

Abstract

The impact of the mountain cropping system on groundwater quality and soil heavy metal accumulation was studied in mid-hills of Solan and Kullu districts of Himachal Pradesh. To assess the impact of dominant cropping systems, the four commonly occurring systems, namely vegetable, fruit, cereal crop and agroforestry were selected in the area ranging from 800-1800m. Uncultivated land in the region was considered as control. In total, there were five treatments which were replicated six times under randomized block design. The study was conducted for two years, i.e. during 2014 and 2015. The study indicated that the mountain cropping systems varied significantly with respect to their impact on groundwater quality and soil heavy metal accumulation. The pH, electrical conductivity, chlorides, nitrates and sulphates in groundwater were within drinking water permissible limits prescribed by Bureau to Indian Standards (BIS). The concentration of zinc, arsenic and nickel in groundwater was also within drinking water critical limits prescribed by BIS but lead and cadmium exceeded the limits. The concentration of lead and cadmium ranged from 0.12 to 0.27 mg L⁻¹ and 0 to 0.02 mg L⁻¹, respectively, and followed similar crop system-wise trend, i.e. vegetable > fruit > agriculture > agroforestry > control. The soil accumulation of zinc, arsenic and nickel was within permissible limits prescribed by WHO but lead and cadmium violated the limits. Interestingly, soil accumulation of lead exceeded WHO permissible limits under all cropping systems, including the control. The accumulation of lead and cadmium in soil ranged from 0.16 to 0.44 mg kg⁻¹ and 0.02 to 0.12 mg kg⁻¹, respectively, and had a similar crop system-wise trend they had in groundwater. Therefore, to maintain the quality of the important natural resources like groundwater and soil in mid-hills of Himachal Pradesh, necessary steps need to be taken.