Capture by Nature: Lichens as Bioindicators of Air Pollutants

Soto Lopez, Emmanuel (School: Montessori Guillermo Riefkohl)

This study investigated the accumulation of heavy metals in lichens as bioindicators of air quality in southern Puerto Rico. The objective was to evaluate whether proximity to industrial activity influences metal bioaccumulation. If atmospheric pollution is higher in industrial or urban areas, then lichens from those areas will show greater heavy-metal concentrations than lichens from cleaner, rural areas. Composite lichen samples were collected from three sites: two industrial areas and one rural area. Samples were dried at 60°C, macerated, and digested using HNO3. Elemental concentrations of As, Cd, Cr, Cu, Hg, Ni, Pb, and Zn were quantified using Inductively Coupled Plasma (ICP) spectroscopy. Results showed that copper (Cu) and zinc (Zn) presented the highest concentrations across all sites. Site 1 recorded 42.25 ppm of Cu and 28.88 ppm of Zn, while Site 2 exhibited similar Cu levels (42.50 ppm) but higher Zn concentrations (40.00 ppm). In contrast, Site 3 displayed significantly lower values for both metals (18.75 ppm). Standard deviation values were within acceptable limits, indicating analytical consistency. Slight variability was observed for Zn, which is expected due to increased dispersion at higher concentrations. A clear spatial pattern was identified, with metal concentrations decreasing as distance from anthropogenic sources increased. These findings support the effectiveness of lichens as bioindicators of metal deposition in the region. Although measured concentrations remained below EPA soil remediation thresholds, the results demonstrate a relationship between industrial proximity and heavy metal bioaccumulation.

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