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Performance of Phosphate Solubilizing Bacteria by Their Effects on Lead (Pb) Toxicity

R.H.A.N. Hettiarachchi and B.C. Walpola *

Department of Soil Science, Faculty of Agriculture, University of Ruhuna, Sri Lanka.

Abstract

Lead (Pb) is regarded as a potent occupational toxin and its toxicological manifestations are well known. The non-biodegradable nature of Pb compounds is the prime reason for its prolonged persistence in the environment. When the soil is contaminated with Pb, plants would absorb it as it's a persistent contaminant. Being a heavy metal, Pb is causing severe adverse effects through concentration at the ends of the food chains. Pb poisoning can be managed by using physical, chemical and biological methods. Biological detoxification is defined as enzymatic degradation or transformation of toxins that directs to less toxic products. However, a complete understanding of how these detoxification mechanisms influence metal tropic transfer is lacking. Microorganisms play an important role in the environmental fate of including Pb. Among the heavy metals, arsenic and lead are considered to be extremely toxic to all form of life. Harmful influences of heavy metals were observed on the physiological activity of microorganisms in natural habitats. Phosphate Solubilizing Microorganisms (PSMs) have specialized attributes for conversion of insoluble forms of phosphate to soluble forms via methods such as mineralization and solubilization. This study was conducted to identify the ability of the PSMs to grow in the presence of Pb. The agricultural soil was used to isolate the Phosphate solubilizing bacteria and isolation was done by using National Botanical Research Institutes Phosphate (NBRIP) medium. Fourteen phosphate solubilizing bacteria isolates were found and their resistance to Pb was tested in media having 100 ppm, 200 ppm, and 400 ppm lead concentrations in compound of lead acetate $(CH_3COO)_2Pb.Pb(OH)_2$. Survived isolates of bacteria were extracted and used to determine the phosphate solubilization under Pb toxicity. Bacterial isolates were re-inoculated into NBRIP broth medium. Phosphorus solubilization, growth, and pH were monitored after 1, 3 and 5 days. Among 14 isolates 11, 10 and 7 isolates were survived in 100 ppm, 200 ppm and 400 ppm Pb concentrations respectively. Seven isolates from 400ppm Pb toxicity level were used for further analysis of Phosphorus solubilization. Among them, PSB-8 isolate showed a vigorous growth under highest Pb concentration and has solubilized 72.02 ppm phosphate.

Key words: *Lead toxicity, Soil bacteria, Phosphate Solubilization, toxicity tolerance*

****Corresponding Author:*** *buddhiwalpola@yahoo.com*