Editorial

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Importance of metadata in bio/phyto-remediation studies: a way to channelize future research through meta-analysis

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Meta-analysis is a modern statistical approach that combines the results from multiple studies to enhance the power of data, improves the quality of estimates, and the magnitude of the effect of a treatment. In bio/phyto-remediation studies, some authors adopt general ways to present research outcomes such as percentages, means, and graphs. This type of data has multiple limits, non-availability of comparative statistical significance and publication bias are the most imperative. In addition, such data creates big hindrances to perform meta-analysis in a cluster of other studies. Consequently, such datasets restrict the statistical comparison between similar studies, and quantitative assessment of variables. Hence, newcomers in the field of bioremediation find it difficult to design effective test protocols, and at the end, have to content with unconvincing results. Therefore, we suggest presentation of actual data along with statistical analyses of observations, and comparison with the control for robust translation of results. Otherwise, the authors must be directed to publish original datasets as supporting material or appendices with the manuscript.

Bio/phyto-remediation is, arguably, the most cost effective method of environmental restoration however, its field scale application has been debated owing to their lower efficiency and higher time consumption than the chemical/mechanical methods. Different techniques have been employed to enhance its overall effectiveness. The conventional methods of bio/phyto-remediation are being augmented using microbial consortia, floating treatment wetlands, constructed wetlands and hybrid phytoremediation systems (Saeed and Sun, 2012; Vymazal, 2013; Arslan et al., 2014) However, selection of suitable remediation system for a particular pollutant has always remained a challenge. A potential reason behind this challenge could be the lack of details in the published results, in some cases. Most researchers try to figure out loopholes in earlier studies, and make plans to overcome them. However, if not aided by appropriate statistical models, cognitive thinking is prone to overlook combined effects of results from different studies.

Meta-analysis is a tremendous method to compile and compare published data on a particular problem, and to infer fact-oriented, precise hypothesis. Meta-analysis uses statistical models to review existing data on a particular problem, and provides quantifiable estimates (Russo, 2007). However, meta-analysis needs actual data on the problem in focus (raw data) which is sometimes, not available as authors instead provide general estimates like percentages, averages, and means. Furthermore, at times, the data is presented in the form of graphical expressions, from which data extraction is close to impossible. Although, these graphs are sufficient to understand the study objectives; nevertheless, they deny the readers access to numerical data, and thus hinder application of mathematical models. There are some meta-analysis available on phytoremediation of environmental pollutants however, they are limited in scope, and do not provide comparative view of extensive research conducted in recent years (Audet and Charest, 2007; Li et al., 2015). Therefore, we advise researchers to perform detailed statistical analyses of their observations, and make comparisons with the control for robust translation of results. Besides, the reviewers and editors should direct the authors to publish original datasets, as supporting material or appendices, with the manuscript.

Compliance with ethical standards

Conflict of interest

The authors declare no conflict of interest.

References

Arslan, M., Afzal, M., Amin, I., Iqbal, S., Khan, Q.M. 2014. Nutrients Can Enhance the Abundance and Expression of Alkane Hydroxylase CYP153 Gene in the Rhizosphere of Ryegrass Planted in Hydrocarbon-Polluted Soil. PLoS ONE 9(10), e111208.

Audet, P., Charest, C. 2007. Heavy metal phytoremediation from a meta- analytical perspective. Environmental Pollution 147(1), 231-237.

Li, J., Yu, H., Luan, Y. 2015. Meta-Analysis of the Copper, Zinc, and Cadmium Absorption Capacities of Aquatic Plants in Heavy Metal-Polluted Water. International journal of environmental research and public health 12(12), 14958-14973.

Russo, M.W., 2007. How to review a meta-analysis. Gastroenterol Hepatol, 3(8), 637.

Saeed T, Sun G. 2012. A review on nitrogen and organics removal mechanisms in subsurface flow constructed wetlands: dependency on environmental parameters, operating conditions and supporting media. Journal of environmental management, 112, 429-448.

Vymazal J. 2013. The use of hybrid constructed wetlands for wastewater treatment with special attention to nitrogen removal: a review of a recent development. Water research, 47(14), 4795-4811.

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