

DISTRIBUTION AND GEO-ENVIRONMENTAL ANALYSIS FOR ECOLOGICAL RISK ASSESSMENT OF HEAVY METALS IN SOILS OF LOWER DIR, KHYBER PAKHTUNKHWA, PAKISTAN

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Abstract

The soil samples (n= 43) collected from Lower Dir were analysed for pH, EC, salinity, Na, K, Ca, Mg, Fe, Mn, Zn, Cu, Cd, Ni, Cr, Pb, Co and Ag. The physical parameters were measured through electrochemical analyser while major and minor elements were measured by using atomic absorption spectrometer. The calculated values of elements were compared with their background concentration as well with their normal levels in agricultural soil. The mean concentration of elements indicated that Mn, Fe, Cu, Cd and Ag were found higher than their background concentrations. The average concentrations in the soil samples of Lower Dir were found as 18.151, 75.561, 1.77, 17.731, 20.199, 2.052, 85.552 and 8.24 (in mg/Kgs) respectively for Cr, Cu, Cd, Co, Ni, Ag, Zn and Pb. These elements on the basis of highest to lowest average concentrations can be sorted as: Zn > Cu > Ni > Cr > Co > Pb > Ag > Cd. Contamination Factor (CF) analysis indicated very strong pollution for Ag, medium to moderate pollution for Mn, Cu, and Cd, moderate to strong pollution category for Fe and finally non to medium for Pb, Cr, Ni, Zn, Co, Ca, and Mg. The contamination degree of elements was found as 20.947, which satisfied the category of considerable degree of contamination because of natural inputs. The Pollution Load Index (PLI) for 12 elements was found as 0.857 in the soil of Lowe Dir which falls in the “No Pollution” category. Index of geo-accumulation results indicated that Ag showed moderate pollution while rest of the elements attributed unpolluted to moderately polluted intensity of pollution. Finally, Enrichment Factor (EF) analysis showed lowest degree of enrichment for Cr while highest degree of enrichment for Ag and Cd. The data concluded that possible sources of pollution for Ag and Cd are anthropogenic as their EF calculated values were found higher than 1.5, however, rest of the elements can be subjected to geogenic sources of pollution. By mutual comparing of EF calculated values of selected elements and seven categories of EF; the Cd and Ag compliance moderate enrichment category, Fe showed minor enrichment while the remaining elements resulted no enrichment class.