Future prospective

L. polyrhiza L. and *L. triscula* L. were found growing in majority of water bodies all through the year. Both the plants were reported as heavy metal hyperaccumulator and hence can also be exploited for cleaning industrial effluents containing heavy metals.

Zn and Ni should get registered as a mobile trace metal which is warranted by a number of studies. However, there are certain contradictory reports as well. This aspect therefore requires additional attention and should be addressed in future. Zn and Ni at concentration above the tolerable limit, generates oxidative stress. However, the mechanisms operating both at protein and molecular levels that result in the generation of toxicity symptoms are yet to be explored in details.

It is very illustrious that Ni is an essential component of the enzyme urease, reports as well. It is also reported that Ni factors seed germination/ viability and seedling vigor but the reasons are yet to be explored. The information available on the interaction of Ni with other mineral nutrients and metabolism is restricted to only a few elements and processes, which is insufficient to make out concrete insight. The mechanism to generate Ni toxicity in photosynthetic machinery us also not very clearly understood.

Heavy metal pollution in the environment has led to researches on the emerging fields like phytoremediation (i.e. use of hyper accumulators or wetland plants to remove and sequester heavy metals from soil and water). However, many such plants have limited utility for phytoremedication, because of their slow growth, difficult propagation, seasonal growth and low biomass. Solutions to this problem are important and need further research.

With the development of biotechnology, the capabilities of hyperaccumulators may be greatly enhanced through specific metal gene identification and its transfer in certain promising species. This can play a significant role in the extraction of heavy metals from the polluted soils and water. The use of cleaning technologies is site-specific due to spatial and climatic variations and is not economically feasible everywhere. Therefore, cheaper technologies are being sought for practical use. Nevertheless, the recent advances in plant biotechnology have created a new hope for the development of hyperaccumulating species.

However, much research work is needed in this respect such as metal uptake studies at cellular level including efflux and influx of different metal ions by different cell organelles and membranes. To date the available methods for the recovery of heavy metals from plant biomass of hyperaccumulators are still limited. Traditional disposal approaches such as burning and ashing are not applicable to volatile metals; therefore, investigations are needed to develop new methods for effective recovery of metals from the hyperaccumulatior plant biomass.

In summary, phytoremediation processes hold great promise as means to clean-up polluted soils and water. Currently, the most advanced and effective phytoremediation technology is phytoextraction of heavy metals from soils using hyperaccumulating plants. In addition, aquatic plants also hold great promise to rid contaminated water of heavy metal contaminants. It is hoped that in the future, phytoremediation technologies will become more efficacious. This will most likely occur by using biotechnology, genetic engineering and plant breeding techniques and having a much better understanding of the ecology of rhizosphere microorganisms growing in polluted soils and water.