

# Vishnu D. Rajput

**Vishnu D. Rajput** working as “**Principal Scientist**” and Head of ‘**International Laboratory on Nanobiotechnology**’ at Southern Federal University, Rostov-on-Don, Russia. His ongoing research is based on the investigation of effective remediation approaches using biochar/nano-biochar based sorbents and nanomaterials. With long experience and experimental work, Dr. Rajput comprehensively detailed the state of research in environmental science about “how nanoparticles/heavy metals interact with plants, soil, microbial community, and the larger environment as well as possible remediation technology using nanoparticles/nano-biochar. Recently he is working nano-enhanced remediation of soil and water system. In recent work, he is working on nano-bioengineering for soil rhizospheric microbes and enhanced remediation using nanotechnology, CRISPR and metagenomics.

## Educational Experience

- Doctor of Science in Natural Science (2012-2015)  
University of Chinese Academy of Sciences, Beijing 100049, China
- M.Sc. Agricultural Biotechnology (2005-2007)  
Chander Shekhar Azad University of Agriculture & Technology, Kanpur, Uttar Pradesh 208002, India.

## Professional Experience

- **Principal Scientist**, (March 2024 continue)  
Academy of Biology and Biotechnology, Southern Federal University, Rostov, Russia  
Duties: Research & teaching (undergraduates & masters students)
- **Leading Researcher**, (June 2020 continue)  
Academy of Biology and Biotechnology, Southern Federal University, Rostov, Russia,  
Duties: Research & teaching (undergraduates & masters students)
- **Senior Researcher**, (March 2016 June 2020)
- Academy of Biology and Biotechnology, Southern Federal University, Rostov, Russia,  
Duties: Research & teaching (undergraduates & masters students)
- **Senior Research Fellow**, (2009-2012)
- Central Soil Salinity Research Institute, Karnal-132001 Haryana, India, Duties: Research
- **Project Assistant**, (9 March to 31 May 2009)
- Center for Plant Biotechnology, Hissar, Haryana, India, Duties: Research

## Key achievements

- Observed influence of Biochar and heavy metal tolerant microbes on plant growth in polluted soil.
- Optimized safe application of metal-based nanoparticles for sustainable agriculture.
- Revealed the mechanism of nanoparticles translocation, effects and accumulation in plant tissues and discovered effective concentration of ZnO & CuO NPs for plant growth
- Developed nano-enhanced remediation technologies for heavy metal contamination, combined with metal tolerant microbes and hyperaccumulator plants.
- Fabricated biochars with various sizes such as nano-biochar, nanomaterial-enabled biochar, microbes-enriched biochar for soil health improvement.
- Developed methodology for rhizospheric microbes’ modulation and bio-nanoengineering for soil microbes using metagenomic and CRISPR

### **Publications and Metrics**

- As per Scopus/WoS database: Documents: 425, h-index: 41, Citations: 7,054, FWCI: 2.82 on 31<sup>st</sup> July 2024.
- In year 2023, he is included in the list of **2%** worlds potential scientists by Elsevier BV publishing house.

### **Awards and Achievements**

- Last five years, received appreciation letters (Letter of Gratitude, Certificate of Honor, Diploma Awards) by Rector of Southern Federal University for breakthrough research environmental and soil science.
- Received “Hindustan Harit Kranti Award-2022 for outstanding contribution in agriculture by Hindustan Agri- Research Welfare Society, Govt. of India
- Received “Best Reviewer Awards by Plants Journal with Cash price 500 USD.
- Received 1st Diploma Award by Ministry of Science and Higher Education of the Russian Federation, Saint Petersburg State University. Institute of Earth Sciences, Dokuchaev Central Soil Science Museum – branch of FSBSI FRC V.V. Dokuchaev Soil Science Institute, ANO Preservation and development of Dokuchaev scientific heritage "Soil – life" Dokuchaev Society of Soil Science, Interregional CSO “Nature protection union.

### **Project leader!**

Participated 18 National & International research project. Recent projects as a project leader are below.

- BRICS\_Agreement No. 075-15-2022-1247 “Key technologies for carbonization and rational disposal of urban food waste using big data and artificial intelligence” Assign the project an internal registration number Grant/22-06-Ab, 2022-2024.
- Bioengineering of the rhizosphere\_project No. SP03/S4\_0708Priority\_16 (Priority 2030), 03.2024 – 31.12.2026

### **Honorary Adjunct Faculty**

- Honorary Adjunct Professor at Bioengineering and Biosciences, Lovely Professional University, dated: 10/3/2023. Work is completed honorary for min of 1-2 weeks lectures and discussion per year.
- Adjunct Research Faculty at Center for Research Impact & Outcome, Chitkara University, Punjab, India, Nature of work: Honorary, 1 visit; online/offline per year

### **Supervisor/mentor**

- Supervised two (Mr. Hazarad Amin, Maria Belen Moya) master students (Erasmus+), 2020-2021.
- Co-supervisor Sailaja P, PhD scholar, Thesis on: Phytoremediation Potential of Various Ficus Species for Heavy Metal Removal, Registration No. 42200140, Lovely Professional University, Punjab 2023-2027.
- Joint supervision of the research work of 1 postgraduate student, 1 master's and 1 undergraduate student continue at Southern Federal University.
- Invited trainee PhD Student, Monika Batta, LPU India for 3 months (July-Sept, 2023) and supervised for research at SfedU.
- Supervising masters, PhD, and postdoc researchers at Southern Federal University.

### **Members of editorial boards of peer-reviewed scientific journal**

- Editorial Board Member: Biochar, Impact Factor: 11.452, ISSN: 2524-7867, Springer
- Editorial Board Member: Eurasian Journal of Soil Science (2147-4249)
- International Advisory Board Member: SAINS TANAH - Journal of Soil Science and Agroclimatology (ISSN 2356-1424).

### **Membership in leading scientific communities**

- Honorary member of the American Chemical Society (Membership No. 32122551
- Since: 8/26/2020).
- The member of “SCIENTIFIC COMMITTEE” The Federation of Eurasian Soil Science Societies (Member Countries: Turkey, Russia, Azerbaijan, Kazakhstan, Romania, Kyrgyzstan, Bosnia & Herzegovina, and Serbia).
- Member of organizing committee International Conference on Sustainable Nanotechnology and Nanomaterials (ICONN – 2022), Organized By- University Center for Research & Development (UCRD), Chandigarh University, India, In Association with National University of Singapore and University of Salento, Italy
- Organizing committee member of III International Scientific Conference "CURRENT STATE OF CHERNOZEMS" organized by Southern Federal University September 12-17, 2023.
- Organizing committee member of 1st ICOSATA 2022: International Conference of SAINS TANAH: Soil Science, Agriculture, & Environment (27-28 July 2022).

### **Courses and Lectures**

- Lectured for international students on the Mevlana exchange program with Selcuk University, Konya, Turkey, and for students of the Faculty of Soil Science and Land Resource Assessment 2017-2018 academic year.
- A course of lectures on the English-language program "Plant Biotechnology" for graduate students at the Academy of Biology and Biotechnology of the Southern Federal University, Rostov-on-Don.
- A course of lectures for bachelors and undergraduates on the topic "Advanced methods of the molecular biology of soils and plants" and "International research funds and scholarships" for Russian and foreign students.
- A course of lectures "Chemical soil pollution" for bachelors from Spain under the Erasmus exchange program for one semester.
- Delivered lecture in Faculty Development Program, organized by Department of Botany, Hansraj college, University of Delhi, 1-6 April 2024.
- Delivered lecture in International Agriculture Certificate Course-Cum-Training Program organized by ICAR, India 1-30 April 2024.
- Delivered lectures in “15 Days Training –Cum–Certificate Programme on Trending Novel Technologies in Agriculture, Animal Husbandry, Fisheries Science and Their Allied Systems” January- 15-30, 2023 in Online Mode organized by Society of Agriculture Research and Social Development, College of Agriculture, Tripura (Lembuchera, West Tripura) & Malla Reddy University, Hyderabad” India
- Giving lectures on biotechnology to 1st year undergraduate students of the Faculty of Agriculture at the Phonics Group of Institutions in India, 2015.
- Miscellaneous Recognized Reviewer for manuscript/thesis and projects
- Reviewed more than 222 research articles send by renewed journal and achieve outstanding reviewers award by Elsevier 2017.

### **Conferences attended last 5 years**

- Attended more than 50 International conferences, some of them listed below.
- Presented work in a plenary session and hosted session at 2nd International Conference on Waste Recycling, Reuse and Reduction of Pollution and Carbon Emissions in joint organization with the 2nd SiNor Biochar Workshop, June 26 – 29, 2024, Hangzhou, China
- Participated in a scientific and technical exhibition at 4 Hongkong Universities and discussed about ongoing research between 15 Oct - 5 Nov 2023, organized jointly by Department of Civil and Environmental Engineering, Hong Kong University of Science and Technology (HKUST), State Key Laboratory of Marine Pollution, City University of Hong Kong (CityU), State Key Laboratory of Environmental and Biological Analysis, Hong Kong Baptist University (HKBU), State Key Laboratory of Marine Pollution, The Education University of Hong Kong (EduHK).
- Work presented (in person) as a foreign expert School of Water Resources and Environment of our school, "Mining and Metallurgy Solid Waste Pollution Prevention, Control and Treatment" and "One Belt and One Road" innovative talent exchange, "Mining and Metallurgy Solid Waste Pollution Prevention, Control and Treatment", Beijing China, Date: 02.11.2023 - 4.11.2023
- Presented report in person at 2023 international symposium on agro-environmental quality, Organized by Nanjing Agricultural University, Nanjing, China. Work entitled: Alleviating ZnO Nanoparticles Toxicity in Barley using Biochar and Metal-Tolerant Bacteria. Date: October 16- 19, 2023
- Work presented at IV International Symposium "Biodiagnosis and Environmental Assessment: Modern Technologies, Problems and Solutions" and International Youth Scientific School "Soil Remediation: Innovative Approaches to Restoration of Environmental Functions", which held on August 29-30, 2023, at Moscow State University named after MV Lomonosov, Moscow, Russia.
- Research work presented and hosted plenary session at ICWNR, India 2024, held at GNSU, Bihar, India, between 10-12 March 2024.

### **Selected papers:**

1. Rajput, V. D.; Chernikova, Natalya; Minkina, Tatiana; Gorovtsov, Andrey; Fedorenko, Alexey; Mandzhieva, Saglara; Bauer, Tatiana; Tsitsuashvili, Victoria; Beschtnikov, Vladimir; Wong, Ming Hung; Biochar and metal-tolerant bacteria in alleviating ZnO nanoparticles toxicity in barley. *Environmental Research*, 115243, 2023. IF: 8.3, Q1 <https://doi.org/10.1016/j.envres.2023.115243>
2. Rajput VD, Gorovtsov AV, Fedorenko GM, Minkina TM, Fedorenko AG, Lysenko VS, Sushkova SS, Mandzhieva SS, Elinson MA (2020). The influence of application of anatomical parameters biochar and metal tolerant bacteria in polluted soil on morpho-physiological and of spring barley. *Environmental Geochemistry and Health*. IF: 4.2, Q1 <https://doi.org/10.1007/s10653-019-00505-1>.
3. Rajput, P., Kumar, P., Priya, A.K., Kumari, S., Shiade, S.R.G., Rajput, V.D., Fathi, A., Pradhan, A., Sarfraz, R., Sushkova, S., Mandzhieva, S., Minkina, T., Soldatov, A., Wong, M.H., Rensing, C. 2024. Nanomaterials and biochar mediated remediation of emerging contaminants. *Science of The Total Environment*, 916, 170064. <https://doi.org/10.1016/j.scitotenv.2024.170064>
4. Rajput, V. D., Minkina, T., Kimber, R., Singh, V. K., Shende, S., Behal, A., Sushkova, S., Mandzhieva, S., and Lloyd, J. R. (2021). Insights into bio-synthesis of nanoparticles by *Shewanella* genus. *Applied and Environmental Microbiology*, IF: 5.01, Q1 <https://doi.org/10.1128/AEM.01390-21>
5. Burachevskaya, M.; Minkina, T.; Bauer, T.; Lobzenko, I.; Fedorenko, A.; Mazarji, M.; Sushkova, S.; Mandzhieva, S.; Nazarenko, A.; Butova, V.; Wong, M.H.; Rajput, V.D. 2023. Fabrication of biochar derived from different types of feedstocks as an efficient

- adsorbent for soil heavy metal removal. *Scientific Reports*, 13, 1, 2020, 2023. IF: 4.9, Q1 <https://doi.org/10.1038/s41598-023-27638-9>
6. Fang, J.; Li, W.; Tian, Y.; Chen, Z.; Yu, Y.; Shan, S.; Rajput, V.D.; Srivastava, S.; Lin, D. Pyrolysis temperature affects the inhibitory mechanism of biochars on the mobility of extracellular antibiotic resistance genes in saturated porous media. *Journal of Hazardous Materials* 2022, 439, 129668. IF: 13.6, Q1 <https://doi.org/10.1016/j.jhazmat.2022.129668>
  7. Andrey G, Rajput V, Tatiana M, Saglara M, Svetlana S, Igora K, Grigoryevad T, Vasily C, Iraida A, Vladislav Z, Elena F, Hasmik M (2019). The role of biochar-microbe interaction in alleviating heavy metal toxicity in *Hordeum vulgare* L. grown in highly polluted soils. *Applied Geochemistry*, IF: 3.4, Q2 <https://doi.org/10.1016/j.apgeochem.2019.03.017>
  8. Shuvaeva, V.A., Mazarji, M., Nevidomskaya, D.G., Minkina, T.M., Fedorenko, A.G., Rajput, V.D., Kirichkov, M.V., Tsitsuashvili, V.S., Mandzhieva, S.S., Veligzhanin, A.A., Svetogorov, R.D., Khramov, E.V., Wong, M.H. Synthesis and properties of nano-cadmium oxide and its size-dependent responses by barley plant, *Environmental Research*, 2024, 118045, <https://doi.org/10.1016/j.envres.2023.118045>
  9. Azarin, K., Usatov, A., Minkina, T., Plotnikov, A., Kasyanova, A., Fedorenko, A., Duplii, N., Vechkanov, E., Rajput, V.D., Mandzhieva, S., and Alamri, S. (2022). Effects of ZnO nanoparticles and its bulk form on growth, antioxidant defense system and expression of oxidative stress related genes in *Hordeum vulgare* L. *Chemosphere* 287, 132167. IF: 8.8, Q1 <https://doi.org/10.1016/j.chemosphere.2021.132167>
  10. Kumari, A., Chokheli, V.A., Lysenko, V.S., Mandzhieva, S.S., Minkina, T.M., Mazarji, M., Rajput, V.D., Shuvaeva, V.A., Sushkova, S.S. & Barakhov, A. (2022) Genotoxic and morpho-physiological responses of ZnO macro- and nano-forms in plants. *Environmental Geochemistry and Health*. IF: 4.2, Q1. <https://doi.org/10.1007/s10653-022-01428-0>
  11. Kumari, A., Mandzhieva, S., Minkina, T., Rajput, V.D., Shuvaeva, V., Nevidomskaya, D., Kirichkov, M., Veligzhanin, A., Svetogorov, R., Khramov, E. Speciation of macro-and nanoparticles of Cr<sub>2</sub>O<sub>3</sub> in *Hordeum vulgare* L. and subsequent toxicity: A comparative study. *Environmental Research*, 223, 115485, 2023. IF: 8.3, Q1 <https://doi.org/10.1016/j.envres.2023.115485>
  12. Liu, X., Ju, Y., Mandzhieva, S., Pinski, D., Minkina, T., Rajput, V.D., Roane, T., Huang, S., Li, Y., Ma, L.Q., Clemens, S. & Rensing, C. (2023) Sporadic Pb accumulation by plants: Influence of soil biogeochemistry, microbial community and physiological mechanisms. *Journal of Hazardous Materials* 444, 130391. IF: 13.6, Q1
  13. Rajput V, Chaplygin, V., Gorovtsov, A., Fedorenko, A., Azarov, A., Chernikova, N., Barakhov, A., Minkina, T., Maksimov, A., Mandzhieva, S., and Sushkova, S. (2020). Assessing the toxicity and accumulation of bulk- and nano-CuO in *Hordeum sativum* L. *Environmental Geochemistry and Health*, IF: 4.2, Q1 <https://doi.org/10.1007/s10653-020-00681-5>
  14. Rajput V, Minkina V, Mazarji M, Shende S, Sushkova S, Mandzhieva S, Burachevskaya M, Chaplygin V, Singh A, Jatav H (2020) Accumulation of nanoparticles in the soil-plant systems and their effects on human health. *Annals of Agricultural Sciences*, 65, 137-143. IF: 5.9, Q1 <https://doi.org/10.1016/j.aoas.2020.08.001>
  15. Verma, Y., Datta, S.C., Mandzhieva, S.S., Jatav, S. S., Perelomov, L., Burachevskaya, M., Rajput, V.D. 2023. Release Behavior of Phosphorus from Bentonite Clay-Polymer Composites with Varying Cross-Linker Levels, and Neutralization Degree. *Eurasian Soil Science*, IF:1.4, Q2 <https://doi.org/10.1134/S1064229323601476>