Impact assessment of metals on soils from Machu Picchu archaeological site

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Abstract

Machu Picchu is an archaeological Inca sanctuary from the 15th century, located 2430 m above the sea level in the Cusco Region, Peru. In 1983, it was declared World Heritage Site by UNESCO. The surroundings and soils from the entire archaeological site are carefully preserved together with its grass parks. Due to the importance of the archaeological city and its surroundings, the Decentralized Culture Directorate of Cusco-PAN Machu Picchu decided to carry out a careful monitoring study in order to determine the ecological status of the soils. In this work, elemental and molecular characterization of 17 soils collected along the entire park was performed by means of X-ray Diffraction (XRD) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) after acidic digestion assisted by microwave energy. Thanks to the combination of these analytical techniques, it was possible to obtain the mineral composition and metal concentrations of all soils from these 17 sampling points. Finally, different statistical treatments were carried out in order to confirm the ecological status of the different sampling points from Machu Picchu archaeological site concluding that soils are not impacted.

Keywords

Soil analyses; Metals; MetalloidsM; Contamination factor; ICP-MS; Machu picchu