CHAPTER 6

Conclusion
CONCLUSION

The present investigation attempted to explore a feasible and affordable alternative to complicated and costly metal decontamination technologies that are generally practiced worldwide. The indigenous microbial populations of As contaminated rice-growing soil environments were selected to elucidate the intrinsic capacity of microbial As transformation. Efficient As resistant as well as oxidising and volatilizing bacterial strains were isolated, screened and characterized phenotypically, biochemically and by molecular techniques. The As oxidizers having arsenite oxidase activity transformed more toxic AsIII to less toxic AsV and confirmed the presence of aoxB gene. They were found to be genetically similar to different species of Bacillus, one of which was identified as Geobacillus stearothermophilus—the first of its type to exhibit AsIII transforming ability. Bacillus megaterium (AMO-10) performed optimally in oxidising AsIII, followed by Geobacillus stearothermophilus (AGH-02), both of which could be considered for use in the bioremediation of soil after further detailed proteomic and genomic characterization.

The strains capable of volatilizing As belonged to diverse phylogenetic genera viz. Rhodobacter, Alcaligenes, Bordetella, Bacterium (unclassified) and few of them were capable of volatilizing As under both aerobic and anaerobic conditions. Increasing concentration of As in culture media decreased the percent volatilization due to increased toxic effects of the metalloid. Arsenite volatilization rates have been found to be relatively higher than AsV in both aerobic and anaerobic systems.

Laboratory incubation study in As contaminated soils inoculated with efficient As volatilizing bacteria and subsequent study under rice plantation in green house, depicted the potentiality of the isolates Rhodobacter sphaeroides (AMT-08) and Alcaligenes faecalis (AMT-04) as promising As bioremediating agents. Role of organic matter in soil for enhancing As biovolatization by the isolates were also established. From the above findings, it is evident that eco-friendly native bacterial isolates from As-contaminated environments can be used in future as a strong alternative to various expensive physical and chemical remediation measures. Successful exploration of these strains with advanced research could be explored in bioremediation to mitigate As contaminated environments.