Chapter 8
Mitigating Arsenic Toxicity in Plants: Role of Microbiota

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Abstract Arsenic (As) pollution, particularly in soil and water, is a very prominent environmental issue which seriously threatens plant growth, development, and productivity. Since As is ubiquitous in the natural environment, microorganisms have developed mechanisms to resist the toxic effects of this metalloid. A large number of microorganisms, viz. *Acinetobacter*, *Aeromonas*, *Bacillus*, *Exiguobacterium*, and *Pseudomonas*, are capable of growing in the presence of high concentrations of As. But relatively less information is available on accumulation, mobilization, distribution, and speciation of As by rhizospheric microbiota and their impact on plant growth and development. The use of As-resistant and plant growth promoting microorganisms (PGPMs) for the restoration of plants growing on contaminated soils is the need of the time. The use of PGPM occupies a small but growing niche in the development of organic agriculture and has attracted attention during the last decade only. There are several reports revealing the multifarious role of soil microbiota in amelioration of As toxicity and improving metal tolerance in plants. Colonization of PGPMs helps the host plant to overcome As-induced phosphate (P) deficiency and consequently maintain favorable P:As ratio. Further, they also improve nutritional status and reduce As uptake and translocation in plants. Inoculation of bacteria/fungi can exert protective effects on vascular plants under As contamination by transforming more toxic inorganic forms into less toxic organic forms or via reducing the concentration of As by enhancing plant biomass. The PGPMs also result in higher activities of the antioxidant enzymes (superoxide dismutase, catalase, ascorbate peroxidase, and guaiacol peroxidase) and accumulation of nonenzymatic antioxidants (carotenoids, ascorbic acid, proline, and α-tocopherol). Increased concentrations of cysteine, glutathione, and non-protein thiols, and activity of glutathione *S*-transferase have also been reported that facilitate sequestration of As into nontoxic complexes. Thus, application of As-resistant PGPMs could pro-

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