

Soil amendments to reduce the Cd uptake by plants

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The non-essential trace element cadmium (Cd) can present a human health risk. Long term application of Cd-rich phosphate fertilizers can cause elevated Cd concentrations in soil. Cadmium is readily taken up by plants and can be transferred to grazing animals. In many agricultural systems, Cd concentrations in leafy vegetables and the offal products of grazing animals are at or above food safety standards. There is no practical means to remove Cd from contaminated soil. Therefore, there is an imperative to find a low-cost solution to reduce the plant Cd-uptake. We wanted to determine whether low-cost soil amendments could fulfil this role. Batch experiments revealed that lignite coal and composts made from municipal green waste and animal residues combined with wood-waste sorbed >50 times more Cd than two agricultural soils between pH 4.5 and pH 7 and that sawdust, charcoal, and zeolite did not sorb significant amounts of Cd. Pot trials demonstrated that municipal compost applied at rates of 2.5% and 5% (w/w), reduced Cd uptake by spinach, lettuce, onions and potatoes by 25% to 60%. Lignite produced variable results, with plant Cd concentrations increasing in some soils, presumably due to acidification. Similarly, liming produced variable results. Besides reducing plant Cd uptake, municipal composts had little effect on the plant-uptake of other elements. Unlike lime or lignite, municipal composts significantly improved plant growth especially potato. Incubation studies followed by pot trials demonstrated that Cd sorption by composts and its effectiveness in reducing plant Cd-uptake persists for at least one year, even under warm, humid and high N conditions. We conclude that biological wastes, especially composts, are an underutilised resource that can not only reduce plant Cd-uptake but also improve plant production.