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Sorption of cadmium by an acid soil amended with compost and copper-mine tailing

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Humified materials from the compost industry and certain waste from mining operations can be used as low cost toxic metal adsorbents in soils having a very low sorption capacity. An experiment was designed to assess the sorption of cadmium (Cd) by an acid coarse-textured soil (pH 5.50) amended with peat moss-shrimp waste compost (PSC), and three copper-mine tailing samples rich in calcareous products, namely untreated tailing (MT), tailing + 10% of PSC (MTC-10) and tailing + 20% of PSC (MTC-20). The soil amendment rates ranged from 0 to 300 g/kg soil. The sorption measurement was carried out on 17 soils by adding 30 mL of 0.01 M CaCl2 solution containing 100 mg Cd/L, as CdCl2, to 1.00 g of soil. The suspension was shaken for 30 min and equilibrated at room temperature for 7 days. After centrifuging, the Cd concentration in the supernatant was measured by atomic absorption spectrophotometry. The sorption coefficient (Ks) was used to interpret the sorption data. Triplicate samples of the soils were used throughout the sorption study. MT (pH 7.7) amendment treatment was more effective than PSC (pH 6.8) treatment in raising the pH of acid sandy soil. Sorption increased with amendment additions depending on the type and rate of amendment application. The compost alone had the highest affinity for Cd, while the tailing alone exhibited the least affinity. The increasing order of Cd sorbed after amendment was: PSC > MTC-20 > MTC-10 > MT. The results indicate that PSC and Cu-mine tailing amended with PSC can be used as effective sorbents for anthropogenic Cd in acid sandy soils.