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Distribution of Cu, Zn, and P in Coastal Plain Soils Receiving Repeated Biosolids Applications

Long-term agronomic N-based application of biosolids will cause a gradual increase in the concentration of trace elements and phosphorus in amended soil. It is important to improve our knowledge of mobility of trace metals and P in receiving fields with marginal adsorptive capacity. Biosolids liquid slurry was applied an Acredale (fine silty mixed thermic typic Ochraqualfs) and a Bojac (coarse loamy mixed thermic typic Hapludult) for a period of 14 years starting in 1984. The repeated biosolids application supplied 70 and 204 kg ha-1 of Cu and Zn, respectively, to the Acredale soil and 81 and 225 kg ha-1 of Cu and Zn, respectively, to the Bojac soil. Soils were sampled to a depth of 0.75 m and sectioned into 10-cm increments. Total Cu, Zn, C, N, and P analysis were performed on samples from the controls and biosolids-receiving plots. Mehlich-1 and Oxalate extractable P, Cu, and Zn were analyzed on samples from the Ap horizon. The total C and N contents were not different than background levels in the Bojac soil and were slightly higher in the Acredale soil seven years after cessation of biosolids application. Phosphorus, Cu and Zn are still concentrated in the top 0.25 m of the Acredale soil. In Bojac sandy soil, enrichment of P, Cu and Zn were detected to 0.75m below the soil surface. Monitoring well water analysis revealed no change in P, Cu, or Zn concentration. Approximately 20 to 40% of the Cu and Zn applied in the biosolids could not be accounted employing a mass balance technique, which could have been due to a combination of leaching and incomplete extraction. Higher Mehlich 1 extractable concentrations of both metals and excessive P concentrations were found in the treated plots. Degree of P saturation was > 65% in treated plots which could increase the risk of P loss.

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