

Heavy metals determination in surface water and ground water in an agricultural community of El Salvador

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Abstract

Heavy metals can be present in the water naturally as trace elements introduced through the hydrological cycle and reactions with Earth's crust materials. They can also come from human activities, such as the large-scale use of chemicals in agriculture and improper disposal of pesticide waste activities. Some metals (arsenic and lead) are considered toxic to health. However, others (zinc, nickel) are essential to human life at moderate concentrations. An overload of these elements is considered as contamination and can cause adverse human health and environmental effects. It is estimated that in Latin America, about 4 million people are at risk of being affected by contamination with heavy metals.

This study was carried out in an area located in the coastal area of El Salvador. A former pesticide factory is located in the study area, which stored more than 32 tons of obsolete pesticides inappropriately during 30 years. Within the study area is located the village of Loma del Gallo. The main economic activity in this community is agriculture and their main sources of water supply are the nearby rivers and wells whose water table varies from 2 to 27 meters. The aim of this study was to determinate chemical parameters (hardness, pH, heavy metals) in samples of groundwater and surface water.

According to the results, the hardness in groundwater varies between 19mg/l and 247mg/l, this water can be classified between moderately hard and very hard. Groundwater can be considered neutral with a pH ranging between 6.1 to 7.3. Arsenic and cadmium were the main metals found in groundwater with maximum values of 0.012mg/l and 0.004mg/l respectively. The maximum values of arsenic and cadmium in surface water are 0.026mg/l and 0.0001mg/l respectively. The surface water can be categorized between soft and moderately hard with a hardness range between 30mg/l to 71mg/l. Also this water can be categorized as neutral with a pH between 6.3 to 7.5.

In general, surface water has a higher concentration of heavy metals than groundwater. High levels of Cd in water samples from rivers and wells in the sugar cane fields area, possibly have originated in agrochemicals such as fertilizers applied to crops of sugar cane, or as impurities in the applied pesticides. High levels of As in surface and groundwater may be related to anthropogenic source as the former pesticide factory, or to geogenic sources due to the volcanic origin of the soils in the region.