

Bacterial Consortium (*Priestia endophytica* strain NDAS01F, *Bacillus licheniformis* Strain NDSA24R, *Priestia flexa* strain NDAS28R) Mediated Amelioration of Arsenic Stress and Growth Improvement of *Oryza sativa* L. †

Anurakti Shukla^{1,*}, Sudhakar Srivastava^{1,*}

¹ Plant Stress Biology Laboratory, Institute of Environment and Sustainable Development, Banaras Hindu University, Varanasi - 221005, U.P., India; anurakti02@gmail.com (A.S.); sudhakar.iesd@bhu.ac.in (S.S.);

* Correspondence: eanurakti02@gmail.com (A.S.); sudhakar.iesd@bhu.ac.in (S.S.)

† Presented at Environmental Toxicology: Impact on Human Health (Environ Tox 2021)

Received: 5.11.2021; Revised: 18.11.2021; Accepted: 20.11.2021; Published: 30.11.2021

Abstract: In the rice field, microbes-facilitated arsenic (As) redox reactions play a crucial role in As' bioavailability. In the current study, three bacterial strains; B1 (*Priestia endophytica* strain NDAS01F), B2 (*Bacillus licheniformis* strain NDSA24R), and B3 (*Priestia flexa* strain NDAS28R), were isolated from the rhizospheric soil of high As paddy field (35 mg kg⁻¹ of As) in Nadia district, West Bengal. These individual bacteria and their consortium (B1+B2+B3) were used in the pot experiment, where 200 rice seeds were soaked in each bacterial culture for about 6 hrs. These seeds were used for nursery development, and after 25 days, the seeds were transplanted to the pots having 50 mg kg⁻¹ of As (sodium meta-arsenite). The untreated seeds were taken as control. The experiment was conducted for total 45 days. After final harvesting, various morphological parameters like shoot length, root length, and biochemical parameters like antioxidant enzymes (SOD, CAT, etc.) and As estimation in plants were performed to check the efficiency of individual bacterial strains and consortium compared to control. The best result was obtained by the seeds inoculated with the consortium. These plants showed 72% and 52% increments in biomass (FW) and chlorophyll-a content. This microbial consortium can find application in the field to reduce As content in rice and act as a stress inhibitor, and thus, generate better yield.

Keywords: arsenic; *Priestia endophytica* strain NDAS01F; *Priestia flexa* strain NDAS28R; *Bacillus licheniformis* strain NDSA24R; *Oryza sativa*.

© 2021 by the authors. This article is an open-access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Funding

This work was supported by the Department of Atomic Energy, BRNS, BARC for a project (Sanction No. 35/14/16/2018-BRNS/10403).

Acknowledgments

SS conceived the project and designed the work. AS carried out the work and analysis with the close supervision of SS. The authors would also like to thank Central Instrumentation Facility, IIT-BHU, Varanasi for conducting ICP-MS experiment.

Conflicts of Interest

The authors declare no conflict of interest.