Curriculum vitae

DR. RICHA NAGAR

(Chancellor's Gold medallist)
Assistant Professor-II
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PUBLIC PROFILE (GOOGLE SCHOLAR): http://scholar.google.co.in/citations?user=k_aLPwgAAAAJ&hl=en

Citations: 353	h-index: 10	i10-index: 10

Summary:

Environmental Teacher and researcher with 8 years of teaching and 11(8+3) years of research experience.

Core competencies:

- ✓ Have worked thoroughly on toxicological risk evaluation of heavy metals.
- ✓ Models development for various parameters of environment.
- ✓ Looking after QMS and EMS as Internal auditor of Amity University.
- ✓ Trained in ISO 9001:2015 & ISO 14001:2015.
- ✓ Perform Environmental analysis, aspect – impact analysis as well as Cost Benefit Analysis and Life Cycle Analysis for toxicants in environmental management systems.
- ✓ Curriculum development, Academic co-ordination and research guidance as well as organizing workshops

Teaching Experience: (8 Yrs)

Working as Assistant Professor-II at Amity Institute of Environmental Sciences, Amity University, Sector 125, Noida since July 2011. I have been taking classes of M.Sc. Environmental Sciences, B.Sc. Environmental Sciences and M. Tech. Environmental Engineering as well as compulsory environmental studies course in various bachelor programmes.

Specializations and Taught courses: Environmental Management Systems, Pollution abatement technologies, Climate Change, Environmental Biostatistics and modeling, Models applicable for Environmental Health Management, Ecotoxicology, Bioremediation, Environmental Microbiology and Biotechnology, Environmental Zoology, Earth and Environment.

Administrative responsibilities: I have a thorough experience of all academic and administrative activities of and Environment Institution like- Curriculum development, Time tabling, M.Sc. programme leadership for running batch, co-ordinating course faculties, Quality assessment and enhancement, accreditations, online publishing of classes and programme management, laboratory management, library management, coordinating co-curricular and extra-curricular activities, examinations, Organizing workshops and have been **MC (Anchor)** in most of the functions and workshops of the Institute.

Research Expertise:

Current Progressing Research:

My research involves all aspects of Environmental Management of stress and toxicity analysis. Current research areas include:

- ✓ The effect of plant extracts on cancer/ toxicities caused by arsenic.
- ✓ Pesticides accumulation and effect on plants.
- ✓ Impacts on roadside plants due to air pollution in Noida region.
- ✓ Modeling the spread and socio-economic-health impact of groundwater arsenic contamination in India : future scenarios.

Ph.D. Guidance:

Currently guiding 2 full time and 2 part time research scholars Under Topics:

- ✓ "To study arsenic induced oxidative stress in cell line as modulated by natural plant extracts eugenol, paeonol and paeonol oxime.";
- ✓ "Screening of eco-friendly natural compound as acetylcholinesterase inhibitor for alzheimer disease treatment";
- ✓ "Accumulation and translocation of various pesticides and heavy metals in food crops grown in Ghaziabad district"; one yet to be decided.

Ph.D. Work:

My Ph.D. thesis is on the Topic **"Biochemical Responses In Rice (Oryza Sativa L.) under Arsenic Stress"** For My Ph.D. Awarded by University of Lucknow in Collaboration with National Botanical Research Institute (**N.B.R.I.**), Lucknow. The thesis work entailed the following objectives:

- ✓ Environmetal Health Risk Assessment of Arsenic in groundwater on food chain through contaminated rice consumption
- ✓ Have mapped dietary As fractions in West Bengal Districts cotaminated with Arsenic
- ✓ Biochemical aspects of arsenic stress on plants.
- ✓ Thiolic and antioxidative response, amino acid profiling in rice germplasms grown in field and hydroponics for arsenic tolerance studies.
- ✓ Protocol development for analysing biomolecules on instruments like HPLC and ICP-MS.
- ✓ Arsenic speciation, peptide and amino acid studies have been my focus.

The conclusive results from my Ph.D. work lead to release of an **Arsenic Tolerant Least accumulating variety** into the fields of West Bengal mitigating the impacts on health on the population. The knowledge gap in biochemical pathway of thiolic-amino acids and antioxidants was also bridged.

Awards:

- ✓ **Chancellor's Gold Medal** (best student all round in all the faculties) of Lucknow University 2007
- ✓ Dr. Chakravarty Gold Medal (for exemplary work in social service) of Lucknow University 2007
- ✓ Smt. Pushpawati Tandon Memorial Gold Medal (for securing first position in M.Sc. Environmental Science examinations) of Lucknow University 2007
- ✓ Best poster award at the 4th International Conference on Plants and Environmental Pollution (ICPEP-4) at the National Botanical Research Institute, Lucknow, India from 8 - 11 December 2010.
- ✓ Best Research Paper award 2012-13 for securing the highest impact factor of National Botanical Research Institute

- ✓ Best Research Paper award 2014-15 for securing the highest impact factor of National Botanical Research Institute
- ✓ Green Era Award for contribution to Environment, Lucknow, 2009

Academic Qualifications:

- ✓ Doctor of Philosophy in Environmental Science from University of Lucknow and National Botanical Research Institute, Lucknow awarded in July 2014.
- ✓ UGC-NET qualified *(exam date-June 2007, December 2007, June 2008)*
- ✓ Master of Science in Environmental Science (**university topper, triple gold medallist**) passed in first division (79%), from University of Lucknow, Lucknow, in 2007.
- ✓ Bachelor of Science in Biology (Botany, Chemistry, Zoology) passed in first division (63.4%) from University of Lucknow, Lucknow, in 2005.
- ✓ Senior Secondary school passed in first division (86%) from I.C.S.E. Board, Seth M.R Jaipuria school, Lucknow in 2002.
- ✓ High school passed in first division (81.2%) from I.C.S.E. Board, Seth M.R Jaipuria school, Lucknow, in 2000.
- ✓ Three months certificate course on Comprehensive Disaster Risk Management Framework from National Institute of Disaster Management (NIDM) (2013)
- ✓ Internal Auditor course by BSI (2018)
- ✓ 3 months Remote Sensing and GIS course by IIRS (2017)

Books and book chapter:

- ✓ Richa Dave Nagar "Arsenic Stress Responsive Amino Acids in Rice Plant", ISBN 978-3-659-35442-7, Lap-Lambert Publishing, Germany, 2016
- ✓ Richa Dave Nagar "Modern Air Pollution Prevention Strategies in the Urban Environment: A Case Study of Delhi City", Handbook of Environmental Materials Management, ISBN 978-3-319-58538-3, Springer, 2018

Research Publications (International):

- ✓ **Richa Dave**, Rudra Deo Tripathi, others. Arsenate and Arsenite Exposure Modulate Antioxidants and Amino Acids in Contrasting Arsenic Accumulating Rice (*Oryza sativa* L.) Genotypes. Journal of hazardous materials 262, 1123-1131, **2013**
- ✓ **Richa Dave**, Pradyumna Kumar Singh, Preeti Tripathi, others. Arsenite tolerance is related to proportional thiolic metabolite synthesis in rice (Oryza sativa L.) Archives of Environmental Contamination and Toxicology 64(2):235-42, **2013**
- ✓ Manju Shri, **Richa Dave**, Sanjay Diwedi, others. Heterologous expression of Ceratophyllum demersum phytochelatin synthase, CdPCS1, in rice leads to lower arsenic accumulation in grain. Scientific reports 4 :5784 Scientific Reports (Nature Publishing) **2014**
- ✓ Shivangi Somvanshi, **Richa Dave,** Dr. Renu Dhupper, Dr. Bhawna Dubey, Dr. P.Kunwar Spatial image enhancement techniques for determining the water quality of Gomti River, Lucknow. Journal of Environmental Science, Computer Science and Engineering and Technology, July 16, **2013**
- ✓ Sanjay Dwivedi, Aradhana Mishra, Preeti Tripathi, **Richa Dave**, others. Arsenic affects essential and non-essential amino acids differentially in rice grains. Environment International 46: 16-22. **2012**

- ✓ Preeti Tripathi, Sanjay Dwivedi, Aradhana Mishra, Amit Kumar, **Richa Dave**, others. Arsenic Accumulation in Native Plants of West Bengal, India: Prospects for Phytoremediation but Concerns with the use of Medicinal Plants Environment Monitoring and Assessment 184: 2617-31. **2012**
- ✓ Sanjay Dwivedi, Aradhana Mishra, Amit Kumar, Preeti Tripathi, **Richa Dave.** Bioremediation potential of genus Portulaca L. collected from industrial areas in Vadodara, Gujarat, India Clean Technology and Environmental Policy. 14: 223-228. **2012**
- ✓ Arti Rai, Preeti Tripathi, Sanjay Dwivedi, Sonali Dubey, Manju Shri, Smita Kumar, Pankaj Kumar Tripathi, **Richa Dave**, others. Arsenic tolerances in rice (*Oryza sativa*) have a predominant role in transcriptional regulation of a set of genes including sulphur assimilation pathway and antioxidant system Chemosphere. 82: 986-995.**2011**
- ✓ Sanjay Dwivedi, RD Tripathi, Preeti Tripathi, Amit Kumar, **Richa Dave,** others Arsenate exposure affects amino acids, mineral nutrient status and antioxidants in rice (Oryza sativa L.) genotypes. Environmental Science and Technology . 44: 9542-9549. **2010**
- ✓ Sanjay Dwivedi, RD Tripathi, Sudhakar Srivastava, Ragini Singh, Amit Kumar, Preeti Tripathi, **Richa Dave,** others. Arsenic affects mineral nutrients in grains of various Indian rice (Oryza sativa L.) genotypes grown on arsenic-contaminated soils of West Bengal. Protoplasma 245: 113-124. **2010**
- ✓ Sanjay Dwivedi, Sudhakar Srivastava, Seema Mishra, Amit Kumar, RD Tripathi, UN Rai, **Richa Dave, others.** Characterization of native microalgal strains for their chromium bioaccumulation potential: phytoplankton response in polluted habitats. Journal of Hazardous Materials 173: 95-101. **2010**

Article:

- ✓ **Richa Dave,** Rudra Deo Tripathi, others. Climate Change, Towards a Booming Bane. Environews. **2010**

DR. Richa Nagar

"Teaching is the most enriching lifelong learning experience"

Modern Air Pollution Prevention Strategies in the Urban Environment: A Case Study of Delhi City

Richa Dave Nagar and Geetanjali Kaushik

Contents

Abstract

Air pollution is a global concern. Information from the country's major regulator the Central Pollution Control Board (CPCB) has showed that 77% of Indian urban clusters clearly exceeded the National Ambient Air Quality Standard (NAAQS) for respirable suspended particulate matter (RSPM or PM10) in 2010 (CPCB 2012). Another key estimate from WHO pointed that out of 20 world's worst particulate air polluted cities around 13 were in India including the capital Delhi, which has been the worst ranked city in terms of air pollution (WHO 2014). Studies have shown a statistically significant correlation between mortality and ambient air pollution (Lee et al. 2006).

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C. M. Hussain (ed.), *Handbook of Environmental Materials Management*,
https://doi.org/10.1007/978-3-319-58538-3_160-1

Journal of Hazardous Materials 262 (2013) 1123–1131

Contents lists available at ScienceDirect

Journal of Hazardous Materials

journal homepage: www.elsevier.com/locate/jhazmat

Arsenate and arsenite exposure modulate antioxidants and amino acids in contrasting arsenic accumulating rice (*Oryza sativa* L.) genotypes

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HIGHLIGHTS

- Contrasting As accumulating rice genotypes were selected from 303 rice cultivars.
- About 13 fold difference was observed between HARG and LARG for As accumulation.
- The induction of antioxidant was more in HARG than LARG along with MDA content.
- Total amino acids positively correlated in LARG and negatively correlated in HARG.
- Stress responsive amino acids showed higher accumulation in HARG than LARG.

ARTICLE INFO

Article history:
Received 20 December 2011
Received in revised form 19 May 2012
Accepted 25 June 2012
Available online 1 July 2012

Keywords:
Amino acids
Antioxidants
Arsenic accumulation
Oryza sativa

ABSTRACT

Carcinogenic arsenic (As) concentrations are found in rice due to irrigation with contaminated groundwater in South-East Asia. The present study evaluates comparative antioxidant property and specific amino acid accumulation in contrasting rice genotypes corresponding to differential As accumulation during arsenate (As^{V}) and arsenite (As^{III}) exposures. The study was conducted on two contrasting As accumulating rice genotypes selected from 303 genotype accessions, in hydroponic conditions. Maximum As accumulation was up to 1181 $\mu g\,g^{-1}$ dw in the roots of high As accumulating genotype (HARG), and 89 $\mu g\,g^{-1}$ dw in low As accumulating genotype (LARG) under As^{III} exposures. The inorganic As was correlated more significantly upon exposures to As^{III} than As^{V}. In the presence of As^{V} various antioxidant enzymes guiacol peroxidase (GPX), ascorbate peroxidase (APX) and superoxide dismutase (SOD) were highly stimulated in HARG. The stress responsive amino acids proline, cysteine, glycine, glutamic acid and methionine showed higher accumulation in HARG than LARG. A clear correlation was found between stress responsive amino acids, As accumulation and antioxidative response. The comparisons between the contrasting genotypes helped to determine the significance of antioxidants and specific amino acid response to As stress.

1. Introduction

The health of nearly 150 million people worldwide from over 70 countries spanning six inhabited continents is threatened from the hazards of arsenic (As) present in groundwater [1]. 110 million of these reside in South and South-East Asia including one hundred thousand from India alone. This As originated from Himalayan minerals released from solid phases under anaerobic conditions [2,3] into groundwater used for irrigation of paddy fields. This As accumulating in irrigated soils poses a serious threat to sustainable agriculture in affected areas [2,4]. Arsenic exists in the environment in more toxic inorganic [arsenate (As^{V}) and arsenite (As^{III})] and less toxic organic (monomethylarsonic acid and dimethylarsenic acid) forms, As^{III} being most toxic amongst them. Arsenate disrupts energy flows in cells and is taken up by plants through high-affinity phosphate transporters [5]. Uptake of AsIII

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0304-3894/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.jhazmat.2012.06.049

Arch Environ Contam Toxicol (2013) 64:235–242
DOI 10.1007/s00244-012-9818-8

Arsenite Tolerance is Related to Proportional Thiolic Metabolite Synthesis in Rice (*Oryza sativa* L.)

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Received: 23 June 2012 / Accepted: 24 September 2012 / Published online: 10 November 2012

Abstract Thiol metabolism is the primary detoxification strategy by which rice plants tolerate arsenic (As) stress. In light of this, it is important to understand the importance of harmonised thiol metabolism with As accumulation and tolerance in rice plant. For this aim, tolerant (T) and sensitive (S) genotypes were screened from 303 rice (*Oryza sativa*) genotypes on exposure to 10 and 25 μM arsenite (As^{III}) in hydroponic culture. On further As accumulation estimation, contrasting (13-fold difference) T (IC-340072) and S (IC-115730) genotypes were selected. This difference was further evaluated using biochemical and molecular approaches to understand involvement of thiolic metabolism *vis-a-vis* As accumulation in these two genotypes. Various phytochelatin (PC) species (PC_2, PC_3 and PC_4) were detected in both the genotypes with a dominance of PC_3. However, PC concentrations were greater in the S genotype, and it was noticed that the total PC ($PC_2 + PC_3 + PC_4$)–to–As^{III} molar ratio (PC-SH:As^{III}) was greater in T (2.35 and 1.36 in shoots and roots, respectively) than in the S genotype (0.90 and 0.15 in shoots and roots, respectively). Expression analysis of several metal(loid) stress–related genes showed significant upregulation of glutaredoxin, sulphate transporter, and ascorbate peroxidase in the S genotype. Furthermore, enzyme activity of phytochelatin synthase and cysteine synthase was greater on As accumulation in the S compared with the T genotype. It was concluded that the T genotype synthesizes adequate thiols to detoxify metalloid load, whereas the S genotype synthesizes greater but inadequate levels of thiols to tolerate an exceedingly greater load of metalloids, as evidenced by thiol-to-metalloid molar ratios, and therefore shows a phytotoxicity response.

Electronic supplementary material The online version of this article (doi:10.1007/s00244-012-9818-8) contains supplementary material, which is available to authorized users.

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Increased arsenic (As) levels in soils cause considerable concern with respect to plant uptake, especially in rice, and its subsequent entry into the ecosystem through its consumption by animals and human being. Rice is particularly efficient in accumulating arsenite (As^{III}), and paddy fields in the south and southeast Asia have As^{III} concentrations ≤20 μM (Zhao et al. 2010) in soil solutions. This poses a health hazard to millions of people dependent on rice as

CLIMATE CHANGE , TOWARDS A BOOMING BANE

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Climate change is considered as the greatest civilization threat today to human beings and life on earth. Carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values. Methane (CH_4), from rice paddy production and enteric fermentation, is increasing, as are chlorofluorocarbons (CFCs) that have been used for many years as a refrigerant and to produce foam. Methane is a much more potent greenhouse gas (GHG) than CO_2. Carbon dioxide, methane, nitrous oxide and three groups of fluorinated gases (sulfur hexafluoride, HFCs, and PFCs) are the major greenhouse gases.

The amount of carbon dioxide in the atmosphere today (387 ppm) exceeds by far the natural range of the last 650,000 years (180 to 300 ppm). The current amount of methane in the atmosphere (1745 ppb) exceeds by far the natural range of the last 650,000 years (320 to 790 ppb). The primary source of the increase in carbon dioxide is fossil fuel use, but land-use changes also make a contribution. The primary source of the increase in methane is very likely to be a combination of human agricultural activities and fossil fuel use. Nitrous oxide concentrations have risen from a pre-industrial value of 270 ppb to 314 ppb more than a third of this rise is due to human activity, primarily agriculture. Perfluorocarbons (PFCs) and sulphur hexafluoride (SF6) are greenhouse gases with atmospheric lifetimes of more than 1000 years. They are powerful greenhouse gases and today's emissions will still be affecting earth's climate in the next millennium. Man's use of fluorides has given rise to significant emissions of both PFCs and SF6 in recent years.

These gases contribute to the green-house effect that is warming our atmosphere day by day. The greenhouse effect results from the trapping of solar radiation that radiates back from the Earth's surface by these gases. The atmosphere is essentially transparent to incoming short wave solar radiation. After striking the Earth's surface, the wavelength of this radiation increases as it loses energy. The GHG's are opaque to this lower energy radiation, and therefore trap it as heat, thereby increasing the atmospheric tempe-rature. As these gases increase, due to natural causes and human activities, they enhance the greenhouse effect, and may raise temperatures even more. If the **climate warms**, the vegetation belts will tend to move northward, changing global ecological and biome patterns. Other effects may be discerned in precipitation patterns, sea level changes, and more. This leads to a complex chain of events affecting the global climate or which can be summarized as **CLIMATE CHANGE,** which is a long-term shift or alteration in the climate due to anthropogenic activities.

One obvious consequence of the significant rise in CO_2 in the northern polar latitudes would be melting of Arctic Ocean and Greenland Ice Cap ices, releasing huge quantities of stored water that would have an extremely serious impact on global sea levels.

Calculations show that the burning of fossil fuels (mainly coal, petroleum derivatives, and natural gas) adds about 6 billion metric tons of carbon (as the element) to the air annually; each year also, deforestation permits an extra 1-2 billion metric tons of carbon to reach the atmosphere. The projected climate is both wetter and warmer. There is considerable geographical variation in the magnitude of changes for both temperature as well as rainfall. North-Western India is likely to become drier, while north-eastern India is likely to become much wetter. The temperature increases in north-western India is also much more than that in the northeast. Southern and south-eastern parts of India are likely to experience only a moderate increase in temperature.

Warmer global temperatures are already causing profound changes in many of the earth's natural systems. Approxi-mately 20-30 per cent of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5 °C.

In all regions of the world, with faster temperature rise, the greater is the risk of damage. The climate does not respond immediately to emissions, which can last for years or decades in the atmosphere. And because of the delaying effect of the oceans - which absorb and eventually release heat more slowly than the atmosphere - surface

Gas	Preindustrial level	Current level	Increase since 1750	Radiative forcing (W/m^2)
Carbon dioxide	280 ppm	387ppm	107 ppm	1.46
Methane	700 ppb	1745 ppb	1045 ppb	0.48
Nitrous oxide	270 ppb	314 ppb	44 ppb	0.15
CFC-12	0	533 ppt	533 ppt	0.17

Amino acids- arsenic stress in rice

Richa Dave Nagar
R.D. Tripathi

Arsenic Stress Responsive Amino Acids in Rice Plant

Dave Nagar, Tripathi

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