee, A. Singh, S..Agrawal C.,Yadava S. Rai, R. and Rai, L. C. (2017) Role of Algae as Biofertilizer p. 189-201 in “*Algal Green Chemistry: Recent Progress in Biotechnology*” (eds). Rastogi, R. P. Madamwar, D. & Pandey. A. Elsevier, USA
187. Rai, R., Singh S., Yadav, S., Chatterjee A.. Rai, S. Shankar A. and.Rai L.C (2017) Impact of UV-B radiation on photosynthesis and productivity of crop. In “Environment and Photosynthesis: A Future Prospect” (eds) Singh V.P. et al. Studium Press, USA
186. Yadav, S. Shankar, A. Rai, S. Rai, R. Singh, S. and Rai L.C. (2017). Chlorophyll fluorescence and photosynthesis under abiotic stress. In “Environment and Photosynthesis: A Future Prospect” (eds) Singh V.P. et al. Studium Press, USA
185. Kumar A., and Rai L.C. (2017) Organic carbon and nitrogen availability determine bacterial community composition in paddy fields of the Indo-Gangetic Plain. 3Biotech doi: 10.1007/s13205-017-0810-x.
184. Rai, R. and Rai, L.C. (2017). UV-B Induced Effects and Repair Mechanism in Aquatic Cyanobacteria. Fish & Ocean Opj. 1: 1-3.
183. Yadav S, Rai, S. Rai R, Shankar A, Singh S. and. Rai, L.C (2017). Cyanobacteria: Role in agriculture, environment sustainability, biotechnological potential and agro-ecological impact. (ed). D.P. Singh “Plant-microbe interaction” 978-981-10-6592-7, 428646_1_En, (10) Springer, USA
182. Yadav S, Rai, R, Shrivastava A K, Singh P K, Sen S, Chatterjee A, Rai S, Singh S. and. Rai L.C (2017). Cyanobacterial Biodiversity and Biotechnology: A promising approach for crop improvement: (eds): Ram Prasad, Sarvajeet Singh Gill & Narendra Tuteja “Crop Improvement through Microbial Biotechnology” Elsevier, USA.
181. Agrawal C. Yadav S., Rai S.,Chatterjee, A..Sen, S. Rai, R. and Rai, L.C. (2017). Identification and functional characterisation of four novel aldo/keto reductases in *Anabaena* sp. PCC 7120 by integrating wet lab with in silico approaches. Functional and Integrative Genomics: 17: 413-425
180. Sen S. Rai, S. Yadav S. Agrawal C. Rai, R., Chatterjee A. and Rai L. C. (2017). Dehydration and rehydration-induced temporal changes in cytosolic and membrane proteome of the nitrogen-fixing cyanobacterium *Anabaena* sp. PCC7120. Algal Research 27: 244-258
179. Mishra,Y., Hall, M., Locmelis R., Nam, K., .Söderberg A.G.C, Storm, P. Chaurasia,N., Rai, L.C., Jansson, S., Schröder, W.P. and Sauer U. H (2017). Active-site plasticity revealed in the

asymmetric dimer of AnPrx6 the 1-Cys peroxiredoxin and molecular chaperone from *Anabaena* sp. PCC 7120. Scientific Reports | 7: 17151 | DOI:10.1038/s41598-017-17044-3

178. Singh P.K, Shrivastava A K, Singh S, Chatterjee A and Rai, L.C. (2017).Alr2954 of *Anabaena* sp. PCC 7120 with ADP-ribose pyrophosphatase activity bestows abiotic stress tolerance in *Escherichia coli*. Functional & Integrative Genomics: 17:39–52

177. Chaurasia, N., Mishra, Y. Yadava S. Rai, R.and Rai L.C. (2017). Overexpression of phytochelatase (pcs) enhances abiotic stress tolerance by altering the proteome of transformed *Anabaena* sp. PCC 7120. Protoplasma 254: 1715-1724

176. Chatterjee,A., Shrivastava,A.K., Sen S., Rai, S. Yadav S.and Rai L C. (2016) UVR8 Signaling mechanism and integration with other pathways . Singh V.P. Singh S. Prasad S M and Parihar P (Eds) Mapping UV-B research from past to recent advancements ISBN:978-1-119-14360-4; Vol. 1 pp 289-308. John Wiley & Sons. Chichester,West Sussex, U.K.

175. Yadav S.,Shrivastava,A.K.,Agrawal C.,Sen S.,Chatterjee,A., Rai,S. and Rai L C. (2016) Impact of UV-B exposure on phytochrome and photosynthetic machinery: From Cyanobacteria to Plants. Singh V.P. Singh S. Prasad S M and Parihar P (Eds) Mapping UV-B research from past to recent advancements ISBN:978-1-119-14360-4; Vol. 1 pp 259-278. John Wiley & Sons. Chichester, West Sussex, U.K.

174. Shrivastava A. K., Pandey S, Dietz, Karl J; Singh P K, Singh, S., Rai R. and Rai L. C. (2016). Over expression of AhpC enhances stress tolerance and N₂-fixation in *Anabaena* by upregulating stress responsive genes. Biochemica et Biophysica Acta 1860: 2576-2588

173. Shrivastava A. K., Pandey, S, Yadav, S. Mishra Y.,Singh, P.K., Rai, R. Singh, S..and Rai L.C.(2016) Comparative proteomics of wild type, An+ahpC and AnΔahpC strains of *Anabaena* sp. PCC7120 demonstrates AhpC mediated augmentation of photosynthesis, N₂-fixation and modulation of regulatory network of antioxidative proteins J. Proteomics 140: 81–99

172. Narayan, O.P. Bhargava P., Kumari N, Rajaram H. and Rai, L.C. (2016) A single gene all3940 (Dps) overexpression in *Anabaena* sp. PCC 7120 confers multiple abiotic stress tolerance via proteomic alterations.Functional & Integrative Genomics: 16:67-78.

171. Agrawal, C. Sen, S.Yadav, S. Rai,S, and Rai L C. (2015) A Novel Aldo-Keto Reductase (AKR17A1) of *Anabaena* sp. PCC 7120 Degrades the Rice Field Herbicide Butachlor and Confers Tolerance to Abiotic Stresses in *E. coli*. PLOS ONE: 10(9): e0137744

170.Sen S., Agrawal C., Mishra Y., Rai S., Chatterjee A., Yadav S., Singh S., Rai L.C (2015) Exploring the membrane proteome of the diazotropic cyanobacterium *Anabaena* PCC7120 through gel-based proteomics and in silico approaches. J. Proteomics 127: 161–168.

169. Singh P K, Shrivastava A K, Chatterjee A, Pandey, S, Rai, S, Singh, S. and Rai, L C (2015). Cadmium toxicity in diazotrophic *Anabaena* spp. adjudged by hasty up-accumulation of transporter and signaling and severe down-accumulation of nitrogen metabolism protein. *J. Proteomics* 127: 134–146.
168. Shrivastava A. K, Chatterjee A. Yadava, S., Singh P K; Singh, S and Rai, L C (2015). UV-B stress induced metabolic rearrangements explored with comparative proteomics in three *Anabaena* species. *J. Proteomics*: 127: 122–133.
167. Shrivastava, A.K. Singh, S. Singh P K, Pandey S and Rai, L C (2015). A novel alkyl hydroperoxidase (AhpD) of *Anabaena* PCC7120 confers abiotic stress tolerance in *Escherichia coli*. *Functional & Integrative Genomics* 15:77–92
166. Agrawal, C., Sen, S., Chatterjee A., Rai, S. Yadava, S. Singh, S. and Rai, L.C. (2015). Signal perception and mechanism of salt toxicity/ tolerance in photosynthetic organisms: Cyanobacteria to plants. *In* Tripathi, B.M, and Maria M. (Eds): *Stress Responses in Plants: Mechanism of Toxicity & Tolerance*. Springer, Heidelberg. Pp.79-113.
165. Kumar A. and Rai, L. C.(2015) Proteomic and biochemical basis for enhanced growth yield of *Enterobacter* sp. LCR1 on insoluble phosphate medium. *Microbiological Research*, 170 :195-204
164. Mishra S., Bhargava P., Adhikary S.P. and Rai L.C (2015). Weighted morphology: A new approach towards phylogenetic assessment of Nostocales (Cyanobacteria). *Protoplasma*. 252:145-63
165. Pandey, S., Rai, R. And Rai, L C (2014). Biochemical and molecular basis of arsenic toxicity and tolerance in microbes and plants. *In* SJS Flora (Ed.) *Hand Book of Arsenic Toxicity*, Elsevier/ Academic Press USA pp. 629-675.
162. Rai, S., Agrawal, C., Shrivastava, A. K. Singh, P. K., and Rai, L. C. (2014) Comparative proteomics unveils cross species variations in *Anabaena* under salt stress *Journal of Proteomics*. 98: 254–270
161. Agrawal, C., Sen, S., Singh S., Rai, S., Singh P. K., Singh, V.K. and Rai, L.C. (2014). Comparative proteomics reveals association of early responsive protein in conferring butachlor tolerance in N₂-fixing cyanobacterium *Anabaena*. *Journal of Proteomics* 96: 271–290
160. Rai, S., Singh, S., Shrivastava, A. K. and Rai L. C. (2013) Salt and UV-B induced changes in *Anabaena* sp. PCC 7120: Physiological, Proteomic and Bioinformatic Perspectives. *Photosynthesis Research*: 118:105–114.

159. Pandey S., Shrivastava A. K., Rai R. and Rai L.C.(2013). Molecular characterization of Alr1105 a novel arsenate reductase of the diazotrophic cyanobacterium *Anabaena* sp. PCC 7120 and decoding its roles in abiotic stress management in *Escherichia coli*. Plant Molecular Biology 83:417–432
158. Pandey S., Shrivastava A.K., Singh V. K., Rai R., Singh P.K., Rai S. and Rai L.C.(2013). A new arsenate reductase involved in arsenic detoxification in *Anabaena* PCC7120 Functional and Integrative Genomics. 13: 43-55.
157. Shrivastava, A. K., Pandey, S., Singh, P.K., Rai, S. and Rai, L.C. (2012) *alr0882* a hypothetical protein of *Anabaena* PCC 7120 protects *E. coli* from nutrient starvation and abiotic stresses. GENE 511: 248-255.
156. Singh P.K., Rai, S. Pandey S., Agrawal C.,Shrivastava, A K. Kumar,S. and Rai L C. (2012). Cadmium and UV-B induced changes in proteome and some biochemical attributes of *Anabaeana* PCC 7120. Phykos 42: 39-50.
155. Hudek L., Rai S., Michalczyk A., Rai L. C., Neilan B. A. and Ackland M. L. (2012) Physiological metal uptake by *Nostoc punctiforme*. Biometals 25: 893-903.
154. Rai, S., Pandey S.,Srivastava, A.K.,Singh P.K. and Rai, L.C. (2012).Probing interactive protein network in the cyanobacterium *Anabaeana* PCC 7120 under salt and UV-B using proteomics and biochemical approaches. Proceedings Frontiers in Agricultural Proteomics 108-120.
153. Pandey, S. Rai, Rashmi and Rai, L. C. (2012).Proteomics combines morphological, physiological and biochemical attributes to unravel the survival strategy of *Anabaena* sp.PCC 7120 under arsenic stress. Journal of Proteomics.75: 921-937.
152. Rai,S., Pandey S.,Shrivastava, A.K.,Singh P.K. and Rai, L.C.(2012) Understanding the mechanism of abiotic stress management in cyanobacteria with special reference to proteomics. In Srivastava, A.K., Rai, A.N. and Neilan, B. (eds). Stress Biology of Cyanobacteria:Molecular Mechanisms to Cellular Responses. 93-112. CRC Press/ Taylor and Francis, USA
151. Kumari, N. Narayan, O.P. and Rai, L. C. (2012). Butachlor-induced cyanobacterial diversity shift in selected Indian paddy fields as assessed by 16S rRNA-PCR and DGGE analyses Journal of Microbiology & Biotechnology 22:1-12.
150. Kumari N, Singh V.K., Narayan O.P. and Rai, L.C. (2011).Toxicity of butachlor assessed by molecular docking to NusB and GroES protein. Online J Bioinformatics 12: 289-303.
149. Mishra Y., Hall, M., Chaurasia, N., Rai, L.C., Jansson, S., Schroeder, W.P. and Sauer, U. H. (2011). Expression, purification, crystallization and preliminary X-ray crystallographic

studies of alkyl hydroperoxide-reductase (AhpC) from the cyanobacterium *Anabaena* sp. PCC 7120. Acta Crystallgr Sect F Structural Biology and Crystallization Communications.

148. Narayan, O.P., Kumari, N. and Rai, L.C. (2011) Proteomic changes under long term iron starvation in *Anabaena* (*Nostoc*) sp.PCC 7120: Exploring survival strategy. Journal of Microbiology and Biotechnology: 21, 136-146.

147. Kumar A, Bhargava, P. and Rai, L.C. (2010). Isolation and molecular characterization of phosphate solubilising *Enterobacter* and *Exiguobacterium* species from paddy fields of Eastern Uttar Pradesh, India. African Journal of Microbiology 4: 820-829

146. Mishra, Y. Bhargava, P. Chaurasia, N., Narayan, O.P., Kumari, N. and Rai, L.C. (2010). Cyanobacterial Proteomics- Protocol II: Alternatives to Gel Electrophoresis and Methods of Protein Identification. In **Protocols on Algal and Cyanobacterial Research** (eds.) Bagchi, S.N., Kleiner, D. Mohanty P. 129-137. Narosa Publishing House, New Delhi

145. Mishra, Y. Bhargava, P. Chaurasia, N., Narayan, O.P., Kumari, N. and Rai, L.C. (2010). Protocol for Cyanobacterial Proteomics I. In **Protocols on Algal and Cyanobacterial Research** (eds.) Bagchi, S.N., Kleiner, D. Mohanty P. 113-128. Narosa Publishing House, New Delhi.

144. Narayan, O.P., Kumari, N. and Rai, L.C. (2010) Heterologous expression of *Anabaena* PCC 7120 *all3940* (a Dps family gene) protects *Escherichia coli* from nutrient limitation and abiotic stresses. Biochemical Biophysical Research Communications 394: 163–169

143. Kumari N., Narayan O.P and Rai, L.C. (2009). Understanding butachlor toxicity in *Aulosira fertilissima* using physiological, biochemical and proteomic approaches. Chemosphere. 77: 1501-1507.

142. Kumari, N., Srivastava, A.K., Bhargava, P., and Rai, L.C. (2009). Molecular approaches towards assessment of cyanobacterial biodiversity. African Journal of Biotechnology 18: 4284-4298

141. Mishra, S., Bhargava, P., Mishra, Y. Rai, R., Zotta T., Parente, E. and Rai, L. C. (2009). Protein fingerprinting may serve as a complementary tool for the phylogenetic classification of heterocystous (*Nostoc*, *Anabaena*, *Cylindrospermum*, *Aulosira* and *Tolypothrix*) Cyanobacteria. The Internet Journal of Microbiology: 7; 2.

140. Mishra, Y., Bhargava P., Chaurasia, N. and Rai, L.C. (2009). Proteomic evaluation of non-survival of *Anabaena doliolum* (Cyanophyta) at elevated temperatures. European Journal of Phycology: 44: 551-565.

139. Srivastava, A. K., Bhargava, P. Kumar, A., Rai, L.C. and Neilan B.A. (2009). Molecular characterization and the effect of salinity on cyanobacterial diversity in the rice fields of Eastern Uttar Pradesh, India. Saline Systems 5: 4 doi: 10.1186/1746-1448-5-4

138. Srivastava, A.K., Bhargava, P., Thaper R., and Rai, L.C. (2009). Differential response of antioxidative defense system of *Anabaena doliolum* under arsenite and arsenate stress. *Journal of Basic Microbiology*. 49: 1-10.
137. Mishra, Y., Chaurasia, N. and Rai, L.C. (2009) *AhpC* (alkylhydroperoxide reductase) from *Anabaena* sp. PCC 7120 protects *Escherichia coli* cells from multiple abiotic stresses. *Biochemical Biophysical Research Communications*. 381: 606-611.
136. Mishra Y., Chaurasia, N. and Rai, L.C. (2009). Heat pre-treatment alleviates UV-B toxicity in the cyanobacterium *Anabaena doliolum*: a proteomic analysis of cross tolerance. *Photochemistry and Photobiology*. 85: 824–833
135. Hudek L., Rai, L.C., Freestone D., Michalczyk, A., Gibson, M. and Ackland, M.L. (2009). Bioinformatic and Expression analyses of genes mediating zinc homeostasis in *Nostoc punctiforme*. *Applied & Environmental Microbiology* 75 784-791.
134. Sakthivel, K., Rai, L.,C. and Nakamoto, H. (2008). Role of small heat shock protein and DNA-binding protein from starved cells, Dps, in oxidative stress management. *Current Topics in Biochemical Research* 10: 79-86.
133. Chaurasia, N.,Mishra, Y. and Rai, L.C. (2008) Cloning, expression and analysis of phytochelatin synthase (pcs) gene from *Anabaena* sp. PCC 7120 in offering multiple stress tolerance in *Escherichia coli*. *Biochemical and Biophysical Research Communications* 376:225-230
132. Mishra, Y.,Bhargava, P.,Thapar, R., Srivastava, A.K., and Rai. L. C. (2008). A comparative study of antioxidative defense system in copper and temperature acclimated strains of *Anabaena doliolum*. *World J. Microbiology & Biotechnology*:24: 2997-3004.
131. Bhargava P., Kumar, A., Mishra, Y. and Rai, L.C. (2008). Copper pretreatment augments ultraviolet B toxicity in the cyanobacterium *Anabaena doliolum*: A proteomic analysis of cell death. *Functional Plant Biology*. 35: 360-372.
130. Srivastava, A.K., Bhargava P., Thapar R. and Rai, L.C. (2008) Salinity-induced glycolate metabolism in *Anabaena doliolum*: A physiological and homology based proteomic study. *Environmental Experimental Botany*: 64: 49–57.
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